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SECTION 002114

DIESEL ENGINE EMISSIONS CONTROLS

Contractor, by submission of its bid, agrees to meet the requirements of this Section.

A. Covered Vehicles: Vehicles covered under this Section include any nonroad diesel engine that has a horsepower greater than 50.

B. Requirements

1. All contractors, and all the contractor's subcontractors, if any, in the performance of this contract use ultra-low sulfur diesel fuel, and a listed clean diesel technology for reducing the emission of pollutants for diesel-powered non-road engines. Clean diesel technologies are further defined in part D of this Section. Retrofit emission control devices shall consist of diesel oxidation catalysts ("DOC") or such other technologies that provide a minimum emissions reduction of twenty percent (20%) of particulate matter with a mean aerodynamic width of less than ten (10) microns (PM10) in the application for which it is verified. Any retrofit emission control device installed to comply with this Section must either be listed by EPA or the California Air Resources Board (CARB) as a verified diesel retrofit technology that reduces particulate matter emissions by 20% or more, or must be certified by the diesel retrofit device manufacturer as a product that reduces particulate matter emissions by 20% or more for the covered vehicle.

2. No later than two business days before any covered vehicle is brought on to the contract site, the successful bidder (hereinafter, "contractor") shall submit to the City's project manager information about the vehicle including confirmation that the appropriate emissions control technology has been installed on the vehicle or that the vehicle is Tier 4 or Tier 4 Interim. Except as otherwise provided, any vehicle covered under this Section shall be in compliance with this Section prior to being brought onto the contract site.

   a. Contractor shall submit the following information for each covered vehicle (using *Fleet Roster for Public Works Construction Projects* form):
      i. vehicle identification number (VIN), if applicable, or vehicle serial number, and the vehicle type, make, year and owner;
      ii. the horsepower rating of each engine;
      iii. the emission control device manufacturer name, model, and verifying/certifying organization; and
      iv. the type of fuel to be used and approximate expected quantity.

b. In the event contractor has purchased appropriate emissions control technology, but the technology is not delivered before use of the covered vehicle is required on the contract site, the contractor shall, in addition to submission of a.i., through iv. above, submit proof of purchase of the emissions control technology. Installation of the appropriate emissions control technology must be completed within five (5) days of delivery of the technology. In no event may Contractor use the covered vehicle without the use of the emission control technology, for which the technology has already been purchased and identified, on the contract site for longer than sixty (60) days.

c. If a covered vehicle owned by a contractor breaks down on the contract site, contractor may use, if a compliant replacement is unavailable, a temporary vehicle that is not compliant while the covered vehicle is being repaired; the temporary vehicle cannot remain on site for more than 30 cumulative days after the date of the initial breakdown of the covered vehicle. Contractor shall notify the project manager in writing prior to bringing a non-compliant vehicle on the contract site.

3. The contractor shall establish truck-staging zones for vehicles that are waiting to load or unload material at the contract site. Such zones shall be located where the emissions from the trucks will have minimum impact to the public.

4. The contractor shall not permit idling of delivery and/or dump trucks, or equipment on the contract site during periods of non-active use, and it should be limited to three (3) minutes in accordance with the Philadelphia Traffic Code Anti-Idling Ordinance Section 12-1127(1) of The Philadelphia Code (http://www.phila.gov/philacode/html/_data/title12/chapter_12_1100_miscellaneous_/12_1127_excessive_idling_of_an.html) and the Pennsylvania Diesel-Powered Motor Vehicle Idling Act, Title 35 Purdons Pennsylvania Statutes, Section 4601 *et seq.*

C. Exemptions

1. Subject to written approval by the City of Philadelphia Air Management Services (AMS), covered vehicles will be exempted from low diesel emission controls if one or more of the following conditions exist:

a. It is physically impossible to install appropriate emissions control technology on the vehicle;

b. Installation of the appropriate emissions control technology would render vehicle operation unsafe due to obstructed sightline;

c. Installation of the appropriate emissions control technology would void any applicable expressed manufacturer's warranty on the vehicle; or

d. The covered vehicle will not be at the work site for more than a total of three (3) business days.

2. In support of a request for exemption, contractors shall provide to AMS one of the following:
   a. a signed letter from one or more diesel technology vendors, written on the vendor's formal stationary, certifying that no emissions controls that would reduce Particulate Matter (PM) emissions by at least 20% and allow for safe operation could be physically installed, or the cost of installing such control technology would cost 150% more than the purchase price of the clean diesel technology device;
   b. a signed letter from the vehicle manufacturer certifying that the installation of any device to reduce PM emissions by 20% or more would void the applicable expressed manufacturer's warranty, along with a copy of the warranty for each vehicle for which an exemption is sought; or
   c. a signed letter on the contractor's company letterhead stating that the covered vehicle will remain on site for no longer than three (3) days total during the duration of the project.

3. In no event will the City grant an exemption from the required use of ultra-low sulfur diesel fuel or the idling laws.

D. Definitions

1. Contract site – all areas covered under the contract, and areas accessed for purposes of performing activity under the contract;

2. Non-active use – a period of time greater than five (5) minutes when a piece of diesel equipment is not being operated in performance of its work;

3. Non-road – diesel vehicles listed by EPA for use in non-road applications. These include construction, agricultural, and other industrial vehicles that are not legally operable on highways;

4. On-road – vehicles listed by EPA for on-highway applications;

5. Truck-staging zone – a designated area on the contract site where delivery or pickup activities will be located;

6. Ultra low sulfur diesel fuel – Diesel fuel with a sulfur content of 15 parts per million or less;

7. Vehicle – a piece of diesel-powered equipment being used for contract activities; and

8. Listed clean diesel technology – includes:
   a. Diesel oxidation catalyst – a device similar to a catalytic converter that reduces diesel emissions and does not require regeneration;

   Tier 4 or Tier 4 Interim – any vehicle certified by EPA as meeting Tier 4 emissions standards or Tier 4 Interim emissions standards;

b. Particulate filter – a device that traps soot produced by the engine and vaporizes this soot through the application of heat, requiring only periodic maintenance;

c. Closed crankcase ventilation – a device that reduces fugitive emissions from the vehicle's crankcase by routing them through the tailpipe;

d. Selective catalytic reduction – A device that reduces emissions of oxides of nitrogen by treating exhaust with urea;

e. Emissions upgrade groups – groups of replacement components that, when installed during vehicle overhaul, reduce engine emissions;

f. Engine repower – the replacement of a vehicle's engine with a newer model to reduce tailpipe emissions; and

g. Any other technology verified by EPA or CARB to reduce diesel particulate emissions by 20% or more.

E. Monitoring and Penalties for Non-Compliance

1. City reserves the right to request purchase and/or installation documents to verify contractor's, and any subcontractor's installation of the retrofit in the vehicle. These purchase documents shall be provided to the City's project manager by the contractor within five (5) days of the City's request.

2. Any false certification or representation in connection with these requirements for Diesel Engine Emissions Controls and/or any failure to comply with these requirements shall constitute a material breach of contract entitling the City to all rights and remedies provided in the contract and otherwise available at law and/or in equity, including but not limited to the monetary assessment set forth herein. For contracts of $500,000.00 or less, an assessment of $500.00 per offense per day shall be imposed upon the contractor for every covered vehicle operating in violation of this section. For all other contracts, an assessment of $1000.00 per offense per day shall be imposed upon the contractor for every covered vehicle operating in violation of this section. In addition, it is understood that false certification or representation is subject to penalties under Title 18 Pa. C.S.A. § 4904 (relating to unsworn falsification to authorities).

NOTICE TO SELLERS-MAYOR'S EXECUTIVE ORDER 7-14

NOTICE TO SELLERS

Pursuant to the Order, available on-line at http://www.phila.gov/ExecutiveOrders/Executive%20Orders/EO%207-14.pdf, Contractor agrees that Contractor and all of its Subcontractors, at any tier, shall report to the OIG knowledge of violations subject to investigation by the OIG pursuant to the Order; shall cooperate fully with representatives of the OIG by providing complete and accurate information as well as necessary assistance in matters under investigation; shall keep conversations and contact with the OIG confidential, except and to the extent the OIG may authorize disclosure; and shall instruct their employees that under no circumstances shall any person take or threaten any action in an attempt to prevent anyone from providing information to a City official regarding conduct that may be investigated by the OIG, or from cooperating with the OIG, or retaliate against anyone for doing so or against anyone who is about to do so.

All entities and individuals affected by Mayor's Executive Order 7-14 are advised to thoroughly read the Order, especially Section 3, **Type of Matters Investigated by the OIG**, Section 4, **Entities Subject to Investigation by the OIG**, Section 8, **Duties of Executive Agencies and Other Entities**, Section 9, **Responsibilities of Officers and Employees of Executive Agencies and Other Entities**, and Section 10, **Responsibilities of City Contractors, Recipients of City Assistance and Recipients of City Funding**.

END OF SECTION 002114

SECTION 002115

NOTICE TO SELLERS – MAYOR'S EXECUTIVE ORDER

Pursuant to the Order, available on-line at http://www.phila.gov/ExecutiveOrders/Executive%20Orders/EO%207-14.pdf, Contractor agrees that Contractor and all of its Subcontractors, at any tier, shall report to the OIG knowledge of violations subject to investigation by the OIG pursuant to the Order; shall cooperate fully with representatives of the OIG by providing complete and accurate information as well as necessary assistance in matters under investigation; shall keep conversations and contact with the OIG confidential, except and to the extent the OIG may authorize disclosure; and shall instruct their employees that under no circumstances shall any person take or threaten any action in an attempt to prevent anyone from providing information to a City official regarding conduct that may be investigated by the OIG, or from cooperating with the OIG, or retaliate against anyone for doing so or against anyone who is about to do so.

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END OF SECTION 002115

SECTION 002313

PREVAILING WAGE REQUIREMENTS

No persons shall be employed except competent and first-class workers and mechanics. No workers shall be regarded as competent and first class unless they are fully skilled in their respective branches of labor. All workers shall be paid not less than the wages for such hours or work as shall be the established and current wages paid for such hours by employers of organized labor in doing of similar work in the community where work is being done. The Prevailing Minimum Wage Predetermination is hereby made a part of this Specification. The Contractor is put on notice that it must pay workers the prevailing rates issued by the Philadelphia Labor Standards Unit and the Pennsylvania Department of Labor & Industry according to the wage rate schedule[s]. A copy of the current prevailing wage schedule effective May 26, 2023 is attached for reference only. The final prevailing wage schedules will be provided prior to contract execution.

Please direct any questions or concerns regarding the prevailing wage rate schedule to:

Philadelphia Labor Standards Unit
Municipal Services Bldg., 1st Floor Room 170C
1401 John F. Kennedy Blvd.
Philadelphia, PA 19102-1670
Telephone Numbers: (215) 686-2132
Fax Number: (215) 686-2116

Bureau of Labor Law Compliance
Labor & Industry Building, Room 1301
651 Boas Street
Harrisburg PA 17121
(717)705-5969
Email: RA-LI-SLMR-LLC@pa.gov

END OF SECTION 002313

MEMORANDUM

TO: **Municipal Operating Departments and Awarding Agencies**

FROM: **Perritti DiVirgilio, Director, Fair Labor Standards**

DATE: **Effective June 20, 2023**

RE: **Updated Prevailing Wage Schedule for the City of Philadelphia**

The Philadelphia Labor Standards Unit has issued an updated prevailing wage rate schedule for construction projects done on behalf of the City of Philadelphia. Enclosed herein you will find the two (2) decisions, which comprise the updated prevailing wage schedule. They are as the follows:

I. Building Construction
II. Heavy and Highway Construction

Please direct any questions or concerns regarding the prevailing wage rate schedule to my attention:

Philadelphia Labor Standards Unit
Municipal Services Bldg., 1st Floor Room 170C
1401 John F. Kennedy Blvd.
Philadelphia, PA 19102-1670
Telephone Numbers: (215) 686-2132
Fax Number: (215) 686-2116

Thank you for your cooperation.

PREVAILING WAGE RATE SCHEDULE
FOR CONSTRUCTION WORK DONE ON BEHALF OF CITY OF PHILADELPHIA
INCLUDING REPAIR, ALTERATION, AND REMODELING WORK

I. BUILDING CONSTRUCTION

A. Job Classification and Wage Rates

	Basic Hourly Rate	Fringe Benefits
ASBESTOS WORKER		
Journeyman	**57.84**	**43.46**
Handler Level 1	**32.01**	**23.80**
Handler Level 2	**46.47**	**23.80**
BOILERMAKER	**51.27**	**35.30**
BRICKLAYER	**47.50**	**31.61**
CARPENTER	**52.64**	**29.77**
(as of 51/2024)	**54.64**	**29.77**
(as of 51/2025)	**56.64**	**29.77**
CEMENT MASON	**44.20**	**32.96**
DRY WALL FINISHER	**41.80**	**31.76**
ELECTRICIAN	**68.18**	**44.06**
(Telecommunication Senior Tech)	**64.97**	**33.53**
(Telecommunication Tech A)	**61.07**	**31.54**
ELEVATOR CONSTRUCTOR	**63.52**	**37.485**

FOOTNOTES FOR ELEVATOR MECHANICS:

A. PAID VACATION: Employer contributes 8% of basic hourly rate for 5 years or more of service or 6% for 6 months to 5 years of service.

B. Eight Paid Holidays (provided employee has worked 5 consecutive days before and the working day after the holiday): New Year's Day; Memorial Day; Independence Day; Labor Day; Veteran's Day; Thanksgiving Day and the Friday after Thanksgiving Day, and Christmas Day.

GLAZIER	**46.68**	**36.62**
IRONWORKER		
Structural & Ornamental	**47.70**	**39.16**
Reinforcing (Rodsetter)	**47.41**	**33.10**
Rigger & Machinery Mover	**43.72**	**32.47**
LABORER		
Journeyman Class One	**36.45**	**27.02**
Journeyman Class Two	**36.55**	**27.02**
Journeyman Class Three	**36.60**	**27.02**
Journeyman Class Four	**36.75**	**27.02**
Journeyman Class Five	**36.80**	**27.02**
Journeyman Class Six	**36.59**	**27.02**
Journeyman Class Seven	**37.70**	**27.02**
Journeyman Class Eight	**37.75**	**27.02**
Journeyman Class Nine	**37.85**	**27.02**

Journeyman Class Ten	**38.00**	**27.02**
Journeyman Class Eleven	**38.25**	**27.02**
Journeyman Class Twelve	**36.82**	**27.02**
LABORER: ASBESTOS ABATEMENT, LEAD ABATEMENT, TOXIC WASTE HANDLING, HAZARDOUS WASTE HANDLING		
MASTER ABATEMENT TECHNICIAN	**37.95**	**27.30**
LANDSCAPE LABORER		
Class I	**29.45**	**23.98**
Class II	**29.45**	**23.98**
LATHER	**52.64**	**29.46**
LINE CONSTRUCTION		
Lineman	60.48	30.25
(as of 6/03/2024)	**62.07**	**31.36**
Winch Truck Operator	**42.34**	**26.40**
(as of 6/03/2024)	**43.45**	**27.18**
Ground hand	**36.29**	**24.20**
(as of 6/03/2024)	**37.24**	**24.90**
Watch/Flag Person	**25.86**	**20.26**
(as of 6/03/2024	**26.54**	**21.19**
MARBLE SETTER	**45.90**	**32.20**
MARBLE FINISHER	**39.52**	**29.30**
MILLWRIGHT	**51.60**	**35.81**
(as of 51/2024)	**54.67**	**35.81**
(as of 51/2025)	**57.39**	**35.81**
(as of 51/2026)	**60.20**	**35.81**
PAINTER		
Brush & Roller	**42.32**	**32.91**
Spray, Steel, & Swing	**43.57**	**32.91**
Bridges	**59.78**	**32.13**
PILEDRIVERMAN	**46.73**	**41.74**
(as of 5/1/2024)	**49.23**	**41.74**
(as of 5/1/2025)	**51.48**	**41.74**
(as of 5/1/2026)	**53.23**	**41.74**
(Diver)	**58.41**	**41.74**
(as of 5/1/2024)	**61.54**	**41.74**
(as of 5/1/2025)	**64.35**	**41.74**
(as of 5/1/2026)	**66.54**	**41.74**
(Diver Tender)	**46.73**	**41.74**
(as of 5/1/2024)	**49.23**	**41.74**
(as of 5/1/2025)	**51.48**	**41.74**
(as of 5/1/2026)	**53.23**	**41.74**
PLASTERER	**42.97**	**32.65**
(as of 5/1/2024)	**42.97**	**33.90**
PLUMBER	**64.73**	**37.61**
POINTER, CAULKER, & CLEANER	**48.80**	**30.70**
POWER EQUIPMENT OPERATOR		
Group One	**52.20**	**32.81**
Group One A	**55.20**	**33.70**

Group Two	**51.95**	**32.74**
Group Two A	**54.97**	**33.61**
Group Three	**47.87**	**31.53**
Group Four	**47.57**	**31.44**
Group Five	**45.85**	**30.93**
Group Six	**44.85**	**30.65**

*****TOXIC/HAZARDOUS WASTE REMOVAL*****
Add 20 percent to basic hourly rate for all classifications

ROOFER	**42.63**	**34.62**
Shingle	**32.85**	**22.10**
Slate & Tile	**35.85**	**22.10**
SHEET METAL WORKER	**57.31**	**48.97**
(Sign Makers and Hangers)	**25.03**	**21.41**
SOFT FLOOR LAYER (Resilient Floor)	**53.93**	**30.54**
SPRINKLER FITTER	**64.73**	**32.59**
STEAM FITTER	**67.37**	**41.99**
STONE MASON	**47.20**	**31.95**
Surveying and Layout		
(Chief of Party)	**60.54**	**29.27**
(as of 5/1/2024)	**62.83**	**29.27**
(as of 5/1/2025)	**65.14**	**29.27**
(Instrument Person)	**52.64**	**29.27**
(as of 5/1/2024)	**54.64**	**29.27**
(as of 5/1/2025)	**56.64**	**29.27**
(Rodman)	**26.32**	**20.87**
(as of 5/1/2024)	**27.32**	**20.87**
(as of 5/1/2025)	**28.32**	**20.87**
TERRAZZO MECHANIC	**50.26**	**29.56**
TERRAZZO FINISHER (Grinder)	**44.02**	**27.86**
TERRAZZO FINISHER (Finisher)	**43.75**	**27.86**
TILE SETTER	**50.26**	**29.10**
TILE FINISHER	**39.52**	**29.30**
TRUCK DRIVER		
Journeyman Class I	**36.29**	**21.555**
Journeyman Class II	**36.39**	**21.555**
Journeyman Class III And Low Boy	**36.64**	**21.555**
WALL COVERER	**44.41**	**32.91**
WELDER - Rate for craft to which, welding work is incidental.		
WINDOW TINTER	**24.97**	**12.38**

B. Job Classification Definitions: Building Construction,

1. Laborer Classifications:

Class One: Strip concrete, dismantle concrete, load, unload, handle and/or transport reinforced steel and steel mesh, carry lumber, handle miscellaneous building materials operate jack hammers, use paving breakers and other pneumatic tools, build scaffolds, perform raking,handle asphalt, perform spading and concrete pit work, perform grading, perform form pinning or shorting, perform demolition work with exception of burners, lay conduits, lay ducts, perform sheating or lagging, lay non-metallic pipe, perform caulking.

Class Two: Power Buggies, Burners on Demolition.

Class Three: Wagon drill operator (single)

Class Four: Powderman, wagon drill operator (multiple), perform circular caissons excavations, caisson groundman, perform underpinning excavation, perform laborers' work at depth of eight (8) feet or below.

Class Five: Caisson bottom worker.

C**lass Six:** Yard worker.

Class Seven: Trackmen, Brakemen, Groutmen, Bottom Shaft Men, All Other Men in Free Air Tunnels.

Class Eight: Caisson Foreman

Class Nine: Miner Helper, Form Setters.

Class Ten: Miners Bore Driver, Blasters, Drillers, Pneumatic Shield Operator.

Class Eleven: Welders & Burners.

Class Twelve: Mason Tenders

Landscape Laborers:

Class I: Landscape laborer

Class II: Farm tractor driver, hydro seeder, mulched nozzle worker, backhoe operator, bulldozer crawler type loader, tree crane operator.

Laborer - Lather and Plasterer: Wheel and/or hod carry any lather and plaster materials used by lathering and plastering contractors' build scaffolds; build runways; perform clean-up and removal of debris as covered by lathering and plastering contractor's contract; deliver any material used by lathering and plastering contractor, from curbside to building and back, unless motor vehicles are permitted to enter building with required materials; all mortar designated for use by plasterer shall be carried via wheel barrow or hod; all plastering and fire proofing machines, as well as guns and mixers requiring the assistance of a worker other than plasterer operator, shall be manned by helper (tender).

2. Truck driver classifications:

Class I: Helper, stake body truck operator (single axle, dumpster).

Class II: Dump truck operator, tandem truck operator, batch truck operator, semi-trailer truck operator, agitator-mixer truck operator, dump Crete type vehicle operator, asphalt distributor, farm tractor operator (when tractor used to transport materials), stake body truck (tandem) operator.

Class III: Euclid type; off highway equipment back truck operator; belly dump truck operator; double-hitched equipment trailer operator; straddle carrier (Ross) operator; low-bed trailer truck operator.

3. Power Equipment Operator Classifications – Building

Group One:

Handling steel and stone in connection with erection Cranes doing hook work
Any machines handling machinery
Helicopters
Concrete Pumps (building)

Machines similar to above, including remote control equipment

Group One A:

Handling steel and stone in connection with erection.
Cranes doing hook work

Any machines handling machinery
Concrete Pumps (Building)
High Rail/Burro Crane
Rail Loader (Winch Boom Type)
All equipment in this group which previously received the hour in lieu of an oiler will receive Wage Group I (A). Equipment in this Wage Group that does not require an oiler.
Machines similar to above, including remote control equipment

Group Two:

All types of cranes
All types of backhoes

Cableways
Draglines
Keystones
All types of shovels
Derricks
Pavers 21E and over
Trenching machines
Trench shovels
Cable spinning machine
Gradalls
Front- end Loaders
Boat Captain
Hoist with Two Towers
Building Hoists-double drum (unless used as a single drum)
Pippin type backhoes
Tandem scrapers
Tower type crane operation erecting dismantling jumping or jacking
Drills self-contained (Drillmaster type)
Fork lift (20ft. and over)
Motor Patrols (fine grade)
Batch Plant with Mixer
Carryalls, Scrapers, Tournapulls
Roller (High Grade Finishing)
Spreaders (Asphalt)
Bulldozers and Tractors
Mechanic-Welder
Conveyor Loaders (Euclid-Type Wheel)
Concrete Pumps (Heavy Highway)
Milling Machine
Bobcat
Side Boom
Directional Boring Machines
Vermeer Saw Type Machine (other than hand held)
Tractor Mounted Hydro Axe
Chipper with boom

All Autograde and concrete finishing machines
Bundle Pullers/Extractors (Tubular)
Machines similar to the above including remote control equipment
*Surcharge

Group Two (A):

Crawler backhoes and Crawler gradalls over one (1) cubic yard factory rating

Hydraulic backhoes over one (1) cubic yard factory rating
Single person operation truck cranes 15 ton and over factory rating
Cherry picker type machinery and equipment 15 ton and over factory rating, etc.
Cranes doing hook work will be paid Wage Group I (A).
All equipment in this Group which previously received the hour in lieu of an oiler will receive Wage Group II (A) including concrete pumps (Heavy/Highway).
Machines similar to the above including remote control equipment
*Surcharge
Group Three:
Asphalt Plant Engineers
Conveyors (except building conveyors)
Well Driller
Forklift Trucks of all types
Ditch Witch (small trenchers)
Motor Patrols
Fine Grade machines
Rollers
Concrete Breaking Machines (Guillotine Only)
Stump Grinder
High or Low Pressure Boilers
Building Hoist (single drum)
Elevator Operator (New Construction)
Machines similar to above including remote control equipment
Group Four:
Seamen Pulverizing Mixer
Form Line Graders
Farm Tractors
Road Finishing Machines
Concrete Spreaders (Heavy Highway)
Power Broom (self-contained)
Seed Spreader
Grease Truck
Machines similar to the above including remote control equipment
Group Five:
Compressors
Pumps
Well pint pumps
Conveyors (Building)
Welding Machines
Heaters
Tireman, Power Equipment
Maintenance Engineers (Power Boats)
Miscellaneous Equipment
Operator

Elevator Operator (Renovations)
House Car
Machines similar to above including remote control equipment
Group Six:
Fireman
Oilers and Deck Hands (Personnel Boats)/Grease Truck Helpers
*Surcharge

Group Seven (A):

Handling steel and stone in connection with erection
Cranes doing hook work
Any machines handling machinery
Cable spinning machine
Helicopters
Concrete pumps (Building)
High Rail/Burro Crane
Rail Loader (Winch Boom Type)
Machines similar to above, including remote control equipment

Group Seven B

All types of cranes
All types of backhoes
Cableways
Conveyor Loader (Euclid-Type Wheel)
Drag Lines
Keystones
All types of shovels
Derricks
Pavers 21E and over
Trench shovels
Trenching machines
Gradalls
Front-end Loaders
Boat Captain
Hoist with two towers
Concrete Pumps (Heavy, Highway)
Building Hoists-double drum (unless used as a single drum)
Milling Machine
Mucking Machines in Tunnel
Pippin type backhoes
Bobcat
Tandem scrapers
Side Boom
Tower type crane–operation, erecting, dismantling,
Jumping or jacking
Directional Boring Machines
Vermeer Saw Type Machine (other that hand held)
Drills self-contained (Drillmaster type)
Fork Lift (20 ft. & over)
Track or Mounted Hydro Axe
Motor Patrols (Fine Grade)

Chipper with boom
Batch Plant with Mixer
All autograde and concrete finishing machines
Carryalls, Scapers & Tournapulls
Rollers (High Grade Finishing)
Bundle Pullers/Extractors (Tubular)
Spreaders (Asphalt)
Bulldozers and Tractors
Mechanic – Welders
Production Switch Tamper

Ballast Regulators
Tie Replacer
Rail/Road Loader
Power Jack liner
Machines similar to above, including remote control equipment

II. HEAVY AND HIGHWAY CONSTRUCTION

A. JOB CLASSIFICATION AND WAGE RATES

	Basic Hourly Rate	Fringe Benefits
BOILERMAKER	**51.27**	**35.30**
CARPENTER	**54.78**	**29.27**
(as of 5/1/2024)	**56.48**	**29.27**
(as of 5/1/2025)	**58.18**	**29.27**
(as of 5/1/2026)	**59.88**	**29.27**
CEMENT MASON	**43.20**	**32.91**

(as of 5/1/2024)	**44.25**		**33.41**
(as of 5/1/2025)	**45.80**		**33.41**
(as of 5/1/2026)	**47.40**		**33.41**
ELECTRICIAN	**68.18**		**44.06**
IRONWORKERS			
Structural & Ornamental	**47.70**		**39.16**
Reinforcing (Rodsetter)	**47.41**		**33.10**
Rigger & Machinery Mover	**43.72**		**32.47**
LABORERS			
Group One	**37.55**		**27.45**
Group Two	**37.75**		**27.45**
Group Three	**37.75**		**27.45**
Group Four	**32.25**		**27.45**
Group Five	**38.40**		**27.45**
Group Six	**38.45**		**27.45**
Group Seven	**38.30**		**27.45**
Group Eight	**38.05**		**27.45**
Group Nine	**37.90**		**27.45**
Group Ten	**38.05**		**27.45**
Group Eleven	**37.95**		**27.45**
Group Twelve	**39.65**		**27.45**
Group Thirteen	**41.68**		**27.45**
Group Fourteen	**38.25**		**27.45**
LANDSCAPING LABORER			
Class I	**29.03**		**23.80**
Class II	**27.73**		**23.80**
LINE CONSTRUCTION			
Lineman	60.48		30.25
(as of 6/03/2024)	**62.07**		**31.36**
Winch Truck Operator	**42.34**		**26.40**
(as of 6/03/2024)	**43.45**		**27.18**
Ground hand	**36.29**		**24.20**
(as of 6/03/2024)	**37.24**		**24.90**
Watch/Flag Person	**25.86**		**20.26**
(as of 6/03/2024)	**26.54**		**21.19**

MILLWRIGHT	**51.60**		**35.81**
(as of 5/1/2024)	**54.67**		**35.81**
(as of 5/1/2025)	**57.39**		**35.81**
(as of 5/1/2026)	**60.20**		**35.81**
PAINTERS			
Brush & Roller	**42.32**		**32.91**
Spray, Steel, & Swing	**43.57**		**32.91**
Bridges	**59.78**		**32.13**
PILEDRIVERMAN		**46.73**	**41.74**
(as of 5/1/2024)		**49.23**	**41.74**
(as of 5/1/2025)		**51.48**	**41.74**
(as of 5/1/2026)		**53.23**	**41.74**
(Diver)		**58.41**	**41.74**
(as of 5/1/2024)		**61.54**	**41.74**

(as of 5/1/2025)	**64.35**	**41.74**
(as of 5/1/2026)	**66.54**	**41.74**
(Diver Tender)	**46.73**	**41.74**
(as of 5/1/2024)	**49.23**	**41.74**
(as of 5/1/2025)	**51.48**	**41.74**
(as of 5/1/2026)	**53.23**	**41.74**
POWER EQUIPMENT OPERATOR		
Group One	**51.04**	**31.97**
Group One A	**54.05**	**32.85**
Group Two	**50.79**	**31.90**
Group Two A	**53.81**	**32.77**
Group Three	**46.71**	**30.69**
Group Four	**46.41**	**30.60**
Group Five	**44.69**	**30.09**
Group Six	**43.70**	**29.80**

*****TOXIC/HAZARDOUS WASTE REMOVAL*****
Add 20 percent to basic hourly rate for all classifications

POWER EQUIPMENT OPERATOR DREDGER		
Class A1	**42.66**	**14.01**
Class A2	**38.02**	**13.73**
Class B1	**36.89**	**13.66**
Class B2	**34.73**	**13.53**
Class C1	**33.78**	**13.18**
Class C2	**32.69**	**13.11**
Class D	**27.16**	**12.58**
STEAM FITTER	**67.37**	**41.99**
STONE MASON	**44.90**	**30.75**

Surveying and Layout		
(Chief of Party)	**63.00**	**29.27**
(as of 5/1/2024)	**64.95**	**29.27**
(as of 5/1/2025)	**66.91**	**29.27**
(as of 5/1/2026)	**68.86**	**29.27**
(Instrument Person)	**54.78**	**29.27**
(as of 5/1/2024)	**56.48**	**29.27**
(as of 5/1/2025)	**58.18**	**29.27**
(as of 5/1/2026)	**59.88**	**29.27**
(Rodman)	**43.82**	**22.62**
(as of 5/1/2024)	**45.18**	**22.62**
(as of 5/1/2025)	**46.54**	**22.62**
(as of 5/1/2026)	**47.90**	**22.62**
TRUCK DRIVER		
Class I	**36.14**	**21.555**
Class II	**36.24**	**21.555**

Class III	**36.49**	**21.555**

B. Job Classification Definitions: Heavy and Highway Construction

1. Laborer Classifications:

Group One: Yard workers: (laborer, scale mixerman, burnerman, dustman, feeder)

. **Group Two:** General laborer; Asphalt Shovelers; Sheeting, Shoring & Lagging – Laborer; Stone, Granite & Artificial Stone Setting Laborer; Hod Carriers; Scaffold Building; Relief Joint & Approach Slabs; Assembling & Placing Gabions; Pneumatic Tool Laborers; Concrete Forms & Stripping Laborers; Concrete Lumber Material Laborers; Steel & Steel Mesh (carrying & handling); Form Pinners; Mortar Mixers; Pouring & Placing Concrete; Grade Men.

Group Three: Vibrator Laborers; Finish Surface Asphalt Rackers; Jackhammer Operators; Paving Breaker Operator; Pipelayer & Caulker (all joints up to within 5 feet of the Building Foundation Line); Conduit & Duct Layers

Group Four: Flagperson

Group Five: Miners

Group Six: Welders and Burners.

Group Seven: Miner Bore Driver; Blasters; Drillers Pneumatic Shield Operator

Group Eight: Form Setters

Group Nine: Trackmen; Brackmen; Groutmen; Bottom Shaft Men; All other Laborers in Free Air Tunnels; Underpinning (When an underpinning excavation for a pier hole of five feet square or less and eight feet or more deep is dug, the rate shall apply only after a depth of eight feet is reached, to the men working in the bottom)

Group Ten: Circular Caissons (Where an excavation for circular caissons are dug eight feet or more below the natural grade level adjacent to the starting point of the caisson hole, at ground level, for the men working in the bottom); Welders, Burners & Air Tuggers

Group Eleven: Powdermen; Multiple Wagon Drill Operator Laborer

Group Twelve: Caisson Laborer Foreman

Group Thirteen: Toxic/Hazardous waste Handler

Group Fourteen: Wagon Drill/Hydraulic Track Drill Operator Laborer

Landscape Laborers:

Class I: Landscape laborer

Class II: Farm tractor driver, hydroseeder, mulcher nozzle worker, backhoe operator, bulldozer crawler type loader, tree crane operator.

2. Power Equipment Operator Classifications - Heavy, & Highway

Group One:

Handling steel and stone in connection with erection Cranes doing hook work
Any machines handling machinery
Cable spinning machine
Helicopters
Concrete Pumps (building)
Machines similar to above including remote control equipment

Group One A:

Handling steel and stone in connection with erection.
Cranes doing hook work

Any machines handling machinery
Concrete Pumps (Building)
High Rail/Burro Crane
Rail Loader (Winch Boom Type)
All equipment in this group which previously received the hour in lieu of an oiler will receive Wage Group I (A). Equipment in this Wage Group that does not require an oiler.
Machines similar to above, including remote control equipment
Group Two:
All types of cranes
All types of backhoes
Draglines
Keystones
All types of shovels
Derricks
Pavers 21E and over
Trenching machines
Trench shovels
Gradalls
Front- end Loaders
Boat Captain
Hoist with Two Towers
Building Hoists-double drum (unless used as a single drum)
Pippin type backhoes
Tandem scrapers
Tower type crane operation erecting dismantling jumping or jacking
Drills self-contained (Drillmaster type)
Fork lift (20ft. and over)
Motor Patrols (fine grade)
Batch Plant with Mixer
Carryalls, Scrapers, Tournapulls
Roller (High Grade Finishing)
Bulldozers and Tractors

Mechanic-Welder
Conveyor Loaders (Euclid-Type Wheel)
Concrete Pumps (Heavy Highway)
Milling Machine
Bobcat
Side Boom
Directional Boring Machines
Vermeer Saw Type Machine (other than hand held)
Tractor Mounted Hydro Axe
Chipper with boom
All Autograde and concrete finishing machines
Bundle Pullers/Extractors (Tubular)
Machines similar to the above including remote control equipment
Group Two A:
Crawler backhoes and Crawler gradalls over one (1) cubic yard factory rating
Hydraulic backhoes over one (1) cubic yard factory rating
Single person operation truck cranes 15 ton and over factory rating
Cherry picker type machinery and equipment 15 ton and over factory rating, etc.
Cranes doing hook work will be paid Wage Group I (A).
All equipment in this Group which previously received the hour in lieu of an oiler will

receive Wage Group II (A) including concrete pumps (Heavy/Highway).

Machines similar to the above including remote control equipment

Group Three:

Asphalt Plant Engineers
Conveyors (except building conveyors)
Well Drillers
Forklift Trucks of all types
Ditch Witch (small trenchers)
Motor Patrols
Fine Grade machines
Rollers
Concrete Breaking Machines (Guillotine Only)
Stump Grinder
High or Low Pressure Boilers
Building Hoist (single drum)
Elevator Operator (New Construction)

Machines similar to above including remote control equipment

Group Four:

Seamen Pulverizing Mixer
Form Line Graders
Farm Tractors
Road Finishing Machines
Concrete Spreaders (Heavy Highway)
Power Broom (self-contained)
Seed Spreader
Grease Truck

Machines similar to the above including remote control equipment

Group Five:

CompressorsPumps
Well pint pumps

Conveyors (Building)
Welding Machines
Heaters
Tireman, Power Equipment
Maintenance Engineers (Power Boats)
Miscellaneous Equipment Operator
Elevator Operator (Renovations)
House Car

Machines similar to above including remote control equipment

Group Six:

Fireman
Oilers and Deck Hands (Personnel Boats)
Grease Truck Helpers

Group Seven A:

Handling steel and stone in connection with erection
Cranes doing hook work
Any machines handling machinery
Cable spinning machinery
Helicopters
Concrete pumps (Building)
High Rail/Burro Crane
Rail Loader (Winch Boom Type)

Machines similar to above, including remote control equipment

Group Seven B:

All types of cranes
All types of backhoes
Cableways
Conveyor Loader (Euclid-Type Wheel)
Drag Lines
Keystones
All types of shovels
Derricks
Pavers 21E and over
Trench shovels
Trenching machines
Gradalls
Front-end Loaders
Boat Captain
Hoist with two towers
Concrete Pumps (Heavy, Highway)
Building Hoists-double drum (unless used as a single drum)
Milling Machine
Mucking Machines in Tunnel
Pippin type backhoes
Bobcat
Tandem scrapers
Side Boom
Tower type crane operation, erecting, dismantling,
Jumping or jacking
Directional Boring Machines

Vermeer Saw Type Machine (other that hand held)
Drills self-contained (Drillmaster type)
Fork Lift (20 ft & over)
Tractor Mounted Hydro Axe
Motor Patrols (Fine Grade)
Chipper with boom
Batch Plant with Mixer
All autograde and concrete finishing machines
Carryalls, Scapers & Tournapulls
Rollers (High Grade Finishing)
Bundle Pullers/Extractors (Tubular)
Spreaders (Asphalt)
Bulldozers and Tractors
Mechanic – Welders
Production Switch Tamper
Ballast Regulators
Tie Replacer
Rail/Road Loader
Power Jack liner

Machines similar to above, including remote control equipment

*Surcharge

Power Equipment Operator Dredger Classifications

Class A: Lead Dredgeman, Operator, Leverman, Licensed Tug Operator over 1000HP.

Class A1: Dozer Operator, Front-end Loader.

Class B1: Derrick Operator, Spider/Spill Barge Operator, Engineer, Electrician, Chief welder Chief Mate, Fill Placer, Operator 2, Maintenance Engineer, Licensed Boat Operator.
Class B2: Certified Welder.
Class C1: Mate, Drag Barge Operator, Steward, Assistant Fill Placer, Welder.
Class C2: Boat Operator.
Class D: Shoreman, Deckhand, Rodman, Scowman, Cook, Messman, Porter/Janitor, Oiler.

3. Truck Driver Classifications:

Class I: Helper, stake body truck operator (single axle, dumpster)
Class II: Dump truck operator, tandem truck operator, batch truck operator, semi-trailer truck operator, agitator-mixer truck operator, dumpcrete type vehicle operator, asphalt distributor, farm tractor operator (when used to transport materials), stake body truck (tandem) operator.
Class III: Euclid type, off highway equipment back truck operator, belly dump truck operator, double-hitched equipment trailer operator, straddle carrier (Ross) operator; lowbed trailer truck operator.

NOTE:

1. Contractors are advised to contact the Philadelphia Labor Standards Unit with any questions regarding job classification, prevailing wage rates, and fringe benefits.

2. Prior to employing apprentices on a public works project, the contractor is required to provide written evidence of employee's registration with a statewide training program recognized by the U.S. Bureau of Apprenticeship and Training (BAT). Contractors shall forward proper documentation for each bona fide apprentice to:

Philadelphia Labor Standards Unit
Municipal Services Building
1401 John F. Kennedy Boulevard – 1st Floor, Room 170C
Philadelphia, PA 19102-1670
Telephone Number: (215) 686-2132
Fax Number: (215) 686-2116

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project Name:	Rebuild Lawncrest Recreation Center
Awarding Agency:	Office of the Budget Bureau of Redevelopment, Capital & Dept
Contract Award Date:	12/6/2021
Serial Number:	23-09330
Project Classification:	Building
Determination Date:	12/1/2023
Assigned Field Office:	Philadelphia
Field Office Phone Number:	(215)560-1858
Toll Free Phone Number:	
Project County:	Philadelphia County

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 23-09330 - Building	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Asbestos & Insulation Workers	5/1/2021		$54.35	$39.95	$94.30
Asbestos & Insulation Workers	6/1/2023		$57.84	$43.36	$101.20
Boilermaker (Commercial, Institutional, and Minor Repair Work)	1/1/2019		$29.26	$18.48	$47.74
Boilermakers	1/1/2023		$51.27	$35.30	$86.57
Bricklayer	5/1/2023		$47.50	$31.61	$79.11
Carpenter - Chief of Party (Surveying & Layout)	5/1/2023		$60.54	$29.27	$89.81
Carpenter - Chief of Party (Surveying & Layout)	5/1/2024		$62.83	$29.27	$92.10
Carpenter - Chief of Party (Surveying & Layout)	5/1/2025		$65.14	$29.27	$94.41
Carpenter - Instrument Person (Surveying & Layout)	5/1/2023		$52.64	$29.27	$81.91
Carpenter - Instrument Person (Surveying & Layout)	5/1/2024		$54.64	$29.27	$83.91
Carpenter - Instrument Person (Surveying & Layout)	5/1/2025		$56.64	$29.27	$85.91
Carpenter - Rodman (Surveying & Layout)	5/1/2023		$26.32	$20.87	$47.19
Carpenter - Rodman (Surveying & Layout)	5/1/2024		$27.32	$20.87	$48.19
Carpenter - Rodman (Surveying & Layout)	5/1/2025		$28.32	$20.87	$49.19
Carpenters	5/1/2023		$52.64	$29.27	$81.91
Carpenters	5/1/2024		$54.64	$29.27	$83.91
Carpenters	5/1/2025		$56.64	$29.27	$85.91
Cement Finishers & Plasterers	5/1/2022		$41.97	$32.40	$74.37
Cement Masons	5/1/2023		$44.20	$32.96	$77.16
Dockbuilder, Pile Drivers	5/1/2023		$50.48	$37.99	$88.47
Dockbuilder, Pile Drivers	5/1/2024		$52.98	$37.99	$90.97
Dockbuilder, Pile Drivers	5/1/2025		$55.23	$37.99	$93.22
Dockbuilder, Pile Drivers	5/1/2026		$56.98	$37.99	$94.97
Dockbuilder/Pile Driver Diver	5/1/2023		$58.41	$41.74	$100.15
Dockbuilder/Pile Driver Diver	5/1/2024		$61.54	$41.74	$103.28
Dockbuilder/Pile Driver Diver	5/1/2025		$64.35	$41.74	$106.09
Dockbuilder/Pile Driver Diver	5/1/2026		$66.54	$41.74	$108.28
Dockbuilder/pile driver tender	5/1/2023		$50.48	$37.99	$88.47
Dockbuilder/pile driver tender	5/1/2024		$52.98	$37.99	$90.97
Dockbuilder/pile driver tender	5/1/2025		$55.23	$37.99	$93.22
Dockbuilder/pile driver tender	5/1/2026		$56.98	$37.99	$94.97
Drywall Finisher	5/1/2023		$41.80	$31.76	$73.56
Electricians	5/1/2023		$68.18	$42.97	$111.15
Elevator Constructor	1/1/2023		$66.21	$43.64	$109.85
Floor Coverer	5/1/2023		$54.74	$29.46	$84.20
Floor Coverer	5/1/2024		$56.94	$29.46	$86.40
Glazier	5/1/2023		$46.68	$36.62	$83.30
Interior Finish	5/1/2019		$31.65	$26.62	$58.27
Interior Finish	5/1/2023		$36.45	$27.02	$63.47
Iron Workers (Bridge, Structural Steel, Ornamental, Precast, Reinforcing)	1/1/2023		$50.70	$39.51	$90.21
Iron Workers (Riggers)	7/1/2017		$41.78	$27.92	$69.70
Iron Workers (Riggers)	7/1/2023		$44.62	$34.14	$78.76
Ironworker (Rodman)	7/1/2020		$47.41	$31.60	$79.01

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 23-09330 - Building	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Ironworker (Rodman)	7/1/2023		$48.29	$34.77	$83.06
Laborer (Mason Tenders, Brick)	5/1/2017		$29.77	$26.00	$55.77
Laborers (Class 01 - See notes)	5/1/2022		$35.20	$26.82	$62.02
Laborers (Class 01 - See notes)	5/1/2023		$36.45	$27.02	$63.47
Laborers (Class 02 - See notes)	5/1/2022		$36.70	$27.00	$63.70
Laborers (Class 02 - See notes)	5/1/2023		$37.95	$27.30	$65.25
Laborers (Class 03 - See notes)	5/1/2022		$35.62	$27.05	$62.67
Laborers (Class 03 - See notes)	5/1/2023		$36.87	$27.25	$64.12
Laborers (Class 04 - See notes)	5/1/2022		$35.62	$27.05	$62.67
Laborers (Class 04 - See notes)	5/1/2023		$36.87	$27.25	$64.12
Laborers (Class 05 - See notes)	5/1/2022		$35.20	$26.82	$62.02
Laborers (Class 05 - See notes)	5/1/2023		$36.45	$27.02	$63.47
Landscape Laborer	5/1/2020		$26.55	$23.13	$49.68
Landscape Laborer	5/1/2023		$29.45	$23.98	$53.43
Marble Finisher	5/1/2023		$39.52	$29.30	$68.82
Marble Mason	5/1/2023		$47.20	$31.95	$79.15
Mason Tender, Cement	5/1/2019		$32.07	$26.85	$58.92
Mason Tender, Cement	5/1/2023		$36.87	$27.25	$64.12
Millwright	5/1/2023		$51.60	$35.81	$87.41
Millwright	5/1/2024		$54.67	$35.81	$90.48
Millwright	5/1/2025		$57.39	$35.81	$93.20
Millwright	5/1/2026		$60.20	$35.81	$96.01
Operators (Building, Class 01 - See Notes)	5/1/2023		$52.20	$32.81	$85.01
Operators (Building, Class 01A - See Notes)	5/1/2023		$55.20	$33.70	$88.90
Operators (Building, Class 02 - See Notes)	5/1/2023		$51.95	$32.74	$84.69
Operators (Building, Class 02A - See Notes)	5/1/2023		$54.97	$33.61	$88.58
Operators (Building, Class 03 - See Notes)	5/1/2023		$47.87	$31.53	$79.40
Operators (Building, Class 04 - See Notes)	5/1/2023		$47.57	$31.44	$79.01
Operators (Building, Class 05 - See Notes)	5/1/2023		$45.85	$30.93	$76.78
Operators (Building, Class 06 - See Notes)	5/1/2023		$44.85	$30.65	$75.50
Operators (Building, Class 07A- See Notes)	5/1/2023		$63.33	$37.68	$101.01
Operators (Building, Class 07B- See Notes)	5/1/2023		$63.04	$37.59	$100.63
Painters Class 1 (see notes)	5/1/2023		$42.32	$32.91	$75.23
Painters Class 4 (see notes)	5/1/2023		$44.41	$32.91	$77.32
Plasterers	5/1/2021		$41.52	$31.85	$73.37
Plasterers	5/1/2023		$42.97	$32.65	$75.62
Plumbers	5/1/2023		$64.73	$37.61	$102.34
Pointers, Caulkers, Cleaners	5/1/2023		$48.80	$30.70	$79.50
Roofers (Composition)	5/1/2023		$42.63	$34.62	$77.25
Roofers (Shingle)	5/1/2021		$30.50	$21.55	$52.05
Roofers (Shingle)	5/1/2023		$32.85	$22.10	$54.95
Roofers (Slate & Tile)	5/1/2021		$33.50	$21.55	$55.05
Roofers (Slate & Tile)	5/1/2023		$35.85	$22.10	$57.95
Sheet Metal Workers	5/1/2022		$55.75	$47.28	$103.03

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 23-09330 - Building	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Sheet Metal Workers	5/1/2023		$57.31	$48.97	$106.28
Sign Makers and Hangars	7/15/2022		$30.54	$24.35	$54.89
Sign Makers and Hangars	7/15/2023		$31.76	$24.63	$56.39
Sprinklerfitters	1/1/2023		$62.23	$31.99	$94.22
Steamfitters	5/1/2023		$67.37	$41.99	$109.36
Stone Masons	5/1/2023		$47.20	$31.95	$79.15
Terrazzo Finisher	5/1/2023		$43.75	$27.86	$71.61
Terrazzo Grinder	5/1/2023		$44.02	$27.86	$71.88
Terrazzo Mechanics	5/1/2023		$50.26	$29.56	$79.82
Tile Finisher	5/1/2023		$39.52	$29.30	$68.82
Tile Setter	5/1/2023		$50.26	$29.56	$79.82
Truckdriver class 1(see notes)	5/1/2022		$35.60	$20.74	$56.34
Truckdriver class 1(see notes)	5/1/2023		$36.29	$21.55	$57.84
Truckdriver class 2 (see notes)	5/1/2022		$35.70	$20.74	$56.44
Truckdriver class 2 (see notes)	5/1/2023		$36.39	$21.55	$57.94
Truckdriver class 3 (see notes)	5/1/2022		$35.95	$20.74	$56.69
Truckdriver class 3 (see notes)	5/1/2023		$36.64	$21.55	$58.19
Window Film / Tint Installer	6/1/2019		$24.52	$12.08	$36.60

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 23-09330 - Heavy/Highway	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Carpenter - Chief of Party (Surveying & Layout)	5/1/2023		$63.24	$29.06	$92.30
Carpenter - Chief of Party (Surveying & Layout)	5/1/2024		$65.19	$29.06	$94.25
Carpenter - Chief of Party (Surveying & Layout)	5/1/2025		$67.15	$29.06	$96.21
Carpenter - Chief of Party (Surveying & Layout)	5/1/2026		$69.10	$29.06	$98.16
Carpenter - Instrument Person (Surveying & Layout)	5/1/2023		$54.99	$29.06	$84.05
Carpenter - Instrument Person (Surveying & Layout)	5/1/2024		$56.69	$29.06	$85.75
Carpenter - Instrument Person (Surveying & Layout)	5/1/2025		$58.39	$29.06	$87.45
Carpenter - Instrument Person (Surveying & Layout)	5/1/2026		$60.09	$29.06	$89.15
Carpenter - Rodman (Surveying & Layout)	5/1/2023		$43.99	$22.41	$66.40
Carpenter - Rodman (Surveying & Layout)	5/1/2024		$45.35	$22.41	$67.76
Carpenter - Rodman (Surveying & Layout)	5/1/2025		$46.71	$22.41	$69.12
Carpenter - Rodman (Surveying & Layout)	5/1/2026		$48.07	$22.41	$70.48
Carpenter	5/1/2023		$54.99	$29.06	$84.05
Carpenter	5/1/2024		$56.69	$29.06	$85.75
Carpenter	5/1/2025		$58.49	$29.06	$87.55
Carpenter	5/1/2026		$60.19	$29.06	$89.25
Cement Masons	5/1/2023		$43.20	$32.91	$76.11
Dockbuilder, Pile Drivers	5/1/2023		$50.48	$37.99	$88.47
Dockbuilder, Pile Drivers	5/1/2024		$52.98	$37.99	$90.97
Dockbuilder, Pile Drivers	5/1/2025		$55.23	$37.99	$93.22
Dockbuilder, Pile Drivers	5/1/2026		$56.98	$37.99	$94.97
Dockbuilder/Pile Driver Diver	5/1/2023		$58.41	$41.74	$100.15
Dockbuilder/Pile Driver Diver	5/1/2024		$61.54	$41.74	$103.28
Dockbuilder/Pile Driver Diver	5/1/2025		$64.35	$41.74	$106.09
Dockbuilder/Pile Driver Diver	5/1/2026		$66.54	$41.74	$108.28
Dockbuilder/pile driver tender	5/1/2023		$50.48	$37.99	$88.47
Dockbuilder/pile driver tender	5/1/2024		$52.98	$37.99	$90.97
Dockbuilder/pile driver tender	5/1/2025		$55.23	$37.99	$93.22
Dockbuilder/pile driver tender	5/1/2026		$56.98	$37.99	$94.97
Electric Lineman	5/30/2022		$59.17	$31.48	$90.65
Electric Lineman	5/29/2023		$60.48	$32.77	$93.25
Electric Lineman	6/3/2024		$62.07	$33.96	$96.03
Iron Workers (Bridge, Structural Steel, Ornamental, Precast, Reinforcing)	1/1/2023		$50.70	$39.51	$90.21
Ironworker (Rodman)	7/1/2020		$47.41	$31.60	$79.01
Laborers (Class 01 - See notes)	5/1/2022		$36.30	$27.20	$63.50
Laborers (Class 01 - See notes)	5/1/2023		$37.55	$27.45	$65.00
Laborers (Class 02 - See notes)	5/1/2022		$36.50	$27.20	$63.70
Laborers (Class 02 - See notes)	5/1/2023		$37.75	$27.45	$65.20
Laborers (Class 03 - See notes)	5/1/2022		$36.50	$27.20	$63.70
Laborers (Class 03 - See notes)	5/1/2023		$37.75	$27.45	$65.20
Laborers (Class 04 - See notes)	5/1/2022		$31.10	$27.20	$58.30
Laborers (Class 04 - See notes)	5/1/2023		$32.35	$27.45	$59.80
Laborers (Class 05 - See notes)	5/1/2022		$37.15	$27.20	$64.35
Laborers (Class 05 - See notes)	5/1/2023		$38.40	$27.45	$65.85

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 23-09330 - Heavy/Highway	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Laborers (Class 06 - See notes)	5/1/2022		$37.20	$27.20	$64.40
Laborers (Class 06 - See notes)	5/1/2023		$38.40	$27.45	$65.85
Laborers (Class 07 - See notes)	5/1/2022		$37.05	$27.20	$64.25
Laborers (Class 07 - See notes)	5/1/2023		$38.30	$27.45	$65.75
Laborers (Class 08 - See notes)	5/1/2022		$36.80	$27.20	$64.00
Laborers (Class 08 - See notes)	5/1/2023		$38.05	$27.45	$65.50
Laborers (Class 09 - See notes)	5/1/2022		$36.65	$27.20	$63.85
Laborers (Class 09 - See notes)	5/1/2023		$37.90	$27.45	$65.35
Laborers (Class 10- See notes)	5/1/2022		$36.80	$27.20	$64.00
Laborers (Class 10- See notes)	5/1/2023		$38.05	$27.45	$65.50
Laborers (Class 11 -See Notes)	5/1/2022		$36.70	$27.20	$63.90
Laborers (Class 11 -See Notes)	5/1/2023		$37.95	$27.45	$65.40
Laborers (Class 12 -See Notes)	5/1/2022		$38.40	$27.20	$65.60
Laborers (Class 12 -See Notes)	5/1/2023		$39.65	$27.45	$67.10
Laborers (Class 13 -See Notes)	5/1/2022		$40.43	$27.20	$67.63
Laborers (Class 13 -See Notes)	5/1/2023		$41.65	$27.45	$69.10
Laborers (Class 14 -See Notes)	5/1/2022		$36.55	$27.20	$63.75
Laborers (Class 14 -See Notes)	5/1/2023		$38.25	$27.45	$65.70
Laborers Utility (PGW ONLY) (Flagperson)	5/1/2022		$30.17	$19.18	$49.35
Laborers Utility (PGW ONLY)	5/1/2022		$37.20	$19.18	$56.38
Landscape Laborer	5/1/2022		$27.73	$23.65	$51.38
Landscape Laborer	5/1/2023		$29.03	$23.80	$52.83
Millwright	5/1/2023		$51.60	$35.81	$87.41
Millwright	5/1/2024		$54.67	$35.81	$90.48
Millwright	5/1/2025		$57.39	$35.81	$93.20
Millwright	5/1/2026		$60.20	$35.81	$96.01
Operators Class 01 - See Notes (Building, Heavy, Highway)	5/1/2023		$52.20	$32.81	$85.01
Operators Class 01 - See Notes (Building, Heavy, Highway)	5/1/2024		$53.36	$33.65	$87.01
Operators Class 01 - See Notes (Building, Heavy, Highway)	5/1/2025		$54.52	$34.49	$89.01
Operators Class 01 - See Notes (Building, Heavy, Highway)	5/1/2026		$55.67	$35.34	$91.01
Operators Class 01a - See Notes (Building, Heavy, Highway)	5/1/2023		$55.20	$33.70	$88.90
Operators Class 01a - See Notes (Building, Heavy, Highway)	5/1/2024		$56.37	$34.53	$90.90
Operators Class 01a - See Notes (Building, Heavy, Highway)	5/1/2025		$57.52	$35.38	$92.90
Operators Class 01a - See Notes (Building, Heavy, Highway)	5/1/2026		$58.68	$36.22	$94.90
Operators Class 02 - See Notes (Building, Heavy, Highway)	5/1/2023		$51.95	$32.74	$84.69
Operators Class 02 - See Notes (Building, Heavy, Highway)	5/1/2024		$53.11	$33.58	$86.69
Operators Class 02 - See Notes (Building, Heavy, Highway)	5/1/2025		$54.27	$34.42	$88.69

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 23-09330 - Heavy/Highway	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Operators Class 02 - See Notes (Building, Heavy, Highway)	5/1/2026		$55.43	$35.26	$90.69
Operators Class 02a - See Notes (Building, Heavy, Highway)	5/1/2023		$54.97	$33.61	$88.58
Operators Class 02a - See Notes (Building, Heavy, Highway)	5/1/2024		$56.13	$34.45	$90.58
Operators Class 02a - See Notes (Building, Heavy, Highway)	5/1/2025		$57.29	$35.29	$92.58
Operators Class 02a - See Notes (Building, Heavy, Highway)	5/1/2026		$58.44	$36.14	$94.58
Operators Class 03 - See Notes (Building, Heavy, Highway)	5/1/2023		$47.87	$31.53	$79.40
Operators Class 03 - See Notes (Building, Heavy, Highway)	5/1/2024		$49.03	$32.37	$81.40
Operators Class 03 - See Notes (Building, Heavy, Highway)	5/1/2025		$50.18	$33.22	$83.40
Operators Class 03 - See Notes (Building, Heavy, Highway)	5/1/2026		$51.34	$34.06	$85.40
Operators Class 04 - See Notes (Building, Heavy, Highway)	5/1/2023		$47.57	$31.44	$79.01
Operators Class 04 - See Notes (Building, Heavy, Highway)	5/1/2024		$48.73	$32.28	$81.01
Operators Class 04 - See Notes (Building, Heavy, Highway)	5/1/2025		$49.88	$33.13	$83.01
Operators Class 04 - See Notes (Building, Heavy, Highway)	5/1/2026		$51.04	$33.97	$85.01
Operators Class 05 - See Notes (Building, Heavy, Highway)	5/1/2023		$45.85	$30.93	$76.78
Operators Class 05 - See Notes (Building, Heavy, Highway)	5/1/2024		$47.00	$31.78	$78.78
Operators Class 05 - See Notes (Building, Heavy, Highway)	5/1/2025		$48.16	$32.62	$80.78
Operators Class 05 - See Notes (Building, Heavy, Highway)	5/1/2026		$49.32	$33.46	$82.78
Operators Class 06 - See Notes (Building, Heavy, Highway)	5/1/2023		$44.85	$30.65	$75.50
Operators Class 06 - See Notes (Building, Heavy, Highway)	5/1/2024		$46.02	$31.48	$77.50
Operators Class 06 - See Notes (Building, Heavy, Highway)	5/1/2025		$47.17	$32.33	$79.50
Operators Class 06 - See Notes (Building, Heavy, Highway)	5/1/2026		$48.34	$33.16	$81.50
Operators Class 07 (A) - See Notes (Building, Heavy, Highway)	5/1/2023		$63.33	$37.68	$101.01
Operators Class 07 (A) - See Notes (Building, Heavy, Highway)	5/1/2024		$64.80	$38.61	$103.41
Operators Class 07 (A) - See Notes (Building, Heavy, Highway)	5/1/2025		$66.26	$39.55	$105.81
Operators Class 07 (A) - See Notes (Building, Heavy, Highway)	5/1/2026		$67.73	$40.48	$108.21
Operators Class 07 (B) - See Notes (Building, Heavy, Highway)	5/1/2023		$63.04	$37.59	$100.63
Operators Class 07 (B) - See Notes (Building, Heavy, Highway)	5/1/2024		$64.50	$38.53	$103.03

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 23-09330 - Heavy/Highway	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Operators Class 07 (B) - See Notes (Building, Heavy, Highway)	5/1/2025		$65.97	$39.46	$105.43
Operators Class 07 (B) - See Notes (Building, Heavy, Highway)	5/1/2026		$67.44	$40.39	$107.83
Painters Class 2 (see notes)	2/1/2023		$48.82	$32.09	$80.91
Painters Class 3 (see notes)	2/1/2023		$59.78	$32.13	$91.91
Steamfitters (Heavy and Highway - Gas Distribution)	5/1/2022		$64.57	$40.28	$104.85
Steamfitters (Heavy and Highway - Gas Distribution)	5/1/2023		$67.37	$41.68	$109.05
Truckdriver class 1(see notes)	5/1/2022		$35.45	$20.74	$56.19
Truckdriver class 1(see notes)	5/1/2023		$36.14	$21.55	$57.69
Truckdriver class 2 (see notes)	5/1/2022		$35.55	$20.74	$56.29
Truckdriver class 2 (see notes)	5/1/2023		$36.24	$21.55	$57.79
Truckdriver class 3 (see notes)	5/1/2022		$35.80	$20.74	$56.54
Truckdriver class 3 (see notes)	5/1/2023		$36.49	$21.55	$58.04

SECTION 002413

ECONOMIC OPPORTUNITY PLAN

PART 1 – GENERAL

1.1 SUMMARY

A. This Section specifies requirements necessary to meet the Project Economic Opportunity Plan requirements.

1.2 ECONOMIC OPPORTUNITY PLAN (EOP)

A. The Project will have an Economic Opportunity Plan (EOP), which include specific contract and workforce goals as a percentage of total contract dollars and workforce hours. The Project EOP will take the form of the Rebuild Economic Opportunity Plan as attached to this Section.

B. Contractor shall comply with the Project EOP for the duration of the Project.

1.3 PROJECT EOP MONITORING

A. The Contractor compliance with the Project EOP will be monitored in at least two ways:

a. The City of Philadelphia's Office of Labor Standards will monitor workforce participation as well as compliance with Rebuild Site Wage requirements through the use of the software LCP Tracker and through on-site interviews. Project Users shall cooperate and require their Contractors to cooperate with representatives of the Office of Labor Standards and shall provide full access to Contracts, sites, and data to allow the monitor to verify workforce participation and wage compliance. Project Users shall also submit certified payroll data through LCP Tracker on a weekly basis and/ or require their Contractors to do so.

b. The City of Philadelphia will contract with a consultant, called an EOP Monitor, who will provide services including, but not limited to, on-site verification of workforce participation and compilation and monitoring of contract payment data. Contractor shall cooperate with the EOP Monitor and shall provide full access to subcontracts, the Project site, and date to allow the monitor to verify the Contractor compliance with the Project EOP.

B. Pursuant to the Rebuild Ordinance, the EOP Monitor will make a formal determination for the Project when twenty-five percent (25%) of total projected labor hours are complete, and when twenty-five percent (25%) of the total contract sum has been expended. At that point, the EOP Monitor will determinate whether the Contractor is on track to meet the Project EOP's workforce and contract participation goals. The results of that determination will be shared with the Contractor, PAID, the Project User, the

Rebuild Office, and the District Councilmember. Monitoring of the Contractor's compliance with the Project EOP continues until Final Completion.

1.4 REMEDIES AND PENALTIES

A. If it is determined by the Project User, Rebuild Office, of the EOP Monitor that the Contractor has not met, or is not on track to meet, its workforce and contract participation requirements and commitments, steps will be taken that include but are not limited to the following:

a. *Assistance.* The EOP Monitor, Rebuild Office or Project User will take steps to assist the Contractor in making course corrections. Such steps might include the identification of alternative M/WBEs or alternative ways of packaging contracts. The Contractor shall cooperate in these efforts and shall take all steps necessary to correct any deficiencies in compliance with the Project EOP.

b. *Written Plan.* The Contractor shall prepare a written compliance action plan to show how the Contractor plans to come into compliance with the Project EOP. The plan will be subject to the approval of the Project User, PAID and the Rebuild Office. The Office of Labor Standards, the Office of Economic Opportunity, the EOP Monitor, the District Councilmember and the Rebuild EOP Oversight Committee may also be consulted.

B. If it is determined by the Project User, the Rebuild Office or the EOP Monitor that the Contractor has failed to take successful or acceptable steps to meet the Project EOP commitments, then one or more of the following remedies, which are cumulative and concurrent, may be imposed:

a. *Withholding payment.* The Project User, Rebuild Office and PAID may withhold invoice approvals so that payments (including but not limited to retainage payments) to the Contractor will be suspended. If payments are made directly to Second-Tier Contractors, the Project User, Rebuild Office and PAID may withhold invoice approval selectively in order to impact the non-compliant party. For example, if it's determined that the Contractor (First-Tier Contractor) has been cooperative and responsible and that subcontractor (Second-Tier Contractor) is responsible for Project EOP non-compliance, the Contractor could receive payments while payments to the subcontractor are suspended.

b. *Rebuild EOP Oversight Committee.* The Project User and any non-compliant Contractor may be called to appear before the Rebuild EOP Oversight Committee to address the Project EOP violations.

c. *Work stoppage.* If the Contractor fails to take successful or acceptable steps to meet commitments, the Contractor may be directed to stop work or to stop the work of any non- compliant Second-Tier Contractor. The goal of the work stoppage would be to stop using workforce hours and incurring expenses until a viable plan for meeting Project EOP goals can be implemented. The Project User, Rebuild Office and PAID understand that work stoppages should be avoided if possible, because of potential significant negative consequences for all parties. If this step is necessary, the Contractor would be responsible for any delay costs resulting from the work stoppage.

d. *Liquidated Damages*. The Project User, PAID or the City may recover as liquidated damages one percent of the total dollar amount of the relevant contract for each one percent (or fraction thereof) of the commitment shortfall. (NOTE: The "total dollar amount of the contract" includes approved change orders, amendments, and for requirements contracts will be based on actual quantities ordered.)

e. *Contract termination*. The Contract (or the contract of any non-compliant subcontractor) may be suspended, terminated, or rescinded.

f. *Disqualification and debarment*. The Rebuild Office may disqualify the non-compliant Contractor from bidding on and/or participating in any future Rebuild contracts and/or projects, in addition to recommending that the non-compliant contractor and subcontractor be disqualified from bidding on and/or participating in City of Philadelphia projects for a maximum period of three (3) years.

1.5 CONTRACT PARTICIPATION TRACKING

A. Rebuild tracks contract participation for MBEs, WBEs, and local firms through First-Tier Contractor and Second-Tier Contractor values in Project Contracts and invoices. EOP Monitors are also similarly validating contracts and reporting during the construction phase.

B. Contract participation is calculated by dividing (a) the dollars allocated/disbursed to First-Tier Contractors and Second-Tier Contractors who are certified as M/WBE/local by (b) the total allocation/disbursement of dollars to for-profit organizations on the Project.

C. The Contractor will be responsible for updating the Rebuild Contract Participation Worksheet and providing a Subcontracting Schedule as further described in Section 013100.

D. Contract Participation Calculations for Suppliers

a. Companies supplying materials for the Project who are MBE or WBE certified can be counted toward contract participation goals if all three of the following conditions are satisfied:

i. The materials supplied will be installed at the site.

ii. The materials being supplied are substantial enough to warrant a purchase order. (By contrast, materials or consumables procured at a hardware store would not be eligible.)

iii. The Supplier is a First-Tier Contractor or a Second-Tier Contractor to Community Ventures.

b. As with all other subcontractors, Suppliers should be reported regardless of whether or not they are certified as MBE or WBE so that contract participation can be calculated properly.

E. See the attached Rebuild Economic Opportunity Plan for more details.

1.6 IDENTIFICATION OF PASS THROUGHS

A. While Rebuild will only calculate participation through the first two tiers of contracting, EOP Monitors will observe and track an additional contracting tier in order to identify

any Second-Tier Contractors improperly acting as “pass throughs”.

B. “Pass throughs” are defined in this context as contractors who are certified as M/WBE/local businesses, thus allowing their contract dollars to count for participation, but who are not performing a “commercially useful function” because they are not actually performing, managing, and supervising their work with their own workforce. Common indicators of a contractor acting as a “pass through” include, but are not limited, to the following:
   a. 80% of contract dollars are subcontracted
   b. No certified payrolls are submitted for an active contractor

C. Contractor is responsible for ensuring that each subcontractor preforms a commercially useful function. Employment of a pass through contractor constitutes a violation of the Project EOP and the Contract and can be considered fraudulent activity. If a pass through scenario is suspected, the EOP Monitor will investigate and alert the Rebuild Office and Project User so that appropriate actions can be taken.

1.7 ADDITIONAL INFORMATION TO ASSIST WITH EOP

A. The additional informational documents are available to assist Contractor and potential subcontractors to meet Rebuild requirements and meet the EOP requirements.
   a. PIDC Financing – Information regarding Rebuild Contract Line of Credit offered by PIDC
   b. Rebuild Ready Vendors List – List of vendors who have participated in the Rebuild Ready program.

ATTACHMENTS:

1. Rebuild Economic Opportunity Plan
2. PIDC Financing Information
3. Rebuild Ready Vendors List

END OF SECTION 002413

REBUILD PROJECT
ECONOMIC OPPORTUNITY PLAN

I. Introduction and Definitions

Chapter 17-1600 of The Philadelphia Code requires the development and implementation of "Economic Opportunity Plan(s)" ("**EOPs**") for certain classes of contracts and covered projects as defined in Section 17-1601. Rebuilding Community Infrastructure, generally referred to as "Rebuild," is a City of Philadelphia (the "**City**") program for the construction, demolition, renovation and equipping of the City's parks, libraries, playgrounds, recreation centers and other related facilities for the purpose of creating first-class, modern, safe, and clean parks, recreation centers, and libraries. Diversity and inclusion is a pillar of the Rebuild program and this Economic Opportunity Plan (the "**Project EOP**") will establish goals for achieving the objectives of Diverse Business Inclusion and Workforce Diversity for the [_____] project (the "**Project**"). This Project EOP will also outline and delineate roles and responsibilities between the City, acting through its Rebuild Office, the Philadelphia Authority for Industrial Development ("**PAID**"), Community Ventures (the "**Project User**"), and _____ (the "**Contractor**").

For purposes of this Project EOP, the following definitions will apply:

> ***Diverse Business Inclusion*** means each Contractor's Best and Good Faith Efforts to provide meaningful and representative opportunities for Minority Business Enterprises ("**MBEs**") and Woman Business Enterprises ("**WBEs**") (collectively, "**M/WBEs**" which also includes firms designated as Disadvantaged Business Enterprises or "**DBEs**"). In furtherance of Section 17-1502 of The Philadelphia Code and as informed by the City's most current Annual Disparity Study, contract opportunities for MBEs may be separated into categories of firms owned by African Americans, Hispanic Americans, Asian Americans and Native Americans.
>
> ***Best and Good Faith Efforts*** means those efforts, the scope, intensity and appropriateness of which are designed and performed to foster meaningful and representative opportunities for participation by M/WBEs and achieve an appropriately diverse workforce. Best and Good Faith Efforts are considered met (subject to audit and verification that commitments are met), when a Contractor makes binding contractual commitments within the M/WBE participation ranges established for the contract and commits to employ a diverse workforce within the goals and timetable established for the contract.
>
> ***Commercially Useful Function.*** An M/WBE performs a Commercially Useful Function when it performs a distinct element of a contract (as required by the work to be performed in accordance with the bid specifications) which is worthy of the dollar amount of the M/WBE's contract and the M/WBE carries out its responsibilities by **(a)** managing and supervising the work involved and **(b)** actually self-performing at least twenty percent (20%) of the work of the contract with its own workforce. For suppliers, an M/WBE

performs a Commercially Useful Function when it is responsible for sourcing the material, negotiating price, determining quality and quantity, ordering the material, and paying for it from its own funds. Whether an M/WBE performs a "Commercially Useful Function" will be evaluated and determined by the EOP Monitor and the Rebuild Office on a bid-by-bid basis as informed by prevailing industry standards and the M/WBE's NAIC Codes and may require, without limitation, evidence of a warehouse, distribution equipment, and certified payroll records.

Diverse Workforce refers to the recruitment, hiring, training, employment and trades union referral, as both journeypersons and apprentices, of workers who are African American, Hispanic American, Asian American, and/or Female.

Philadelphia Resident means, to the extent permitted by law, a positive factor for consideration given to those workers residing in Philadelphia and also includes those businesses certified as Local Business Enterprises under Section 17-109 of The Philadelphia Code or meeting the criteria described in Executive Order 04-12.

Grant Agreement means the contract signed between the Project User and PAID for the Project.

II. Rebuild Diversity and Inclusion Goals

A. Diverse Business Inclusion – Contract Participation Goals

As a benchmark for Contractor's expression of its Best and Good Faith Efforts to provide meaningful and representative opportunities for M/WBEs the Project, the following contract participation ranges have been developed. These contract participation ranges represent, in the absence of discrimination in the solicitation and selection of M/WBEs, the percentage of M/WBE participation that would be reasonably attainable on this Project through the exercise of Contractor's Best and Good Faith Efforts:

Professional services contracts: 25-30% MBE and 15-20% WBE

Construction contracts: 30-35% MBE and 15-20% WBE

For purposes of calculating contract participation:

- In order to maximize opportunities for as many businesses as possible, a business that is certified in two or more categories (e.g., MBE and WBE) will only be credited toward one participation range as either an MBE or WBE. The business will not be credited toward more than one category.

- In addition to certification, businesses must be registered with the City of Philadelphia's Office of Economic Opportunity ("**OEO**") as MBE and/or WBE in order to count toward

contract participation goals for Diverse Business Inclusion. Visit phila.mwdsbe.com for more information.

- Only first and second-tier vendors will be included in the contract participation calculation. See the table below for more details:

	TIER	**EXAMPLE**
	Project Lead	**Project User**
Included; counts toward participation goals	**1st-Tier vendor**	**Contractor**
Included; counts toward participation goals	**2nd-Tier vendor**	**Subcontractors**
Not Included; does not count toward participation goals	***3rd-Tier vendor and below***	***Further subcontractors***

- While contract participation is only calculated based on the first two tiers of contracting, EOP Monitors will observe and track an additional contracting tier (i.e., the third-tier contractors) in order to identify any second-tier contractors improperly acting as "pass-throughs." "**Pass-throughs**" are defined in this context as contractors who are certified as M/WBEM/WBEs, thus allowing their contract dollars to count for participation, but who are not performing a Commercially Useful Function because they are not actually performing, managing, and supervising their work with their own workforce. Employment of a pass-through contractor constitutes a violation of this Project EOP and can be considered fraudulent activity. If a pass-through scenario is suspected, the EOP Monitor will investigate and alert PRA and the Rebuild Office so that appropriate actions can be taken.

- In calculating the percentage of M/WBE participation, the standard mathematical rules apply in rounding off numbers. In the event of inconsistency between the dollar and percentage amounts listed on the form, the percentage will govern.

- There are some Project costs that are excluded from the contract participation calculation. The following describes such cost categories, which must be included in the project budget but will be excluded from the contract participation calculation:

  Nonprofit/Government: Project costs committed or disbursed to nonprofit organizations or government agencies are excluded from the contract participation calculation.

  Few Or No Opportunity (FONO) Services: Project costs associated with vendors providing a set of services that few or no MBE- or WBE-certified vendors provide in Philadelphia's marketplace are excluded from the contract participation calculation.

Permitting fees: Permitting fees are excluded from the contract participation calculation.

Contingency costs: Any contingency costs held in the project budget are excluded from the contract participation calculation. As those costs become "active" and are reallocated to vendors, those dollars will be included in the calculation.

B. Diverse Workforce – Workforce Participation Goals

Contractor agrees to exhaust its Best and Good Faith Efforts to employ an appropriately Diverse Workforce which will include minority persons and females at all tiers of employment and management. An appropriately Diverse Workforce is one which reflects the local availability and historic utilization of Philadelphia residents, and also recognizes underutilization of diverse workers across all trades. The following are expressed as hourly project employment goals for workforce participation:

- Total minority laborer and skilled workforce hours 45% (African American journeypersons 27%, Hispanic journeypersons 15%, and Asian journeypersons 3%);
- Total minority workforce hours for laborers, 60% and total minority workforce hours for skilled, 40%;
- Total women laborer and skilled workforce hours 5%;
- Total women workforce hours, 5% laborer and 5% skilled.
- Local construction workforce: 50-60%.

III. Contractor Responsiveness and Responsibility

A. Memorializing Contract and Workforce Participation Commitments. Contractor shall identify all of its M/WBE contract participation and diverse workforce participation commitments on the following forms:

(i) Contract Participation Commitments. Contractor shall identify its contract participation commitments on the **Rebuild Bid Package Contract Participation Worksheet** (Attachment C, Form 06-B, Excel template provided). The identification of Contractor's commitment to use the identified M/WBEs constitutes a representation by Contractor that **(a)** each M/WBE identified on the form will provide a Commercially Useful Function; and **(b)** Contractor has made or intends to make a legally binding commitment with the M/WBE for the work or supply effort described and for the dollar/percentage amount(s) set forth on the form. Contractor shall maintain the M/WBE percentage commitments (which apply to the total amount of the contract and any additional increases) throughout the term of the contract. Without limiting any other vendor selection requirements that may be applicable, as part of Contractor's vendor selection process, Contractor shall solicit vendors from Rebuild's business supports programs, including Rebuild Ready (for a list of Rebuild Ready participants, see Attachment B, Section 6 to the bid documents) and Rebuild's Emerging Vendors Program (search

for Emerging Vendor Program vendors through the OEO database), which may support Contractor's diverse contracting goals.

(ii) Workforce Participation Commitments. Contractor shall identify its plan to solicit and maintain a diverse workforce on a weekly basis with the estimated hourly breakout for African American, Hispanic, Asian and Women workers. The plan must be contained in the Documentation of Best and Good Faith Efforts, **Documentation of Best and Good Faith Efforts Workforce Diversity Goals Form** (Attachment C, Form 06-C). The plan must demonstrate that efforts have been made and are ongoing to meet or exceed the aforementioned employment goals. As part of this plan, Contractor shall solicit worker referrals from the Rebuild workforce development programs, which support training to develop diverse apprentice-ready workers in the skilled trades (see Attachment C, Form 06-e for more information).

(iii) Any reference in this Project EOP to the "Project EOP" is deemed to include a reference to the above-listed documents required to be developed by this Project EOP and, upon completion, each of those documents is deemed to be incorporated by reference into this Project EOP.

B. Contractor Covenants. Contractor shall comply with the following provisions:

(i) If Contractor or any subcontractor make any changes that would impact the contract participation and workforce participation commitments made pursuant to this Project EOP, then Contractor shall inform the Project User and the Rebuild Office and obtain approval for a substitution in accordance with the Project User's Grant Agreement and the Rebuild Rulebook. Failure to do so will constitute a breach of this Project EOP and of the contract.

(ii) M/WBE(s) are to be paid promptly for work performed satisfactorily under the contract/subcontract (including without limitation the supply of materials). Contractor shall pay subcontractors (and shall require subcontractors to pay their lower-tier contractors) within 5 business days of receiving payment. Compliance with this requirement is a condition of subsequent invoice approval and payment.

(iii) Contractor agrees to fully comply with any established payment reporting process which may include the use of electronic payment verification systems (i.e., LCP Tracker).

(iv) In support of Rebuild's overall goal of a local construction workforce of 50%-60% Philadelphia residents, Contractor is strongly encouraged to cause its subcontractors to hire workers residing in Philadelphia and make commitments with businesses certified as Local Business Enterprises ("**LBE**") under Section17-109 of The Philadelphia Code or meeting the criteria described in Executive Order 04-12.

(v) Contractor agrees that its compliance with the contract and workforce participation commitments developed to meet the goals of this Project EOP is material to its contract. Any failure by Contractor to comply with the requirements of this Project EOP and to

achieve the contract and workforce participation commitments made pursuant to this Project EOP will constitute a substantial breach of this Project EOP and the contract and may subject Contractor to all remedies available to the Project User, PAID, and the City under this Project EOP, contract, the Grant Agreement, and otherwise available at law and at equity.

C. Verification of True and Accurate Information. Contractor hereby verifies and agrees that all information submitted to the Project User, PAID, and the Rebuild Office in response to this Project EOP is and will be true and correct. Submission of false information is subject to the penalties of 18 Pa. C.S. § 4904 relating to unsworn falsification to authorities and 18 Pa. C.S. § 4107.2(a)(4) relating to fraud in connection with minority business enterprises or women's business enterprises.

IV. Compliance and Monitoring of Best and Good Faith Efforts

A. Rebuild EOP Oversight Committee. Members of the Rebuild EOP Oversight Committee will include Councilmembers, City department representatives (such as the Rebuild Office and the Office of Economic Opportunity), and non-governmental experts in workforce development and development of M/WBEs. The Rebuild EOP Oversight Committee will oversee the performance of the Rebuild Diversity and Inclusion Goals, including without limitation reviewing EOPs, reviewing supports provided to M/WBEs and activities pursuant to the Rebuild Memorandum of Understanding with the Building Trades. The Rebuild EOP Oversight Committee is expected to meet no less frequently than quarterly.

B. Rebuild Monitor.

Contractor shall (and shall cause all subcontractors to) provide the designated third-party monitor ("**Rebuild Monitor**" or "**EOP Monitor**") with full access to contracts, job sites, and all data requested to evaluate performance as compared to the contract and workforce participation commitments made pursuant to the Project EOP. The Rebuild Monitor will be empowered to assist consultants and contractors with achieving workforce and contract participation goals as necessary.

On each contract for Rebuild improvements, when twenty-five percent (25%) of total projected employment hours are complete, and when twenty-five percent (25%) of the total contract value has been expended, the Rebuild Monitor will determine whether Contractor is on track to meet its contract participation and workforce participation commitments. The Rebuild Monitor will report findings to the Project User, the Rebuild Office, and the Rebuild EOP Oversight Committee and may report findings to the district Councilmember and with any member of the Project Review Team.

C. Certified Payrolls and LCP Tracker. Contractor shall (and shall cause all subcontractors to) submit certified payroll records to the Office of Labor Standards through an electronic system, LCP Tracker, on a weekly basis. Compliance with this requirement is a condition of invoice approval and payment. Contractor shall ensure that the City of Philadelphia's Office of Labor Standards is given full access to job sites and all data requested to monitor

compliance. The Rebuild Office and/ or the Office of Labor Standards can provide training and/or support to Contractor and subcontractors in the use of LCP Tracker, if needed. Contractor shall not allow any subcontractors to work on the Project's construction site until each subcontractor has opened an account in LCP Tracker.

V. Remedies and Incentives

A. If it is determined by the Project User, the City, or the EOP Monitor that Contractor has not met, or is not on track to meet, its contract participation or workforce participation commitments, then steps will be taken that include but are not limited to the following:

(i) ***Assistance***. The Project User, Rebuild Office, and the EOP Monitor, in cooperation with the Office of Labor Standards (OLS), will take steps to assist Contractor in making course corrections. Such steps might include the identification of alternative M/WBEs or alternative ways of packaging contracts. Contractor shall cooperate in these efforts and shall take all steps necessary to correct any deficiencies in compliance with the Project EOP.

(ii) ***Written plan****.* Contractor shall prepare a written compliance action plan to show how Contractor plans to come into compliance with the Project EOP. The plan will be subject to the approval of PAID and the Rebuild Office. The Project User, Office of Labor Standards, the EOP Monitor, District Councilmembers, and the Rebuild EOP Oversight Committee may also be consulted.

B. If it is determined by the Project User, the Rebuild Office, the Office of Labor Standards, or the EOP Monitor that Contractor has failed to take successful or acceptable steps to meet its contract participation or workforce participation commitments, then one or more of the following remedies, which are cumulative and concurrent, may be imposed:

(i) ***Withholding payment****.* The Project User and Rebuild Office may withhold invoice approvals so that payments (including but not limited to retainage payments) to Contractor or any non-compliant subcontractor will be suspended.

(ii) ***Rebuild EOP Oversight Committee.*** Contractor and any non-compliant subcontractor may be called to appear before the Rebuild EOP Oversight Committee to address the Project EOP violations.

(iii) ***Work stoppage****.* Contractor may be directed to stop work or to stop the work of any non-compliant subcontractor. The goal of the work stoppage would be to stop using workforce hours and incurring expenses until a viable plan for meeting Project EOP goals can be implemented. It is understood that work stoppages should be avoided if possible because of potential significant negative consequences for all parties. If this step is necessary, Contractor would be responsible for any delay costs resulting from the work stoppage.

(iv) ***Liquidated damages.*** PAID or the City may recover as liquidated damages one percent of the total dollar amount of the relevant contract for each one percent (or fraction thereof) of the commitment shortfall. (NOTE: The "total dollar amount of the contract" includes approved change orders, amendments, and for requirements contracts will be based on actual quantities ordered.)

(v) ***Contract termination.*** The contract (or the contract of any non-compliant subcontractor) may be suspended, terminated, or rescinded.

(vi) ***Disqualification and debarment.*** The Rebuild Office may disqualify Contractor or any non-compliant subcontractor from bidding on and/or participating in any future Rebuild contracts and/or projects, in addition to recommending that Contractor or non-compliant subcontractor be disqualified from bidding on and/or participating in City of Philadelphia projects for a maximum period of three (3) years.

C. In the case of falsification of records and minority business fraud, criminal penalties may also apply.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK; SIGNATURES FOLLOW]

CONTRACTOR

_____

Signature and Date

_____

Print Name

_____

Title

_____

Company

Exhibit “A”

Financing to Support Your Rebuild Contract

PIDC
Driving growth to every corner of Philadelphia

PIDC financing and a mobilization grant are available to qualified Philadelphia-based businesses that have been awarded a Rebuild sub-contract.

The **Rebuild Contract Line of Credit Loan (“Rebuild CLOC”)** provides support to small, minority, women, and disabled-owned businesses that need working capital to fund contract-related expenses. To qualify, contracts must be for a Rebuild Project and be assignable to PIDC. Use of funds is restricted to labor, materials, and equipment costs directly associated with the contract being financed.

Borrowers may be required to participate in technical assistance programs sponsored by PIDC or other approved providers designed to support their business growth. Financing is an advance on approved contract receivables with an opportunity to access grant dollars for mobilization needs.

For more information, please visit PIDCphila.com or contact
Camille N. Simpkins, Relationship Manager, at 215-496-8137 or csimpkins@pidcphila.com.

PIDC

Driving growth to every corner of Philadelphia.

BUSINESS BUILDER

REBUILD CONTRACT LINE OF CREDIT

The Rebuild Contract Line of Credit ("Rebuild CLOC") provides support to small, minority, women, and disabled-owned businesses that need working capital to fund contract-related expenses. To qualify, contracts must be for a Rebuild Project and be assignable to PIDC. The business must also be located or plan to locate in the city of Philadelphia.

USES

Use of funds is restricted to labor, materials, and equipment costs directly associated with the contract being financed. Borrowers may be required to participate in technical assistance programs sponsored by PIDC or other approved providers designed to support their business growth. Financing is an advance on approved contract receivables with an opportunity to access grant dollars for mobilization needs.

FINANCING

Financing is available to qualified businesses that have been awarded Rebuild contracts or sub-contracts.

Line of Credit Amount:	$50,000 - $300,000 Financing of up to 90% of approved invoices under the Rebuild contract or subcontract(s).
Term:	12 months.
Interest Rate:	Fixed interest rate at 1.5%
Underwriting:	Collateral requirements for the loan must include assignment of contract or sub-contract payments to PIDC. The contract owner must also sign a payment directive. PIDC will review a combination of credit, cash flow, collateral, financial position, management capacity, and industry risk.

TIMING & PROCEDURE

Client submits a completed application to PIDC for staff review at which time a thorough credit analysis is performed. For applications that receive a positive credit evaluation, the loan is presented to the PIDC Loan Committee. Following loan approval, PIDC issues a commitment letter to applicant. Settlement of the loan may occur once the terms of the commitment are satisfied. The process from application submission to settlement generally takes approximately 60 to 90 days to complete.

FEES

Borrower will be charged a fixed fee of $1,000 for loans of $50,000 or $1,500 for loans greater than $50,000. This fee will cover all application, origination, and legal fees. A total of $250 is due at the time of application. The remaining balance will be due upon execution of the commitment letter. If real estate collateral is required, then the fee will increase to cover this expense.

MOBILIZATION GRANT

Contractors receiving a Rebuild CLOC in 2021, are ELIGIBLE for up to a $5,000 Mobilization Grant, which can be used to cover payroll, supplies, equipment, or fees related to the Rebuild contract work.

Contractors will request this grant as part of their application and will describe their proposed use of funds. Contractors must submit proof of expenses for how the grant was expended as part of the approval process of their first invoice.

Fees are subject to change. Please confirm all transaction fees with PIDC prior to application.

For more information, please visit PIDCphila.com or contact

Camille N. Simpkins, Relationship Manager, at 215-496-8137 or csimpkins@pidcphila.com.

Rebuild Ready Alumni							
Company_Name	**Certification**	**Contact**	**Email**	**Phone**	**Title**	**Business Type**	**Union**
360 Concrete Construction Company	MBE	Speaks, Danny	danny@360concretephilly.com	2677097743	Construction Manager	Cast in place concrete	Yes
3rd Generation Design & Construction	MWBE	Brown, Melvin	3rdgenerationdc@gmail.com	2155605796	Project Manager	GC	
548 Construction, Inc.	EVP (MBE)	Forbes, Jvonn	jof548@gmail.com	2158702619	Chief Partner	Full Res. Renos/Foundations	
A & Beyond Services	MBE	Knapper, Martin	anbeyond@gmail.com	2673349000		General Construction	
A Positive Response Plumbing LLC.	MWBE	Fletcher, Angelia	fletcherangelia@gmail.com	2677139094	Owner	Plumbing	
A.M. Electric, Inc.	MBE	Muhammad, Anthony	amelectricinc@verizon.net	2152363663	President	Electrical Service and Installation	
Ace of Diamond, LLC.	EVP (MBE)	Henderson, Lorenzo	AceOfDiamondLLC@gmail.com	2158522965	President	Carpentry	
Advanced Infrastructure Design	MWBE	Mohtashami, Mojgan	mojgan@aidpe.com	7326489001	President	Consulting and Engineering (Civil)	
AEZI Electrical Services, LLC	MBE	Purdie, Danyelle	Danyellepurdie@aezielectrical.com	3022798344	Member	Electrical Contractor	
Aid Army	MBE (Uncertified)	Couch, Malachi	malachicouch@gmail.com	2675025026		Landscaping	
America's Best Construction & Custom Design	MBE (Uncertified)	Moss, SunKing (Sunny)	sunkingmoss@gmail.com	2674160065		General Construction/Custom Design	
Apiary Studio, LLC.	LBE	Hesselein, Hans	hhesselein@apiary-studio.com	6099543988	Principal/Owner	Landscape Architecture	
Baggy Construction, LLC.	MBE (Uncertified)	Johnson, Kenneth	kjohnvet1@gmail.com	2678897527	CFO	General Contractor	
Barton Building Enterprises, LLC.	EVP (MBE)	Barton, Glenn	glennbarton1@gmail.com	2158153170	Owner	Plumbing	

Bashful Designs	MBE (Uncertified)	Williams, Michael	mwilliams8314@yahoo.com	2672900434		Drafter (Floor plans/design conceptions); Architectural Designs	
BBB Cleaning Service, LLC.	MBE (Uncertified)	Burroughs, Steven	buffbyburroughs@gmail.com	2679781903	Owner	GC/Janitorial Services	
Benchmark Construction Group, Inc.	MBE	Penn, Kenneth	kpenn@benchmarkcg.net	2156696016	President	GC	
Blissful Enterprises, LLC.	EVP (MBE In Progress TEC)	Pinkett, Angel	blissfulangel@msn.com	2156517956	Owner	Rental and Rehab	
Brewerytown Construction	EVP (MBE)	Hall, Rahsaan	info@brewerytownconstruction.com	8885728696	Partner	Remodel/Repair	
Browntown Group, LLC.	MBE	Thomas, John	john@browntowngroup.com	2155651016	President	Diversity/Inclusion Consulting	
Bullnose Construction and Consultants, Inc.	MBE (Uncertified)	Whitfield, Kirk	kwhitfield@bullnosecc.com	9543055775		GC	
CGW Electric, Inc.	MBE	Welcome, Charles	cgwelectric@aol.com	2152292433	President	Electrical Contractor	
Cheek Extreme Cleaning	MBE	Cheek, Antoine	cheekextreme@gmail.com	2157151160	Owner	Construction Clean-up	
Community Construction Partners		Anderson, Jordan	ccpartners215@gmail.com	2156920096	Principal	GC	
Creative Living Realty LLC	MBE (Uncertified)	Chibundu, Uzoma	creativelivingrealtyllc@gmail.com	2675758962	Co-Owner	HomeStaging/Construction Renos/Interior Design	
D & D Family Construction, LLC.	MBE	Bozeman, Dennis	dboze1@me.com	2159710337	Owner	Glazing	Yes

D. Berry Communications Technology	MBE	Berry, Darrell	berrytelecom@aol.com	2158790420	President	Security camera install , Door lock entry systems , Tv wall mounting , Ring doorbell set ups	
DASH Renovations LLC.	MBE	Hendricks, Shawn	admin@dashrenovations.com	2672270514	Owner	Interior full gut rehabs/renovations; Commercial roofing	
Dooley's Landscaping & Tree Care Services, LLC	MWBE	Dooley, Mae	dooleylandscaping4trees@yahoo.com	2158495013		Landscaping & Tree Care	
Eating for the Ecosystem, Inc.	WBE	Billger, Sherrilyn	sherrilyn@efteonline.com	2676079254	CEO/Owner	Eco-landscaping/tree Services	
Elite Touch Floors, Inc.	MBE (Uncertified)	Leon, Luis	elitetouchflooring@gmail.com	2676879662	Owner	Commercial/Residential Floor Covering	
ENADO Properties Servicing, LLC.	MBE(Uncertified)	Osbourne, Dane	dosbo90321@gmail.com	6092544840	COO	GC/Rehabilitation	
Excellent Painting USA, LLC.	MBE(Uncertified)	Crosland, Craig	craigexcellentpaintingusa@gmail.com	2675058209	Owner/President	Painting Contractor	
Flow Temp 368 General Contracting, Inc.	EVP (MBE)	Tran, Jason (Johnson, Bernice)	jason@flowtempgc.com	2153293688	Owner	General Contracting, Plumbing, HVAC, and Electric	
G & R Contractors Group	MBE (Uncertified)	Romero, Rene	romeroair1@gmail.com	2672571393	President	Interior Remodeling; Finish Carpentry	
Goldstone General Contactors Corp		Borges, Monica	goldstonegccorp@gmail.com	2157200137	President	Commerical Roof/Metal Installation; Flat Roofing	
Green North Studio LLC	MBE (In Progress TEC)	Mirabal, David	greennorthstudio@gmail.com	7875198002	President & CEO	Architectural Surveying	

Inch and Meter PC	WBE	Matic, Jelena	jelena@inchandmeter.com	2676360448		Environmental Consulting & Engineering Firm	
Infinity Contractors	MBE (Uncertified)	Phillips, Rickey	mrrickeyphillips@gmail.com	2675960710	GC	GC	
Interior Finishes by Sydnor, LLC.	MBE (Uncertified)	Sydnor, Tawanda	tawandasydnor@gmail.com	2676023198	Owner/Partner	GC Contracting Services	
JAG Expansion Group, LP.	WBE	Cormican, Jackie	jackie@jagdumpsters.com	2153652898	Owner	Commerical/Residential Dumpster Rental	
JMGJ LLC DBA Champ's Angels Construction	EVP (MBE)	McGirt, James	champsangels@yahoo.com	2156262069	Owner	Rehab and Home Improvement	
Jones and Sons Construction	MBE	Jones, BillyDee	bizbaby3@aol.com	2679734572	Owner	Concrete	
Just It's Electric LLC	MBE	Truxon, Erik	info@justitselectric.com	1215473587	President	Electrical Contracting	
KH Construction & Co. LLC.	EVP (MWBE)	Hampton, Kimyotta	khconstructionandco@gmail.com	6107035525	Owner	GC; Construction and Facilities Management	
Kingdom Builders & Industrial Maintenance	MWBE	Rush, Shakina	kbimcontractors@gmail.com	4843282240	CEO	General Labor	Yes
KTM Construction Co. dba Keystone Tile & Marble, Inc.	MBE	Williams, Lydell	keystone-tile@outlook.com	2679804415	President	Tile, Granite, Stone Supply/Installation	Yes
Lapstone LLC.	MBE (EVP App in progress)	Mendez, Justin	Justin@lapstonellc.com	2152071512	President	GC	
LaPutt Enterprise LLC	MWBE	Johnson, L Elaine	president@laputts.com	2155205550	President/Owner	GC	Yes
Leary Construction	MBE (Uncertified)	Leary, Robert	r.learyconstruction@gmail.com	2157583394	Owner	Residential & Commerical Construction	

Levy DiCarlo Partners LLC	WBE	DiCarlo, Peter	pdc@ldcp.us	2158483750		Architectural Design Services/Interior Design	
McIntosh Plumbing LLC.	MBE	Mcintosh, Enell	mcintoshplumbing@gmail.com	6109097347	Owner	Plumbing, Steamfitter, Sheet Metal Contractor	Yes
MHM Engineering, P.C.	MBE	Mabrouk, Mohamed	mhm@mhmengineering.com	7183925657	Owner	General A&E Services (design/inspection); GC	
Mikkens Property Management	MBE (Uncertified)	Surles, Kim	mikprop12@gmail.com	2672271649	COO	Property Maintenance & Management	
Miller Design Group, LLC.	MWBE	Miller, Robin	millerdesigngroupllc@gmail.com	2674370082		Design Consultation (Architecture/Entertainment Industries); Rel Estate Education/Consultation	
Milligan Group, LLC.	MWBE	Milligan, Kariema	kariema.milligan@milligangroupllc.com	2152545529	President	Electrical, voice & data, and fiber optics cabling along with video surveillance solutions	Yes
NED Contracting, LLC. (Neighborhood & Economic Development)	MBE	Rucker, Wayne	info@NeighborhoodandEconomicDevelopment.com	2673418505	Owner	General Contractor	
Ohara Development Partners, LLC.	MBE (Uncertified)	Bartholomew, Joanna	info@oharadev.com	2159093046		Building Rehab & Community Development	

Over the Top Masonry Restoration	WBE (Uncertified)	Kearney, Alyssa	alyssa@ottmasonryrestoration.com	8563817458	Owner	Mason Restoration	
P.A. Fly Contracting, Inc.	WBE	Fly, Pamela	pam@paflycontracting.com	2155389663		Carpentry	Yes
Parallel Architecture Studio	MWBE	Pena, Carolina	carolina@prll.studio	2672715799	Principal	Architecture & Interior Design	
Philly Premier Contracting, LLC.	MBE (Uncertified)	Opara, Ugochukwu	Admin@phillypremiercontracting.com	4844784469	CEO	GCC	
PK2 Constuction LLC.	EVP (MBE)	Lisby, Paul	pk2concrete@gmail.com	2672785361	President	Concrete	
Quality Air HVAC Trust	MBE	Massey, Darren	qualityairhvac@gmail.com	2152201979	Operations Manager/Trustee	HVAC/Sales, Service, Install	
Rainbow Electric, LLC.	MBE	Chisolm Jr., Eddie	rainbowelec@verizon.net	2152364965	President	Electrical Contractor	
RDS Contracting Group Inc.	MBE (Uncertified)	Smith, Raymond	raybyray@aol.com	2156816350		Lead Abatement/Demo	
Reese Construction LLC	MBE (Uncertified)	Reece, Kendall	kendallreese57@gmail.com	2153808296		Construction Management/GC	Yes
Rocks & Cornerstones, LLC	MWBE	Houser, Bose	bose@rocks-cornerstones.com	2673158480		Design/Build Renovations	
Rosa Builders & Management, LLC	MBE (Uncertified)	Rosa, Fernando	frosa.1@live.com	2155310462		General Construction/Consulting	
S.H.E. Designs & Builds	MBE (Uncertified)	Banks, Andean	s.h.e.designsbuilds@gmail.com	9512371263	Owner	Design/Reno/Repair	
S4S Enterprises, LLC.	EVP (MBE)	Presbery, Kevin	kpresbery24@gmail.com	2159905717	President	Rehab, Drywall, Concrete	
Seamless Pros, LLC	MBE (Uncertified)	Evans, Khaleel	customersupport@seamlesspros.com	2679746090	Owner	Rough & Finish Carpentry	
Side Technology, Inc.	MBE	Kioko, Simon	skioko@sidetechnology.com	2154730110	President	Construction, Repair/Remodelling	
SMK Philly Construction LLC.	EVP (MWBE)	Carmichael, Shanita	info@smkphilly.com	2674371595	Owner	GC	

Stonne Construction	MBE	Long, Arthur	arthur@stonneconstruction.com	4845159796	Owner	General Construction; Concrete Flatwork	Yes
Tasco Contractors, Inc.	MBE (Uncertified)	Tasco, Robin	robtasco@yahoo.com	2675967020	Owner	Electrical/Sheetrock, Doors, Floors, Painting	
The Prime, LLC	MBE	Pridgen, Edward	epridgen53@gmail.com	2672262479		General Contractor/Construction Mgmt.	
Tyree Strickland Electric, LLC.	MBE	Strickland, Tyree	tystrickelectric@gmail.com	2679731752	Owner	Electrical Contractor	
Unique Properties & Builders, LLC.	MWBE	Watts, Carla	uniqueproperties250@gmail.com	4845440770	Operations & Business Development	General Contracting/Construction Management	
VaceTime, LLC.	MBE	Nelson, Jovace	admin@vacetime.com	2672516414	Owner	Landscape	
WEBCO Construction, LLC.	MBE	Weber, Anthony	anthony@webcoconstruction.com	2157682601	Owner	Construction Management	
Yes Dear…Multi Purpose Improvement Specialists	MBE	McClenny, John	jbmc0001@aol.com	2152922091	Owner	Design/Build Renovations	

SECTION 002513

PAYMENT PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including Application for Payment forms with Continuation Sheets and Contractor's Construction Schedule.
2. Submit the final Schedule of Values to Architect prior to the commencement of work in a form acceptable to the owner.
3. Final Schedule of Values should reflect the requirements and lines as required by Owner, including Rebuild.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:

a. Project name and location.
b. Name of Architect.
c. Architect's project number.
d. Contractor's name and address.
e. Date of submittal.

2. Submit draft of AIA Document G703 Continuation Sheets.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

6. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include cost each item on a separate line. Separate out and show general overhead expenses for each item in addition to the cost.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place are to be shown as separate line items in the Schedule of Values under the General Conditions.

8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

    1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Progress payments shall be submitted to Architect by the 10th of the month. The period covered by each Application for Payment is one month, ending on the 20th. Actual date of submission and period covered is subject to change.

D. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.

E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

    1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
    2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

F. Transmittal: Submit a signed and notarized original copy of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Submittals Schedule (preliminary if not final).
5. List of Contractor's staff assignments.
6. List of Contractor's principal consultants.
7. Copies of building permits.
8. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
9. Initial progress report.
10. Report of preconstruction conference.
11. Certificates of insurance and insurance policies.

I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 004113

GMP SUMMARY FORM

1.1 CONTRACTOR INFORMATION

A. Contractor (Legal Name): _____.

1.Address: _____

_____ _____

2.Contact Person: _____

3.Title: _____

4.Telephone: _____

5.Fax: _____

6.Email: _____

7.Firm Information: (Check one)

____ sole proprietor
____ partnership (State _____)
____ corporation (State _____)
____ other legal entity

8.Is Bidder a Philadelphia-based ("Local"), Minority-Owned ("MBE"), Women- Owned ("WBE"), and/or Disabled-Owned ("DBE") Business?

___ Yes ___ Local ___ MBE ___ WBE ___ DBE
___ No

B. Project Name: **Lawncrest Recreation Center Renovation and Site Improvements Project**; **Project #CVLWC-16381E;**

C. Project Location: **6000 Rising Sun Avenue, Philadelphia, PA 19111**

D. Owner: Community Ventures

1.2 CERTIFICATIONS AND GARAUNTEED MAXIMUM PRICE

A. Guaranteed Maximum Price (GMP), Single Prime (All Trades) Contract: The undersigned Contractor, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, including all scheduled allowances, necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents, for the stipulated sum of:

1. _____Dollars ($_____).
2. The above amount may be modified by amounts indicated by the Contractor on the attached Document 004322 "Unit Prices Form".."

B. Cost breakdown, by category, of the base bid:

CSI Divi	Name	Cost
1.0	General Conditions	$_____
1.2	General Requirements & Temporary Protection	$_____
2.0	Existing Conditions	$_____
3.0	Concrete	$_____
4.0	Masonry	$_____
5.0	Metals	$_____
6.0	Woods & Plastics	$_____
7.0	Moisture Protection	$_____
8.0	Openings	$_____
9.0	Finishes	$_____
10.0	Specialties	$_____
11.0	Equipment	$_____
12.0	Furnishings	$_____
13.0	Special Construction	$_____
14.0	Conveying Systems	$_____

21.0	Fire Suppression	$_____
22.0	Plumbing	$_____
23.0	HVAC	$_____
26.0	Electrical	$_____
27.0	Communications	$_____
28.0	Electronic Safety and Security	$_____
31.0	Earthwork	$_____
32.0	Exterior Improvements	$_____
33.0	Utilities	$_____
	Construction Manager Fee	$_____
	Surety Bond	$_____
	Performance & Payment Bond	$_____
	5% GMP Contingency	$_____

C. Cost breakdown for Owner review and analysis:

Name	Cost
MAIN REC BUILDING	
New Flooring in Basement	$_____
New door hardware in basement	$_____
New window Shades at Multi-purpose Rooms 104 and 105	$_____
Overall Rec Building Addition	$_____
Main Building overall renovation	$_____
CLUBHOUSE BUILDING	
Roof replacement	$_____

Proposed scope of work (excluding roof) $_____

SITE

Asphalt walking loop along Lardner, Hasbrook and Comly $_____

Addapave at tree pits $_____

Proposed site wall repairs outside of clubhouse $_____

Proposed sports courts (basketball courts, multi-purpose courts, and mini pitch) and associated lighting, fencing, furnishing $_____

1.3 SUBCONTRACTORS AND SUPPLIERS PARTICIPATION

Contractor understands that the Rebuild Economic Opportunity Plan and requirements for soliciting and reporting MBE & WBE participation for the project. The Contractor commits to solicit all Second-Tier Contractors and Suppliers via Rebuild's Vendor Selection Requirements after the GMP has been accepted by Owner. Contractor will provide a completed Rebuild Participation and Budget Form after Second-Tier Contractor solicitation. Contractor commits to meeting or exceeding the following goals:

	Rebuild Participation Goals	Contractor Commitment
MBE	30% to 35%	
WBE	15% to 20%	

1.4 TIME OF COMPLETION

A. The undersigned Bidder proposes and agrees hereby to commence the Work of the Contract Documents on a date specified in a written Notice to Proceed to be issued by the Owner, and shall fully complete the Work within **_____ calendar days**.

1.5 ACKNOWLEDGEMENT OF ADDENDA

A. The undersigned Bidder acknowledged receipt of and use of the following Addenda in the preparation of this Bid:

1. Addendum No. 1, dated_____.
2. Addendum No. 2, dated_____.
3. Addendum No. 3, dated_____.
4. Addendum No. 4, dated_____.

1.6 GMP SUPPLEMENTS

A. The following supplements are part of this GMP Form and are attached hereto.

1. GMP Form Supplement – Unit Prices (Per Spec. Section 004322)
2. GMP Form Supplement – Bid Bond Form (AIA Documents A310-2010)
3. GMP Form Supplement – Rebuild EOP Forms (Per Spec. Section 004393)
    a. City of Philadelphia Office of Labor Standards Documentation of Best and Good Faith Efforts Workforce Diversity Goals
    b. Rebuild Past Contract Participation Form
    c. Rebuild Workforce Development Program Commitment Form
    d. Rebuild Existing Workforce Diversity Breakdown

1.8 CONTRACTOR'S LICENSE

The undersigned further states that it is a duly licensed contractor, for the type of work proposed, in **City of Philadelphia**, and that all fees, permits, etc., pursuant to submitting this proposal have been paid in full. A copy of the Contractor License is attached to this GMP Form.

1.9 SUBMISSION OF GMP

A. Respectfully submitted this_____day of_____, 2023.

B. Submitted By:_____(Name of bidding firm or corporation).

C. Authorized Signature:_____(Handwritten signature).

D. Signed By: _____
(Type or print name).

E. Title:_____
(Owner/Partner/President/Vice President).

F. Witnessed By:_____
(Handwritten signature).

G. Attest:_____
(Handwritten signature).

H. By:_____
(Type or print name).

I. Title: _____
(Corporate Secretary or Assistant Secretary).

J. Street Address: _____

K. City, State, Zip:_____

L. Phone:_____.

M. License No.:_____.

N. Federal ID No.:_____(Affix Corporate Seal Here).

END OF SECTION 004113

SECTION 004322

UNIT PRICES

1.1 BID INFORMATION

A. Bidder:_____.

B. Project Name: **Lawncrest Recreation Center Renovation and Site Improvements Project**; **Project #CVLWC-16381E;**

C. Project Location: **6000 Rising Sun Avenue, Philadelphia, PA 19111**

D. Owner: Community Ventures

1.2 BID FORM SUPPLEMENT

A. This form is required to be attached to the Bid Form.

B. The undersigned Bidder proposes the amounts below be added to or deducted from the Contract Sum on performance and measurement of the individual items of Work.

C. Pricing is required for all unit prices indicated within. Proposed unit prices may be rejected by the Owner.

1.3 UNIT PRICES

A. Unit-Price No. 1: Replacement of Damaged Brick Veneer:

1. _____dollars ($_____) per SF.

B. Unit-Price No. 2: Repointing of Brick Mortar Joints

1. _____dollars ($_____) per LF.

C. Unit-Price No. 3: Repair of Overhead Spalls in Concrete

1. _____dollars ($_____) per SF.

D. Unit-Price No. 4: Repair of Fine Cracks in Brick Mortar with Sealant

1. _____dollars ($_____) per LF.

E. Unit-Price No. 5: Replacement of Brick Mortar Joints

1. _____dollars ($_____) per LF.

F. Unit-Price No. 6: Repair of Interior Glazed Block

1. _____dollars ($_____) per SF.

1.4 SUBMISSION OF BID SUPPLEMENT

A. Respectfully submitted this_____day of_____, 2023

B. Submitted By:_____(Insert name of bidding firm or corporation).

C. Authorized Signature:_____(Handwritten signature).

D. Signed By:_____(Type or print name).

E. Title:_____(Owner/Partner/President/Vice President).

END OF DOCUMENT 004322

SECTION 004393

GMP SUBMITTAL CHECKLIST

PART 1 – GENERAL

1.1 GMP INFORMATION

A. Project Name: **Lawncrest Recreation Center Renovation and Site Improvements Project**; **Project #CVLWC-16381E;**

B. Project Location: **6000 Rising Sun Avenue, Philadelphia, PA 19111**

C. Owner: Community Ventures

1.2 GMP CHECKLIST

- GMP Summary Form
- Payment & Performance Bonding Statement
- Subcontractor Leveling Sheets per Trade
- Unit Prices Form
- Allowances Form
- Clarifications List
- Responsibility List between CM and Owner
- Site Logistics Plan
- Submittal Log
- City of Philadelphia Rebuild Economic Opportunity Plan and Forms:
    - Signed Rebuild Economic Opportunity Plan
    - Rebuild Participation and Budget Proposal Form
    - City of Philadelphia Office of Labor Standards Documentation of Best and Good Faith Efforts Workforce Diversity Goals
    - Rebuild Past Contract Participation Form
    - Rebuild Workforce Development Program Commitment Form
    - Rebuild Existing Workforce Diversity Breakdown

END OF SECTION 004393

DOCUMENTATION OF BEST AND GOOD FAITH EFFORTS
WORKFORCE DIVERSITY GOALS

OFFICE OF LABOR STANDARDS

BID TITLE	NAME OF SELLER	BID SUBMISSION DATE

1) Identify the labor organizations (if any) with which you have a collective bargaining agreement.

2) Did you contact the labor organizations applicable to the scope of work of this contract *in writing* to request a diverse workforce? If so, please provide a copy of that request.

3) Please identify any on-the-job training or apprenticeship programs that you operate or provide funding for. Please note if any of these programs are Commonwealth-approved apprenticeship programs that specifically encourage the training and employment of minority, women and/or disabled persons.

4) Please provide the number of trainees and breakout of minority, female and/or disabled participants for each program you operate or fund.

5) Did you seek assistance from the Urban Affairs Coalition, Careerlink Philadelphia, Opportunity Industrial Center, Philadelphia Works, Finishing Trades Institute, JEVS Orleans Technical Institute, the Philadelphia Housing Authority ,or any other labor or community organizations applicable to the scope of work for this contract to perform employee outreach? Provide a list of the recruitment agencies or other community based organizations that your firm uses for employment placement.

6) As identified in the Rebuild Ordinance (Bill No. 170206), the current employment hourly goals for Journeypersons are 45% minority [27% African American, 15% Hispanic and 3% Asian] and 5% female. For Apprentices the hourly goals are 50% minority and 5% female. In the space below please provide an estimate of your weekly employment utilization for each category of minority worker and female workers, and how that will allow you to meet the overall employment goals by the completion of the contract.

		Journeymen				Apprentices	
	Total Hours	% African American	% Hispanic	% Asian	% female	% minority	% female
Week 1							
Week 2							
Week 3							
Week 4							
Week 5							
Week 6							

[insert additional rows as needed]

7) Attach your company's Equal Employment Opportunity Statement and any published nondiscrimination policies.

Note: This form satisfies the requirement for a Workforce Diversity plan outlined in **Chapter 17-1600** of the Philadelphia Code

Project Lead [Nonprofit Name]
Project Name [Site Name]

Summary Tables *(summary tables will auto-populate based on data input in the "Contract Value" sections)*

Professional Services Summary			
	Goal Percentage	Contract Value	Actual Spend
MBE	25.0%	$111,500.00	$150,350.00
		14.3%	14.1%
WBE	20.0%	$64,765.00	$214,396.00
		8.3%	20.1%
Total Prof Services	45.0%	$782,406.00	$1,066,362.00

Contruction Services Summary			
	Goal Percentage	Contract Value	Actual Spend
MBE	35.0%	$21,100.00	$21,650.00
		10.1%	9.1%
WBE	15.0%	$187,150.00	$216,128.00
		89.9%	90.9%
Total Construction	50.0%	$208,250.00	$237,778.00

Total Services Summary			
	Goal Percentage	Contract Value	Actual Spend
MBE		$132,600.00	$172,000.00
		13.4%	13.2%
WBE		$251,915.00	$430,524.00
		25.4%	33.0%
Total Project		$990,656.00	$1,304,140.00

Contracting Goals and Participation

Prime or Sub	Firm/Org	Scope	Certification	Contract Value	Contract % of Prof Services	Actual Spend	Actual % of Prof Services	Notes
Prime	Alpha Architects	Architecture	Majority	$ 440,000.00	56.2%	$499,500.00	46.8%	[Note if no goals were set for this project]
Sub	Bravo Engineering, Inc.	Structural	WBE	$ 47,500.00	6.1%	$70,850.00	6.6%	
Sub	Charlie Engineers	MEP Engineering	MBE	$ 111,500.00	14.3%	$150,350.00	14.1%	
Sub	Delta Engineering, LLC	Geotech	WBE	$ 17,265.00	2.2%	$22,555.00	2.1%	
Sub	Echo Engineering Partners	Special Inspections	WBE	$ -	0.0%	$120,991.00	11.3%	
Sub	Foxtrot Engineering	Civil Engineering	Majority	$ 146,741.00	18.8%	$182,491.00	17.1%	
Sub	Golf Energy Specialists	Energy Audit	Majority	$ 19,400.00	2.5%	$19,625.00	1.8%	
					0.0%		0.0%	
					0.0%		0.0%	
					0.0%		0.0%	
					0.0%		0.0%	
					0.0%		0.0%	
					0.0%		0.0%	
					0.0%		0.0%	
					0.0%		0.0%	
Professional Services				**$ 782,406.00**		**$ 1,066,362.00**		

Prime or Sub	Firm/Org	Scope	Certification	Contract Value	Contract % of Construction	Actual Spend	Actual % of Construction	Notes
Sub	Hotel Landscaping	Planting and Seeding	WBE	$ 17,000.00	8.2%	$ 29,557.00	12.4%	[Note if no goals were set for this project]
Sub	India Const. Services	Tree protection, silt sock	MBE	$ 21,100.00	10.1%	$ 21,650.00	9.1%	
Sub	Juliet Electric	Provide electrical supplies	WBE	$ 90,000.00	43.2%	$ 99,010.00	41.6%	
Sub	Kilo Contracting Corp	Concrete flatwork	WBE	$ 70,000.00	33.6%	$ 78,741.00	33.1%	
Sub	Lima Construction	Porous asphalt walk	WBE	$ 10,150.00	4.9%	$ 8,820.00	3.7%	
					0.0%		0.0%	
					0.0%		0.0%	
					0.0%		0.0%	
					0.0%		0.0%	
					0.0%		0.0%	
					0.0%		0.0%	
					0.0%		0.0%	
					0.0%		0.0%	
Construction				**$ 208,250.00**		**$ 237,778.00**		

Past Contract Participation Detail Form

This form is intended to collect information about contract participation for prior projects, including both professional services contracts (i.e., architecture, engineering, and community engagement) and for construction contracts. Applicants should report on projects and participation goals for which they were responsible.

- A single sheet represents a single project. Multiple sheets can be submitted to report on multiple projects.
- The applicant should enter information in cells that are yellow. Cells that are not yellow are for admin use and/or will calculate automatically.
- Add rows as necessary. (Right Click row # on left of screen, click "Insert Row"). Disregard error messages from Excel.

Contractor	
Project Name	
Project Date Complete	

Summary Tables *(summary tables will auto-populate based on data input in the "Contract Value" sections)*

Professional Services Summary			Contruction Services Summary			Total Services Summary		
	Goal Percentage	Final Contract Amount		Goal Percentage	Final Contract Amount		Goal Percentage	Final Contract Amount
MBE		$0.00	MBE		$0.00	MBE		$0.00
WBE		$0.00	WBE		$0.00	WBE		$0.00
Total Prof Services		$0.00	*Total Construction*		$0.00	*Total Project*		$0.00

Contracting Goals and Participation

	Prime or Sub	Firm/Org	Scope	Certification	Final Contract Amount	Actual % of Prof Services	Notes
							[Note if no goals were set for this project]
Professional Services					$ -		

	Prime or Sub	Firm/Org	Scope	Certification	Final Contract Amount	Actual % of Construction	Notes
							[Note if no goals were set for this project]
Construction					$ -		

Project Lead [Nonprofit Name]
Project Name [Site Name]

Summary Tables *(summary tables will auto-populate based on data input in the "Contract Value" sections)*

Professional Services Summary			
	Goal Percentage	Contract Value	Actual Spend
MBE		$0.00	$0.00
		#DIV/0!	#DIV/0!
WBE		$0.00	$0.00
		#DIV/0!	#DIV/0!
Total Prof Services		$0.00	$0.00

Contruction Services Summary			
	Goal Percentage	Contract Value	Actual Spend
MBE		$0.00	$0.00
		#DIV/0!	#DIV/0!
WBE		$0.00	$0.00
		#DIV/0!	#DIV/0!
Total Construction		$0.00	$0.00

Total Services Summary			
	Goal Percentage	Contract Value	Actual Spend
MBE		$0.00	$0.00
		#DIV/0!	#DIV/0!
WBE		$0.00	$0.00
		#DIV/0!	#DIV/0!
Total Project		$0.00	$0.00

Contracting Goals and Participation

	Prime or Sub	Firm/Org	Scope	Certification	Contract Value	Contract % of Prof Services	Actual Spend	Actual % of Prof Services	Notes
									[Note if no goals were set for this project]
Professional Services					$ -		$ -		

	Prime or Sub	Firm/Org	Scope	Certification	Contract Value	Contract % of Construction	Actual Spend	Actual % of Construction	Notes
									[Note if no goals were set for this project]
Construction					$ -		$ -		

Project Lead [Nonprofit Name]
Project Name [Site Name]

Summary Tables *(summary tables will auto-populate based on data input in the "Contract Value" sections)*

Professional Services Summary			
	Goal Percentage	Contract Value	Actual Spend
MBE		$0.00	$0.00
		#DIV/0!	#DIV/0!
WBE		$0.00	$0.00
		#DIV/0!	#DIV/0!
Total Prof Services		$0.00	$0.00

Contruction Services Summary			
	Goal Percentage	Contract Value	Actual Spend
MBE		$0.00	$0.00
		#DIV/0!	#DIV/0!
WBE		$0.00	$0.00
		#DIV/0!	#DIV/0!
Total Construction		$0.00	$0.00

Total Services Summary			
	Goal Percentage	Contract Value	Actual Spend
MBE		$0.00	$0.00
		#DIV/0!	#DIV/0!
WBE		$0.00	$0.00
		#DIV/0!	#DIV/0!
Total Project		$0.00	$0.00

Contracting Goals and Participation

	Prime or Sub	Firm/Org	Scope	Certification	Contract Value	Contract % of Prof Services	Actual Spend	Actual % of Prof Services	Notes
									[Note if no goals were set for this project]
Professional Services					$ -		$ -		

	Prime or Sub	Firm/Org	Scope	Certification	Contract Value	Contract % of Construction	Actual Spend	Actual % of Construction	Notes
									[Note if no goals were set for this project]
Construction					$ -		$ -		

REBUILD WORKFORCE DEVELOPMENT PROGRAM COMMITMENT

As part of Rebuild's commitment to Diversity, Equity & Inclusion, Rebuild operates two Workforce Development Programs that are designed to increase the diversity in the building trades, which will promote diversity and opportunity during and beyond the Rebuild program. These programs serve as a model for future workforce development programs within the City of Philadelphia.

PHL Pipeline

For entry-level workers with interest and aptitude but no experience yet

- 30 participants annually
- Extended onramp to union apprenticeships

Talent Development Program

For experienced workers seeking union membership

- 30 workers over the life of Rebuild
- Up to 3,000 hours of work in relevant trade

Rebuild's Workforce Development Programs select high-quality, driven individuals to receive rigorous training delivered by established workforce training partners. Through hands-on practice, on-the-job training, and classroom instruction, participants develop the skills required for success in the building trades.

Graduates of these Rebuild Workforce Development Programs who have qualified as apprentices in a trade (referred to as "**Rebuild Workforce Development Apprentices**") are currently active in the following trades:

1. Carpenters
2. Electricians
3. Painters
4. Roofers
5. Cement Masons
6. Bricklayers
7. Laborers
8. Sound & Communications
9. Insulators

Project Users and contractors on Rebuild projects shall participate in the support of the Rebuild Workforce Development Programs, including through the hire of Rebuild Workforce Development Apprentices and partnering with trades unions for the duration of the project, where appropriate. <u>General Contractors must pass this commitment to their subcontractors.</u>

Please identify which scopes on this Project could utilize Rebuild Workforce Development Apprentices from the above-listed trades:

Sign below to indicate your commitment to supporting the Rebuild Workforce Development Program through the hire of Rebuild Workforce Development Apprentices and partnering with trades unions for the duration of the Project, where appropriate, including passing this commitment down to contractors and subcontractors.

_____ _____

NAME: DATE:

TITLE:

Last Revised: 22-11-15

Existing Workforce Diversity Breakdown

We want to get to know your construction team. Please list below the demographic composition of your most recent (**12 months or less**) construction projects. It is understood that this is only a snapshot of your current workforce and may not be reflective of workers who will be assigned to this particular project.

Project Name	**Contractor Name**	**Select Role**
		☐ Prime ☐ Sub

Please provide demographic information regarding your standing crew below. Add additional rows or provide multiple pages as necessary.

EMPLOYEE'S NAME	PHILADELPHIA RESIDENT? (Y/N)	DATE OF LAST PROJECT WORKED	JOURNEYPERSON /OR/ APPRENTICE	GENDER	RACE B	H	A	N	W	TRADE
A.										
B.										
C.										
D.										
E.										
F.										
G										
H.										

ESTIMATED # OF ADDITIONAL HIRES NEEDED FOR PROJECT

Contractor Authorized Signature and Title:	**Date**
SIGN HERE	

Legend		
Race		**Gender**
B - Black/African American	N - Native American	M - Male
H - Hispanic	W - White	F - Female
A - Asian & Pacific Islander		N - Non-binary

SECTION 007201

SUPPLEMENTARY STATE CONDITIONS – RACP

PART 1 GENERAL

1.1 SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the "General Conditions" and other provisions of the Contract Documents as indicated below. All provisions, which are not so amended or supplemented, remain in full force and effect. The "General Conditions" also may be supplemented elsewhere in the Contract Documents by provisions located in, but not necessarily limited to, Division 1 of the specifications.

1.2 STATE REQUIREMENTS FOR RACP GRANTS

The Contractor is hereby notified that state grant funds are being used to finance this construction and the Contractor shall therefore comply with the state requirements imposed by the Commonwealth of Pennsylvania.

If there are different types of state grants funding the construction, each grant will have a separate section in these specifications outlining the supplementary state conditions for that type of grant and Contractor is required to comply with the requirements of each and every type of grant. **Please review the supplementary state condition sections carefully.** Many of the state grant requirements will be duplicative, but there may be important differences.

The City was selected to receive a Redevelopment Assistance Capital Program grant (the "**RACP Grant**") from the Commonwealth of Pennsylvania (the "**Commonwealth**") to fund a portion of the Rebuild Improvements at Lawncrest Recreation Center.

The Contractor is responsible for performing its work in accordance with the Commonwealth's RACP requirements, which are included in this Section 007201 and which may be revised from time to time (the "**RACP Requirements**"). If the Contractor is not complying with the RACP Requirements, payment may be withheld from the Contractor. In the case of any differences between the RACP Requirements and in the Contract Documents (including but not limited to prevailing wage requirements), the Contractor shall comply with the more stringent requirement.

Accordingly, in performing all work, including project management work, the Contractor shall:

a. Comply with the RACP Requirements, including the items listed on the "**Key Compliance Guidelines**" **[ATTACHMENT 1]**

b. Review and comply with the attached "**Guidance on Steel Certification Relative to the Redevelopment Assistance Capital Program (RACP)**" (*Updated June 2022)* **[ATTACHMENT 2]**

c. Ensure that prevailing wage requirements under the Pennsylvania Prevailing Wage Act or the Rebuild prevailing wage requirements (which track the City of Philadelphia's prevailing wage requirements), whichever are higher, are satisfied. ***NOTE*** that the Contractor shall pay, and require to be paid, the current wage rates as those may be updated by the Commonwealth or the City from time to time. The prevailing wages rates for the City and the Commonwealth at the time of this posting are attached in **Section 002313**.

d. The Contractor shall submit wage information on the Commonwealth's wage rate submittal form (the "**DLI Wage Form**") **[ATTACHMENT 3]**. ***NOTE*** that this form will be required in addition to the use of LCP Tracker.

e. Indemnify, defend, and hold harmless, and cause its subcontractors, to indemnify defend, and hold harmless, the Commonwealth (in addition to the City of Philadelphia, PAID, PIDC, and PRA) from and against all claims, liabilities, demands and actions based upon or arising in whole or in part, directly or indirectly, from or in any related to any activities performed in connection with the work.

f. Add, and require subcontractors to add, the Commonwealth as an **additional insured** (in addition to the City of Philadelphia, PAID, PIDC, and PRA) on any insurance policies. ***NOTE*** that the insurance requirements stated in the attached Key Compliance Guidelines may be lower than those otherwise required for the Project. If there is a difference, the Contractor is required to obtain the higher limits and types of insurance.

g. Certify, in writing, for itself and all its subcontractors, that as of the date of its execution of this contract that neither the Contractor, nor any subcontractors, nor any suppliers, are under suspension or debarment by the Commonwealth or any governmental entity, instrumentality, or authority and, if the Contractor cannot so certify, then it agrees to submit, along with the bid/proposal, a written explanation of why such certification cannot be made.

h. Certify, in writing, that as of the date of its execution of the contract, the Contractor has no tax liabilities or other Commonwealth obligations.

i. Execute, and require all subcontractors who work on the Project to execute, the Commonwealth's "Nondiscrimination/Sexual Harassment Clause" **(ATTACHMENT 4)**

as though the Contractor or subcontractor, as the case may be, were the “Applicant” or “Grantee” for purposes of that form.

PART 2 PRODUCTS **Not Used**

PART 3 EXECUTION **Not Used**

ATTACHMENTS:

1. Key Compliance Guidelines
2. Guidance on Steel Certification Relative to the Redevelopment Assistance Capital Program (RACP) (*updated June 2022)*
3. DLI Wage Form
4. Nondiscrimination/Sexual Harassment Clause (form)

END OF SECTION 007201

KEY COMPLIANCE GUIDELINES

It is suggested that a copy of this complete document be given to your Project, Construction Manager, and/or Architect so that they are fully aware of the RACP requirements related to each. This document should be included in your bid packages, and should be made an addendum to any and all construction contracts, plans and specifications related to the RACP project.

Compliance with all RACP requirements, including the key items in these guidelines will be monitored frequently throughout the construction phase of your project and will be reviewed once more during the legislatively mandated close-out audit.

COMPETITIVE BIDDING REQUIREMENTS

The sole and exclusive bidding requirement for RACP projects is in the Capital Facilities Debt Enabling Act (Act 67 of 2004), which states "Notwithstanding any other provision of law, the solicitation of a minimum of three written bids for all contracted construction work on redevelopment assistance capital projects shall be the sole requirement for the composition, solicitation, opening and award of bids on such projects." Unless the terms of the law change, the Office of the Budget cannot grant waivers for bidding requirements to Grantees.

RACP projects are not subject to separation of trades. You are REQUIRED to solicit a minimum of three (3) bids for "all generally contracted work" being performed within the RACP defined scope of work. You are not required to receive three (3) bid responses. However, you should provide documentation to prove that at least three bids were solicited by providing copies of the solicitation letters (preferably on letterhead of the bidding entity) used in the bidding process. You are not required to select the lowest bidder, but if you do not, you will have to provide a brief written justification for your selection. Note: there is NO threshold level under the RACP program regardless of the size or dollar amount associated with the work to be performed. You need to show that you solicited a minimum of three (3) bids for any contract to be eligible for RACP.

Bidding is acceptable at either the general contractor level (described in option a. below) or at the sub-contractor level (described in option b. below):

- **General Contractor (GC) Level** - If you chose to bid at the GC level, please note that the bid should encompass the entire RACP scope of work to be performed including all associated construction work. The dollar amount bid on the project must include 100% of the work to be performed by the GC and the sub-contractors. Bidding at the GC level will require submission of bidding and construction related documents at the GC level only (see Sub-Contractor level below for a distinction)
- **Sub-Contractor Level** - If you choose not to solicit three bids for a General Contractor, then you are required to solicit a minimum of three bids for EACH Sub-Contractor covering all trades involved in the project. Note that any self-performed work by a non-bid GC is NOT an eligible cost for reimbursement OR match purposes. Bidding at the Sub-Contractor level will require submission of bidding and construction related documents at the sub level…meaning proof of

bidding, construction contracts, payment and performance bonds, insurance etc. will need to be provided for every sub-contractor in the RACP scope.

Professional Services: Professional services associated with the project are not required to be bid as these associated costs are only eligible as match.

Change Orders: Grantees and/or Sub-Grantees are not required to competitively bid out change orders as long as the work was within the RACP scope of the original bid and is less than 20% of the total contract. If a change order is for work beyond the RACP scope of work originally bid, the Grantee will be required to competitively bid out the new scope of work in order to be considered RACP eligible.

PENNSYLVANIA STEEL PRODUCTS PROCUREMENT ACT

The Office of the Budget (OB) cannot grant waivers to the Pennsylvania Steel Products Procurement Act (SPPA) unless the terms of the law change. All RACP Grantees must comply with the SPPA. If a Grantee/RACP project fails to abide by the SPPA, it does so at its own risk.

A full explanation on the RACP steel requirements is available as a PDF download.

Up to 2011, OB only accepted the ST-4 Form (justification for the use of foreign steel) that the Department of General Services (DGS) had exclusively devised to address exceptions linked to the requirements of the SPPA, when it was necessary. Since 2011, OB has approved the acceptability of two more DGS ST Forms (ST-2, ST-3) with some caveats, providing that the forms are properly filled out. The ST-1 Form will not be accepted by OB. It is not necessary for the ST-2, ST-3, and ST-4 Forms to be notarized.

Effective January 1, 2013, OB began utilizing the DGS Exempt Machinery and Equipment Steel Products listings (2022, 2021, 2020) as part of our steel policy. DGS published a Statement of Policy- Steel products procurement in the Pennsylvania Bulletin Volume 43, Number 6 dated February 9, 2013 (See PA Bulletin #43, pages 85-86) that discussed the exemption of certain steel products, based on their analysis of ST-4 forms submitted that list products not produced domestically in sufficient quantity. DGS publishes an updated "Exemption List" annually.

Please be aware that ST forms are acceptable only in cases where nonstructural steel needs to be addressed. The DGS ST forms do not replace the steel certification forms associated with structural steel. OB will continue to require the submission of steel mill certifications to demonstrate compliance with the steel requirements for structural steel.

The PDF copies of the three acceptable ST Forms for RACP listed below can be obtained from the RACP website:

- ST-2 Steel Origin Certification: Non-Identifiable, Non-Structural Steel
- ST-3 75% U.S. Manufacture Certification
- ST-4 Not Domestically Manufactured: Prime Contractor (only to be used when requesting items to be exempted that are not found on the current year's List of Exempt Machinery and Equipment Steel Products)

It is suggested that the certifications be collected at the time any steel for the project is purchased and delivered to ease the collection process.

Be advised that OB DOES NOT need to approve the ST forms prior to the start of the construction period. The ST forms need to be submitted to demonstrate that compliance, when and where necessary, has been met.

We shall deem as ineligible all contracts that are unable to demonstrate compliance via the submission of steel certifications for Structural Steel and for Non-structural Steel the submission of steel certifications and/or ST forms and/or DGS Exempt Machinery and Equipment Steel Products List. Therefore, the value of construction contracts associated with non-compliant steel will be removed (both materials and labor costs) from the scope of the project, which may in turn affect the project's ability to leverage their full grant amount (project may not receive its full grant).

Recycled products, melted from previously used steel, are acceptable, providing that adequate documentation from the supplier has been furnished. The supplier shall certify that the recycled steel product was produced in the USA.

TRADE PRACTICES ACT

In accordance with the Trade Practices Act of July 23, 1968, P.L. 686 (71 P.S. § 773.101 et seq.), the Grantee cannot and shall not use or permit to be used in the work any aluminum or steel products made in a foreign country which is listed below as a foreign country which discriminates against aluminum or steel products manufactured in Pennsylvania. The countries of Argentina, Brazil, South Korea, and Spain have been found to discriminate against certain products manufactured in Pennsylvania. Therefore, the purchase or use of those countries' products, as listed below, is not permitted:

- **Argentina:** carbon steel wire rod and cold-rolled carbon steel sheet.
- **Brazil:** welded carbon steel pipes and tubes; carbon steel wire rod; tool steel; certain stainless steel products, including hot-rolled stainless steel bar; stainless steel wire rod and cold-formed stainless steel bar; pre-stressed concrete steel wire strand; hot-rolled carbon steel plate in coil; hot-rolled carbon steel sheet; and cold-rolled carbon steel sheet.
- **South Korea:** welded carbon steel pipes and tubes; hot-rolled carbon steel plate; hot-rolled carbon steel sheet; and galvanized steel sheet.
- **Spain:** certain stainless steel products, including stainless steel wire rod, hot-rolled stainless steel bars; and cold-formed stainless steel bars; pre-stressed concrete steel wire strand; and certain steel products, including hot-rolled steel plate, cold-rolled carbon steel plate, carbon steel structural shapes; galvanized carbon steel sheet, hot-rolled carbon steel bars, and cold-formed carbon steel bars.

Penalties for violation of the above paragraphs may be found in the Trade Practices Act, which penalties include becoming ineligible for public works contracts for a period of three years.

This provision in no way relieves the Grantee of responsibility to comply with those provisions which prohibit the use of foreign-made steel and cast iron products.

PUBLIC WORKS CONTRACTORS' BOND LAW (PAYMENT & PERFORMANCE BONDS)

The requirement for 100% payment and performance (P&P) bonds is a state law; the Office of the Budget cannot waive this requirement.

A performance bond must be obtained at 100% of the contract amount, conditioned upon the faithful performance of the contract in accordance with the plans, specifications, and conditions of the contract. Such bond shall be solely for the protection of the contracting body which awarded said contract.

A payment bond must be obtained at 100% of the contract amount. Such bond shall be solely for the protection of claimants supplying labor or materials to the Grantee, its contractor or to any of its subcontractors, in the prosecution of the work provided for in such contract, and shall be conditioned for the prompt payment of all such material furnished or labor supplied or performed in the prosecution of the work. "Labor or materials" shall include public utility services and reasonable rentals of equipment, but only for periods when the equipment rented is actually used at the site.

PA PREVAILING WAGE ACT (PWA)

The Office of the Budget cannot grant waivers for the PA Prevailing Wage Act. All Grantees must comply with the act. Grantees that fail to abide by the Prevailing Wage Act do so at their own risk. Please do not assume that PA Prevailing Wage is always consistent with your local union wages.

All projects should apply for a wage determination letter prior to the start of construction by registering the project with the PA Department of Labor and Industry to obtain the prevailing wage rates relevant to your project. This determination sheet will provide the necessary trade classifications for the project, along with their corresponding hourly wage and hourly fringe rates that are required for the certified payrolls required as part of RACP. The wage determination should be obtained within 120 days of the award of construction contracts. If necessary, the Department of Labor and Industry can issue determinations letters after construction has begun.

The prevailing wage information and forms can be found on the PA Department of Labor & Industry website.

AMERICANS WITH DISABILITIES ACT (ADA)

Typically your architect should provide a letter stating the plans and specs are in compliance with ADA regulations. Additionally, the Grantee agrees to comply with the General Prohibitions Against Discrimination, 28 C.F.R. § 35.130, and all other regulations promulgated under Title II of The Americans with Disabilities Act which are applicable to all benefits, services, programs, and activities provided by the commonwealth through contracts.

FIDELITY BONDS

The Grantee shall procure and furnish evidence to OB of fidelity bonds with coverage to be maintained under the administrative title of the position in amounts and for such positions as are reasonably

determined by OB. Fidelity Bonding is also commonly known as "Employee Dishonesty Insurance." The minimum level of coverage should equal the average monthly RACP reimbursement amount based on the total grant amount.

INSURANCE REQUIREMENTS

- Worker's Compensation Insurance - The Grantee shall provide Worker's Compensation Insurance where required, and shall accept full responsibility for the payment of premiums for Worker's Compensation Insurance and Social Security, as well as income tax withholding and any other taxes or payroll deductions required by law for its employees who are performing services related to the project.

- General Liability & Property Damage Insurance - The Grantee will provide and maintain comprehensive general liability and property damage insurance in the minimum amount of $250,000.00 per person for injury and death in a single occurrence; $1,000,000.00 per occurrence for injury or death of more than one (1) person in a single occurrence; and $500,000.00 for a single occurrence of property damage, and which shall be endorsed to protect the commonwealth.

- Flood Insurance – If the project is wholly or partially within a floodplain, proof of sufficient flood insurance coverage must be provided. In any case, a project is required to provide a copy of a floodplain map of the project area, with the project site being delineated thereon.

Identify Commonwealth as Additional Insured: The commonwealth shall be listed on the above insurance policies as an additional insured. Upon request, the Grantee shall furnish proof of insurance as required by this section to OB.

RESTRICTIONS ON GOVERNMENTAL ENTITIES SELLING RACP PROJECTS

Article 8 of the RACP Grant Agreement spells out sale price restrictions for a governmental entity that sells property that was acquired and/or improved with RACP funds. The restrictions are required to insure that the Grantees CANNOT sell the property for a net gain or even recoup the value of the grant in the sale price. A PDF download is available that contains more information on Article 8.

ATTACHMENT 2

GUIDANCE ON STEEL CERTIFICATION RELATIVE TO THE REDEVELOPMENT ASSISTANCE CAPITAL PROGRAM (RACP)

Updated June 2022

The following guidance is a clarification from the Office of the Budget (OB) regarding the requirements associated with the Pennsylvania Steel Products Procurement Act (SPPA) relative to the RACP program whose statutes are regulated under Act 1 of 1999, as amended. In the past, many a grantee has inquired about specific cases, and we were able to provide each individual project with specific directions. Additionally, we had only accepted the ST-4 form that the Department of General Services (DGS) had exclusively devised to address exceptions linked to the requirements of the SPPA in the handling of special cases or exceptions. Please note that cost consideration (or convenience) is not an acceptable justification that the ST-4 form can address. Filled out ST-4 forms premised on cost consideration will not be accepted by OB.

Effective immediately, OB will accept two more DGS ST forms (ST-2, ST-3) with some caveats, providing that the forms are properly filled out. The ST-1 form is NOT a valid option and shall NOT be accepted by OB. It is not necessary for the ST-2, ST-3, and ST-4 forms to be notarized. Please, be advised that this guidance is specifically tailored to suit the published and programmatic needs of OB as the overseer of RACP program. This is not a commonwealth-wide policy. Any attempt to impose this guidance on other state agencies is strongly discouraged.

Please, be aware that the aforementioned ST forms are acceptable only in cases where non-structural steel needs to be addressed. The DGS ST forms do not replace the steel certification forms associated with structural steel. It remains the responsibility of the project representatives to provide documented evidence that a non-structural steel product is not domestically produced in sufficient quantities.

OB shall continue to require that steel mill certifications be submitted to demonstrate compliance with the steel requirements. Please, be further advised that OB DOES NOT need to approve the ST forms prior to the start of the construction period. The ST forms need to be submitted to demonstrate that compliance, when and where necessary, has been met. The ST forms exceptions are displayed below. Please, contact us if you have any questions.

It is suggested that the certifications be collected at the time any steel for the project is purchased and delivered to ease the collection process.

Effective January 1, 2013, OB began utilizing the DGS Exempt Machinery and Equipment Steel Products listings as part of the RACP steel policy. DGS published a Statement of Policy - Steel Products Procurement in the Pennsylvania Bulletin Volume 43, Number 6 dated February 9, 2013 (See PA Bulletin #43, pages 85-86) that discussed their production of an annual list, based on their analysis of submitted ST-4 forms, which exempts certain steel products not produced domestically in sufficient quantity.

No other changes in RACP steel policy resulted from this new adjustment; consequently, the use of steel certificates for structural steel will still be required. Please note that the use of ST 2,

3, and 4, as requested for other steel products, will still be utilized unless an exemption based on the list has been formulated and forwarded to OB.

RACP Policy for Compliance with the Steel Products Procurement Act:

Two distinct approaches are presented below:

Structural Steel Products

Pursuant to the SPPA, OB will require a mill certificate containing the statement "milled, melted, and manufactured in the USA" for all structural steel products used on RACP projects. We shall deem as ineligible all contracts that are unable to demonstrate compliance via the submission of steel certifications. Therefore, the value of construction contracts associated with non-compliant steel will be removed (both materials and labor costs) from the scope of the project.

Non-Structural Steel Products

Pursuant to the SPPA, OB will require, either a mill certificate containing the statement "milled, melted, and manufactured in the USA" or the appropriate ST form or an **Exemption Request** to utilize the DGS current years' Final List of Exempt Machinery and Equipment Steel Products to demonstrate compliance associated with the non-structural steel products used on RACP projects. OB shall deem as ineligible all contracts that are unable to demonstrate compliance via the submission of steel certifications/ST **forms/Exemption Request** based on the DGS Exempt Machinery and Equipment Steel Products listing. Therefore, the value of construction contracts associated with non-compliant steel will be removed (both materials and labor costs) from the scope of the project.

Recycled products, melted from previously used steel, are acceptable, providing that adequate documentation from the supplier has been furnished. The supplier shall certify that the recycled steel product was produced in the USA.

Furthermore, the burden of proof for all non-structural steel products not produced domestically in sufficient quantities is still the project's responsibility to provide.

Please be aware that the acceptance of ST forms is contingent upon the form being fully filled-in and compliant with the submission guidelines for steel certifications for DGS projects (see attached) with the following exceptions:

A. It is not necessary for the forms to be notarized. All ST forms must contain original signatures (i.e. not electronic or stamped).
B. Any questions regarding steel certification submissions and/or compliance with the Act shall be submitted to OB (Scott Bowman - scotbowman@pa.gov).
C. The Steel certification forms do NOT need to be submitted and approved by OB before the steel product arrives on site so as not to interfere with the project construction schedule.
D. OB assumes responsibility for acceptance of the DGS ST forms in accordance

with this policy.

Completion of the ST-2, ST-3, and ST-4 forms shall follow the DGS directions attached to the form with the following exceptions:

- ST forms do NOT need to be submitted and approved by OB before the steel product arrives on site so as not to interfere with the construction schedule.
- RACP ME# assigned to the project shall be inserted in all areas requiring the DGS contract number (Line#5).
- RACP official project name shall be inserted in all areas requiring the contract title (Line #6).

Note:

Acceptance of each ST form shall be determined by OB at its sole discretion. All documents and other information to be delivered in order to demonstrate compliance with the steel requirements shall be and are, in form, content and substance, subject to the approval of OB, which approval may be withheld or delayed at OB's discretion. OB reserves the right to reject all improperly filled out or unsupported ST forms.

Below are links to PDF copies of the three acceptable ST Forms that can be obtained from the RACP website:

- ST-2 Steel Origin Certification: Non-Identifiable, Non-Structural Steel
- ST-3 75% U.S. Manufacture Certification
- ST-4 Not Domestically Manufactured: Prime Contractor (only to be used when the items requested to be exempted are not found on the appropriate year's List of Exempt Machinery and Equipment Steel Products [see section below entitled "Year of DGS Exemption Listing to Use"])

To implement the RACP policy on Non-structural Steel **Exemption Request** utilizing the DGS's current years' Final List of Exempt Machinery and Equipment Steel Products, referred to as the "Exemption List", please follow the below requirements:

1. The Project must be under "active" construction (workers on site) on or AFTER 1/01/2013 (RACP effective date) to use the "Exemption List".
2. "Active" construction does not include performance of just "punch list" items.
3. Effective date is based on the "active" construction date and not the date the machinery and equipment were purchased.
4. There is no retroactive application of utilization of the "Exemption List".
5. No ST-4 form is required for a RACP Exemption Request based on the "Exemption List".
6. RACP Exemption Request (to utilize the "Exemption List") must come from a contractor involved in the construction of the project and be:
   - On Construction Company Letterhead.
   - Dated and Signed by appropriate company official (does not need to be notarized).
   - Should be addressed to Office of the Budget
   - Should contain RACP project name and/or ME #
   - Lists any/all machinery and equipment that the Company is requesting to have exempted from ST-4 documentation.

- All items listed on RACP Exemption Request letter must clearly match-up to an item on the appropriate year's "Exemption List" and the Exemption List year should be notated for each item.
- There can/may be multiple construction company RACP Exemption Request letters utilized for various machinery and equipment, as applicable, per project.
- Exemption Request can be submitted directly by the project to OB or through the State Assigned Consultant for their project.
- Any questions regarding the exemption request submission and/or compliance with the SPPA shall also be submitted to OB, to the attention of Scott Bowman, Scotbowman@pa.gov

Year of DGS Exemption Listing to Use:

A project should be using the exemption listing for when they are in active construction. For example, if construction was active (and complete) in 2019 they would use the 2019 listing. If a project overlaps a calendar year, they should use the latest listing in which construction is active. For example, if construction is active in 2019 and 2020, they would use the 2020 listing.

If a project is phased, they should use the listing for the year they are in active construction for each phase. For example, if the first phase starts and ends in 2020 whereas the second phase starts and ends in 2021, the first phase would use the 2020 listing while the second phase would use the 2021 listing. If a phase overlaps a calendar year, follow the 1st paragraph above.

Among other items, the DGS web page for Steel Products Procurement Act information includes links for a copy of the Act; the current year's Final List of Exempt Machinery and Equipment Steel Products; the PA Bulletin's Steel Products Procurement Act Statement of Policy; and Frequently Asked Questions. Certain prior years DGS Exemption Lists are downloadable from the RACP website.

Please be aware that all other steel items not specifically exempted or that may require any type of interpretation would be discretionary to OB's policy. Be reminded that this exemption listing is not effective for structural steel.

Note:

Acceptance of each Exemption Request shall be determined by OB at its sole discretion. All documents and other information to demonstrate compliance with the steel requirements shall be in form, content, and substance, subject to the approval of OB, which approval may be withheld or delayed at OB's discretion. OB reserves the right to reject all improperly filled out or unsupported Exemption Request.

ATTACHMENT 3

WEEKLY PAYROLL CERTIFICATION FOR PUBLIC WORKS PROJECTS

☐ Contractor or ☐ Subcontractor (Please check one) **ALL INFORMATION MUST BE COMPLETED**

CONTRACTOR ADDRESS	SUBCONTRACTOR ADDRESS	DEPARTMENT OF LABOR & INDUSTRY COMMONWEALTH OF PENNSYLVANIA BUREAU OF LABOR LAW COMPLIANCE PREVAILING WAGE DIVISION 7TH & FORSTER STREETS HARRISBURG, PA 17120 1-800-932-0665

PAYROLL NUMBER	WEEK ENDING DATE	PROJECT AND LOCATION PROJECT SERIAL # PROJECT #

EMPLOYEE NAME	APPR. RATE (%)	WORK CLASSIFICATION	DAY AND DATE HOURS WORKED EACH DAY	S-TIME 0-TIME	BASE HOURLY RATE	TOTAL FRINGE BENEFITS (C=Cash) (FB=Contributions)*	TOTAL DEDUCTIONS	GROSS PAY FOR PREVAILING RATE JOB(S)	CHECK #
						C: FB:			
						C: FB:			
						C: FB:			
						C: FB:			
						C: FB:			

*SEE REVERSE SIDE

PAGE NUMBER _____ OF _____

THE NOTARIZATION MUST BE COMPLETED ON FIRST AND LAST SUBMISSIONS ONLY. ALL OTHER INFORMATION MUST BE COMPLETED WEEKLY.

*FRINGE BENEFITS EXPLANATION (FB): Bona fide benefits contribution, except those required by Federal or State Law (unemployment tax, workers' compensation, income taxes, etc.)

Please specify the type of benefits provided and contributions per hour:

1) Medical or hospital care _____
2) Pension or retirement _____
3) Life insurance _____
4) Disability _____
5) Vacation, holiday _____
6) Other (please specify) _____

CERTIFIED STATEMENT OF COMPLIANCE

1. The undersigned, having executed a contract with _____
(AWARDING AGENCY, CONTRACTOR OR SUBCONTRACTOR)

_____ for the construction of the above-identified project, acknowledges that:

(a) The prevailing wage requirements and the predetermined rates are included in the aforesaid contract.

(b) Correction of any infractions of the aforesaid conditions is the contractor's or subcontractor's responsibility.

(c) It is the contractor's responsibility to include the Prevailing Wage requirements and the predetermined rates in any subcontract or lower tier subcontract for this project.

2. The undersigned certifies that:
   (a) Neither he nor his firm, nor any firm, corporation or partnership in which he or his firm has an interest is debarred by the Secretary of Labor and Industry pursuant to Section 11(e) of the PA Prevailing Wage Act, Act of August 15, 1961, P.L. 987 as amended, 43 P.S.§ 165-11(e).

   (b) No part of this contract has been or will be subcontracted to any subcontractor if such subcontractor or any firm, corporation or partnership in which such subcontractor has an interest is debarred pursuant to the aforementioned statute.

3. The undersigned certifies that:
   (a) the legal name and the business address of the contractor or subcontractor are: _____
   _____

   (b) The undersigned is: ☐ a single proprietorship ☐ a corporation organized in the state of _____
   ☐ a partnership ☐ other organization (describe) _____

   (c) The name, title and address of the owner, partners or officers of the contractor/subcontractor are:

NAME	TITLE	ADDRESS

The willful falsification of any of the above statements may subject the contractor to civil or criminal prosecution, provided in the PA Prevailing Wage Act of August 15, 1961, P.L. 987, as amended, August 9, 1963, 43 P.S. § 165.1 through 165.17.

_____
(DATE)

_____
(SIGNATURE)

_____
(TITLE)

_____
SEAL

Taken, sworn and subscribed before me this _____ Day

of _____ A.D., _____

ATTACHMENT 4

Commonwealth of Pennsylvania
NONDISCRIMINATION/SEXUAL HARASSMENT CLAUSE

During the term of the Contract, the Applicant (known herein as "Grantee") agrees as follows:

1. In the hiring of any employee(s) for the manufacture of supplies, performance of work, or any other activity required under the grant agreement or any subgrant agreement, contract, or subcontract, the Grantee, a subgrantee, a contractor, a subcontractor, or any person acting on behalf of the Grantee shall not discriminate by reason of race, gender, creed, color, sexual orientation, gender identity or expression, or in violation of the *Pennsylvania Human Relations Act* (PHRA) and applicable federal laws, against any citizen of this Commonwealth who is qualified and available to perform the work to which the employment relates.

2. The Grantee, any subgrantee, contractor or any subcontractor or any person on their behalf shall not in any manner discriminate by reason of race, gender, creed, color, sexual orientation, gender identity or expression, or in violation of the PHRA and applicable federal laws, against or intimidate any of its employees.

3. Neither the Grantee nor any subgrantee nor any contractor nor any subcontractor nor any person on their behalf shall in any manner discriminate by reason of race, gender, creed, color, sexual orientation, gender identity or expression, or in violation of the PHRA and applicable federal laws, in the provision of services under the grant agreement, subgrant agreement, contract or subcontract.

4. Neither the Grantee nor any subgrantee nor any contractor nor any subcontractor nor any person on their behalf shall in any manner discriminate against employees by reason of participation in or decision to refrain from participating in labor activities protected under the *Public Employee Relations Act*, *Pennsylvania Labor Relations Act* or *National Labor Relations Act*, as applicable and to the extent determined by entities charged with such Acts' enforcement, and shall comply with any provision of law establishing organizations as employees' exclusive representatives.

5. The Grantee, any subgrantee, contractor or any subcontractor shall establish and maintain a written nondiscrimination and sexual harassment policy and shall inform their employees in writing of the policy. The policy must contain a provision that sexual harassment will not be tolerated and employees who practice it will be disciplined. Posting this Nondiscrimination/Sexual Harassment Clause conspicuously in easily-accessible and well-lighted places customarily frequented by employees and at or near where the grant services are performed shall satisfy this requirement for employees with an established work site.

6. The Grantee, any subgrantee, contractor or any subcontractor shall not discriminate by reason of race, gender, creed, color, sexual orientation, gender identity or expression, or in violation of the PHRA and applicable federal laws, against any subgrantee, contractor, subcontractor or supplier who is qualified to perform the work to which the grant relates.

7. The Grantee and each subgrantee, contractor and subcontractor represents that it is presently in compliance with and will maintain compliance with all applicable federal, state, and local laws and regulations relating to nondiscrimination and sexual harassment. The Grantee and each subgrantee, contractor and subcontractor further represents that it has filed a Standard Form 100 Employer Information Report ("EEO-1") with the U.S. Equal Employment Opportunity Commission ("EEOC") and shall file an annual EEO-1 report with the EEOC as required for employers' subject to *Title VII* of the *Civil Rights Act of 1964*, as amended, that have 100 or more employees and employers that have federal government contracts or first-tier subcontracts and have 50 or more employees. The Grantee, any subgrantee, any contractor or any subcontractor shall, upon request and within the time periods

requested by the Commonwealth, furnish all necessary employment documents and records, including EEO-1 reports, and permit access to their books, records, and accounts by the granting agency and the Bureau of Diversity, Inclusion and Small Business Opportunities for the purpose of ascertaining compliance with the provisions of this Nondiscrimination/Sexual Harassment Clause.

8. The Grantee, any subgrantee, contractor or any subcontractor shall include the provisions of this Nondiscrimination/Sexual Harassment Clause in every subgrant agreement, contract or subcontract so that those provisions applicable to subgrantees, contractors or subcontractors will be binding upon each subgrantee, contractor or subcontractor.

9. The Grantee's and each subgrantee's, contractor's and subcontractor's obligations pursuant to these provisions are ongoing from and after the effective date of the grant agreement through the termination date thereof. Accordingly, the Grantee and each subgrantee, contractor and subcontractor shall have an obligation to inform the Commonwealth if, at any time during the term of the grant agreement, it becomes aware of any actions or occurrences that would result in violation of these provisions.

10. The Commonwealth may cancel or terminate the grant agreement and all money due or to become due under the grant agreement may be forfeited for a violation of the terms and conditions of this Nondiscrimination/Sexual Harassment Clause. In addition, the granting agency may proceed with debarment or suspension and may place the Grantee, subgrantee, contractor, or subcontractor in the Contractor Responsibility File.

_____ _____

Signature Date

_____ _____

Printed Name Title

_____

Company Name

SECTION 011000

SUMMARY

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Project information.
   2. Work covered by Contract Documents.
   3. Work under Owner's separate contracts.
   4. Contractor's use of site and premises.
   5. Coordination with occupants.
   6. Work restrictions.
   7. Specification and Drawing conventions.

1.2 PROJECT INFORMATION

A. Project Identification: **Lawncrest Recreation Center Renovation and Site Improvements Project**; **Project #CVLWC-16381E;**

   1. Project Location: **6000 Rising Sun Avenue, Philadelphia, PA 19111**

B. Owner Representation:
   1. Owner (Project User/Contracting Entity): Community Ventures
      a. Community Ventures Project Manager: Patrick Isaac, pisaac@community-ventures.org
      b. Community Ventures Director of Development: Troy Hannigan thannigan@community-ventures.org
   2. Project Partner: Rebuild
      a. Rebuild Project Manager: Kara Medow kara.medow@phila.gov
      b. Rebuild Director of Construction: Luigi Sebastiani Luigi.sebastiani@phila.gov
   3. Property Owner: City of Philadelphia, Philadelphia Parks and Recreation
      a. Commissioner: Orlando Rendon
      b. Deputy Commissioner for Capital Infrastructure and Natural Lands Management: Aparna Palantino

C. Civil Engineering: Meliora Design, 259 Morgan Street, Phoenixville, PA 19460
      a. Project Manager: Altje Macy, PE. 610.933.0123. altje@melioradesign.com

D. Architect: SITIO architecture + urbanism, 2104 Market Street, Suite 300, Philadelphia, PA 19103
   1. Architect's Representative: Andrew Ferrarelli, RA. 215.268.3820.

aferrarelli@sitioau.com

E. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:
   1. Hunt Engineering Company (HEC)
      a. Structural Engineer. Scott Small, PE. 610.644.4600. ssmall@huntengineering.com
   2. J+M Engineering
      a. Mechanical, Electrical, Plumbing & Fire Protection, Richard Hwang, PE. 215.454.2662 . richard@jandmengineers.com
   3. SALT Design Studio (SALT)
      a. Landscape Architect: Katrina Rogus, RLA. 215.621.7600. katrina@saltdesigns.com
   4. Re:Vision Architecture
      a. Sustainability Consultant: Angela F. Iraldi LEED AP BD+C 445.456.2013 iraldi@revisionarch.com
   5. GREYHAWK
      a. Commissioning Agent: Robert J. Dinan, P.E., CCM, LEED-AP 856.778.3389 rdinan@greyhawk.com

F. Web-Based Project Software: Project software will be used for purposes of managing communication and documents during the construction stage.
   1. See section 013100 “Project Management and Coordination.” For requirements for using web-based Project software.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Lawncrest Recreation Center Buildings Renovation and Site Improvements project entails the renovation of the 21,000 SF main rec building which consists of a basement and main level and a new 5,000 sq. ft. Pre-engineered Metal Building addition, the partial renovation of the 3,800 SF club house consisting of one main level, and exterior site improvements.

   The improvements to the Lawncrest Recreation Center’s main building must achieve at least LEED Silver Certification

B. The Work of Project is defined by the Contract Documents and consists of the following:
   1. Exterior Envelope:
      a. Masonry, repairs and repointing
      b. Replacement of existing windows with Storefront & Curtainwall systems, including new security screens
      c. New exterior doors
      d. New Roof
   2. Interior:
      a. Substantial demolition and renovation of the first-floor classrooms including existing systems

b. Refresh of the existing gym including new flooring
c. Refresh of the existing auditorium
d. Hazmat Remediation
e. Indoor/outdoor bathrooms
f. Finishes
g. Heating and air conditioning systems
h. Power and lighting throughout.
i. Security camera system (interior & exterior)
j. IT upgrades
k. Enhanced Commissioning: contractor will be required to coordinate and cooperate with the Commissioning Agent

3. New Addition to the building
   a. Large Gym space half court-basketball and full court volleyball
4. Site improvements:
   a. Playground and play equipment
   b. Basketball courts
   c. Volleyball and tennis multipurpose courts
   d. Soccer mini-pitch
   e. Stormwater Management System
   f. Half-mile asphalt walking loop.
   g. Site lighting
   h. Regrading at Grove
   i. New landscaping and trees.

C. Type of Contract:
   1. Single-prime

1.4 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.
B. Owner/Project User will procure and pay for the cost of building permits.
C. Owner/Project User will procure and pay for the services of a Special Inspector and other third-party testing and inspections as necessary.
D. The City's Percent for Art Ordinance are not required on this project.
E. Owner/Project User will procure furniture through a separate contract. Contractor to coordinate with furniture dealer for installation.

1.5 CONTRACTOR'S USE OF SITE AND PREMISES

A. The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

B. Only materials and equipment which are to be used directly in the Work, shall be brought to and stored on the Project site by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Project site. Protection of construction materials and equipment stored at the Project site from weather, theft, damage and all other adversity is solely the responsibility of the Contractor. Contractor shall closely coordinate with Project User, for locations of on-site storage of materials, equipment and construction facilities.

C. Contractor shall ensure that the Work, at all times, is performed in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the Work shall be free from all debris, building materials and equipment likely to cause hazardous conditions. Without limitation of any other provision of the Contract Documents, Contractor shall use its best efforts to minimize any interference with the occupancy or beneficial use of (1) any areas and buildings adjacent to the site of the Work or (2) the Building in the event of partial occupancy.

D. Limits on Use of Site: Limit use of Project site to Work in areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

   1. Limits on Use of Site: Confine construction operations to areas indicated on drawings.
   2. Driveways, Walkways, and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.

E. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

F. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

G. Condition of Existing Utilities: Maintain service to site throughout construction period. Repair damage caused by construction operations.

1.6 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.
   1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to normal business working hours will be determined, Monday through Friday, unless otherwise indicated. Contractor should notify Project User for approval of work outside of normal business working hours.

C. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances within the existing building and on Project site is not permitted.

D. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

E. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
   1. Maintain list of approved screened personnel with Owner's representative

1.7 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

   1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
   2. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
   3. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
   4. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
   5. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 011000

SECTION 011110

UNIVERSAL HAZARDOUS WASTE

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. This specification outlines the removal and disposal of miscellaneous universal hazardous waste (UHW) as defined under the federal universal hazardous waste regulations found in Title 40 of the Code of Federal Regulations (CFR), part 273 (40 CFR 273). The regulation applies to the four types of universal waste, which include: batteries, pesticides, mercury containing equipment, and mercury containing fluorescent lamps. Miscellaneous hazardous wastes that require special handling for disposal include PCB-containing oils. Miscellaneous non-hazardous wastes as defined herein include cleaning chemicals, petroleum products, refrigerants, and paints.

B. Listed materials and quantities are approximate. The table below is not considered "all-inclusive." By submitting a base bid, the Contractor signifies they have visited the site, examined conditions that may affect the work, verified quantities of UHW, and is informed as to the extent and character of the project. Any discrepancies from estimated quantities shall not be cause for a contract cost adjustment.

C. The Universal Hazardous Waste scope summarization includes, but is not limited to:
    1. Universal Hazardous Waste as listed in Appendix 1 – Phase I Environmental Site Assessment And Hazardous Materials Inventory

1.2 CODES AND REGULATIONS

A. All work and disposal shall be performed in compliance with all applicable federal, state, and local regulations including, but not limited to:

    1. 40 CFR 273, Standards for Universal Waste Management;
    2. 25 PA Code 266b, Universal Waste Management;
    3. 40 CFR 750, Toxic Substance control Act;
    4. 40 CFR 761, Polychlorinated biphenyls;

5. 40 CFR Part 82, Subpart F Section 608, Clean Air Act;
6. 40 CFR 300-399, EPA Comprehensive Environmental Response Compensation & Liability Act;
7. 40 CFR 260-299, Resource Conservation and Recovery Act (RCRA);
8. 49 CFR 171-180, DOT Hazardous Material Regulations;
9. this Specification.

B. The Contractor has the responsibility of informing themselves fully of the requirements of these regulations and the agencies enforcing them and shall satisfy completely this Specification and all referenced regulations. All other applicable federal, state and local regulations are incorporated by reference.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

3.1 REMOVAL OF UHW

A. The Contractor shall remove all fluorescent light tubes and compact fluorescent light (CFL) bulbs suspected of containing mercury. Fluorescent light tubes and CFL bulbs shall be treated as universal waste in accordance with 40 CFR 763 and PA Code 266b.

B. All fluorescent light ballasts associated with the fluorescent lighting systems are presumed to contain polychlorinated biphenyl (PCB) and as such should be properly removed and disposed of as hazardous waste in accordance 40 CFR Part 763 and 40 CFR Part 761. Ballast units that are clearly labeled as “Non-PCB” do not require disposal as hazardous waste.

C. Mercury-containing instrumentation such as mercury switches and/or mercury thermostats, if any, shall be properly removed and disposed of as universal waste in accordance with 40 CFR Part 763.

D. The Contractor shall remove and recycle all 6 Volt lead-acid batteries associated with emergency lighting and/or exit signs found throughout the building.

E. The Contractor shall remove and recycle lead acid batteries associated with the Emergency Boiler Shut off.

F. Fan coil units and other heating, ventilating and air conditioning (HVAC) and refrigeration equipment, if any, may contain chlorofluorocarbons (CFC) such as Freon-12, a controlled substance, that should be captured and properly disposed of prior to renovation of the

facility. The removal and disposal of any CFC's, as well as any HVAC and refrigeration equipment from the subject properties will be performed, in accordance with 40 CFR Part 82, Subpart F.

G. After removal of CFC's, equipment may be disposed as solid waste.

H. On-site breakage of fluorescent light tubes or CFL bulbs shall not be permitted with the exception of the use of an approved, fully contained, fluorescent lamp crushing system.

I. Mercury-containing equipment shall be removed intact. On-site breakage of mercury-containing equipment shall not be permitted.

J. PCB-containing light ballasts and/or capacitors shall be removed intact. On-site breakage of light ballasts and/or capacitors shall not be permitted

3.2 DISPOSAL OF UHW

A. Procedure for hauling and disposal of universal hazardous waste shall comply with 40 CFR 260-265 & 40 CFR 273 (as applicable), as well as all applicable state, regional and local standards. All universal hazardous waste, debris, containers and contaminated clothing and equipment shall be packaged, sealed, labeled and disposed of in accordance with applicable regulations. This waste material shall be transported in sealed, properly labeled, DOT approved containers and disposed of only at an USEPA or state approved sanitary landfill or universal waste recycling center. The procedure for hauling, disposal and/or recycling of universal hazardous waste shall comply with all federal, state and local regulations.

3.3 PROJECT CLOSEOUT

A. All documentation of transportation and disposal transactions such as landfill receipts, trip tickets, and waste manifests shall be completed and include in the final report for the Owner.

END OF SECTION 011110

SECTION 011120

ASBESTOS ABATEMENT

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. This section outlines the required tasks and procedures involved in the removal of asbestos containing material (ACM) at the Lawncrest Recreation Center. ACM removal, associated equipment demolition, if appropriate, and decontamination cleaning procedures shall be accomplished under asbestos-abatement conditions. The Asbestos Abatement Contractor (AAC) shall cooperate fully with the other Contractors in expediting the work of all trades, and avoid damage to the work of the other Contractors.

1. The AAC may be permitted to combine or separate adjacent, Major and/or Minor work areas, as feasible, provided the Project Designer and/or API is amenable to the plans, and presents no written objections.

B. The abatement work scope summarization includes, but is not limited to:

1. Asbestos Containing Materials as listed in Appendix 1 – Phase I Environmental Site Assessment And Hazardous Materials Inventory

C. Assessment The AAC shall have a PA licensed Supervisor on site at all times during asbestos abatement activities. The AAC shall not perform any abatement activities, including prep, bag-out, and teardown unless a City of Philadelphia certified API is on site.

D. AAC access shall be confined to the work areas indicated in this Contract. The Contract may be proceeding concurrently with others in the building.

E. The AAC shall be served with a Stop Work Order by the Project Designer and/or API when they are in non-compliance with this Contract Specification and/or other pertinent regulations.

F. The project shall remain halted until all matters identified in the Stop Work Order are corrected. The Project Designer and/or API shall notify the AAC to resume work once it has been determined that all remedies have been applied for the AAC to be in compliance with this Contract Specification and/or pertinent regulations.

G. If it is determined that airborne asbestos contamination has occurred "outside the work area" adjacent to an active asbestos abatement work area, the AAC shall contain and clean the affected premises under the direction of the API at no additional cost to the Owner. Causes for "outside the work area" airborne asbestos contamination include, but are not limited to:

1. The loss of a negative pressure differential inside any active asbestos abatement work area;

2. A breech of containment into any active asbestos abatement work area;
3. Improper maintenance of AFDs/HEPA vacuums;
4. Improper worker decontamination procedures;
5. Negligence of the AAC;
6. Any other poor work practices of the AAC.

H. The Owner reserves the right to require asbestos abatement and associated work be performed at times when the building is unoccupied.

I. The AAC shall provide the number of AFDs to obtain a negative pressure differential of four (4) air changes per hour for all pipe chase/wall cavity asbestos abatement work areas.

1. Number of AFDs projected to obtain a negative pressure differential sufficient to provide a minimum of four (4) air changes of the work area per hour:

$$\frac{L \times W \times H \times 4 \text{ air changer per hour}}{\text{CFM Rating of AFD} \times 60}$$

J. As required by the Asbestos Control Regulation, the AAC shall provide a minimum 18" square transparent viewing window consisting of shatterproof material greater than or equal to 1/8" in thickness located at a height appropriate for accessible viewing and in such a manner as to maximize visibility of the abatement work area.

K. AFDs and HEPA vacuums require different maintenance schedules and attention depending on the model. Check the user's manual to determine and comply with the maintenance, filter replacement, and cleaning requirements of each AFD and HEPA vacuum being used.

1. At no time shall an AFD be dismantled and the inner HEPA filter replaced while onsite. Removal and replacement of HEPA filters shall be performed offsite.
2. At no time shall a HEPA vacuum be opened for cleaning/emptying outside an active asbestos abatement work area.
3. Cleaning/emptying a HEPA vacuum shall be performed INSIDE an active asbestos abatement work area with a minimum negative pressure differential of -0.02 inches of water column.
    a. Cleaning/emptying of HEPA vacuums shall be performed directly beside an operating AFD exhausting to the exterior.
    b. HEPA vacuums shall be cleaned/emptied only during gross removal of asbestos and/or equipment demolition. No HEPA vacuums shall be cleaned/emptied, or opened for any other reason, during final cleaning and/or encapsulation.
4. A daily maintenance log should be kept of the ongoing equipment repairs and maintenance activities such as cleaning the air filter devices and HEPA Vacuums.

L. De-energize the asbestos abatement work areas and all conduit running through the work areas, if possible.

1. Appropriate lock and tag out devices shall be installed at the breakers.
2. The AAC shall supply sufficient temporary lighting to illuminate the work areas during wall demolition and asbestos abatement. All active work areas shall be lighted to not less than the minimum illumination intensities listed in OSHA Regulation 29 CFR 1926.56(a), Table D-3 for Indoors: warehouses, corridors, hallways, and exit ways (e.g. - 5-foot candles).

M. Only approved noncombustible or flame-resistant materials shall be used for work area preparation. Polyethylene sheeting shall be certified to conform to NFPA 701.

N. The dropping, lowering, transporting or otherwise moving any open or packaged waste through any shaft during this project is strictly prohibited.

O. Stated quantities are approximate. By submitting a bid, the AAC S certifies they have visited the site, examined conditions that may affect the work, verified quantities of materials, and is informed as to the extent and character of the project.

P. If the AAC discovers or suspects ACM not previously identified for abatement the AAC will notify the Owner who will schedule testing of the materials.

1.2 CODES AND REGULATIONS

A. All work and disposal shall be performed in compliance with all applicable Federal, State, and local regulations including, but not limited to:

1. 29 CFR 1910.1000 Asbestos in General Industry
2. 29 CFR 1910.134 Respiratory Protection
3. 29 CFR 1926.1101 (OSHA);
4. 29 CFR 1926.501 (OSHA);
5. 40 CFR 257 Criteria for Classification of Solid Waste Disposal Facilities and Practices
6. 40 CFR Part 61 (NESHAP);
7. 40 CFR Part 763 (AHERA);
8. 40 CFR 761 (PCB Regulations);
9. Resource Conservation and Recovery Act (RCRA);
10. 40 CFR 300-399, EPA Comprehensive Environmental Response Compensation & Liability Act;
11. 40 CFR 745, EPA Toxic Substances Control Act; LBP Poisoning Prevention
12. EPA Renovation, Repair, and Painting (RRP) rule under the Toxic Substances Control Act;
13. 49 CFR 171-180, DOT Hazardous Material Regulations;
14. 42 CFR Part 84 & 30 CFR Part 11 (NIOSH/DHHS respirator standards);

15. The Asbestos Control Regulation (Philadelphia Department of Public Health);
16. Act 194 & Act 161 (Pennsylvania Department of Labor and Industry);
17. Section F-315.8 (R) of the Philadelphia Fire Prevention Code; and
18. this Specification.

B. The AAC has the responsibility of informing themselves fully of the requirements of these agencies and shall satisfy completely this Specification and all referenced regulations. All other applicable federal state and local regulations are incorporated by reference.

C. The AAC must be a City of Philadelphia Licensed Asbestos Abatement Contractor as well as a Pennsylvania Licensed Asbestos Contractor and employ asbestos workers certified to work in the state of Pennsylvania.

1.3 NOTIFICATIONS

A. The AAC shall notify all applicable agencies including the EPA, DEP, and Philadelphia Air Management Services, using the appropriate form(s).

B. [If Alternate Method Requests are proposed] A request for alternative method shall be submitted to and approved by Air Management Services of the City of Philadelphia prior to the start of the project.

C. The installation and usage of bag-out chambers require a request for alternative methods submitted to and approved by Air Management Services of the City of Philadelphia

D. The AAC shall provide a copy of the asbestos notification to the Owner prior to starting any abatement work.

1.4 SUBMITTALS

A. The AAC shall provide a schedule for all work areas listed. The schedule shall be approved by the Owner and API prior to the commencement of work. The schedule shall include the number of active abatement work areas at any given time, proposed crew sizes, and waiting periods following the delivery of the work area to the API for final visual inspections and clearance testing.

B. Work plan delineating phasing and preparation of the work site, including intended locations of water and electrical sources, and the intended storage locations for furniture and ceiling mounted light fixtures and other ceiling mounted items. Description of decontamination sequence, removal methods to be used and waste handling.

C. Supervisor credentials and delineation of responsibility for work site supervision, including name, telephone number and pager number for both the project manager and the on-site supervisor.

D. Worker qualifications, current licenses, fit tests, and medicals. These may be submitted as the crew is selected or changed; however, no workers will be permitted to remain on site without submission and approval of qualifications.

E. Safety Data Sheets (SDS) for the materials to be used on the job:

1. Asbestos abatement encapsulant (only encapsulants approved by the Department of Public Health may be used).

2. Heavy-duty polyethylene tape used for sealing fixed objects, the construction of critical barriers, decontamination chambers and floor/wall containments.

F. Name of Waste Hauler(s) and disposal site with EPA/DEP identification numbers.

G. Name of the firm or competent person performing the Contractor's OSHA required personnel monitoring and the laboratories PAT Certification and Philadelphia Laboratory Certification.

H. A detailed written description of emergency procedures to be followed in the event of injury or fire. This submittal must include execution procedures, source of emergency assistance (including telephone numbers), and access procedures to be used by emergency personnel.

I. A COVID-19 response plan shall be submitted at the request of the Owner and appropriate City of Philadelphia Department.

1.5 OWNER'S RESPONSIBILITIES

A. The Owner shall employ the services of an Asbestos Project Inspector (API) who is licensed by the City of Philadelphia to perform asbestos project inspection as defined by the Asbestos Control Regulation (ACR).

B. The Owner shall ensure the work areas will be unoccupied prior to abatement activity commencing.

C. The Owner shall make water and electricity available at the site at no cost to the Contractor. The Owner shall notify the AAC of scheduled system shutdowns to ensure no interruptions to the project's engineering controls.

D. The Owner shall be responsible to remove all computers, monitors, printers, all other computer related components, personal effects, books, or other items deemed too valuable or sensitive to leave in the scheduled work areas to be handled by the Contractor. A list of such items includes:

1. Personal items throughout any previously mentioned work areas.

E. All computers and computer accessories in any previously mentioned work areas.

F. Stored maintenance and building supply items, paper products, paints, cleaners, replacement ceiling tiles and florescent light bulbs, excess furniture, etc. located in any of the work areas scheduled for abatement, demolition and/or cleaning.

G. Any other items deemed appropriate by the Owner.

H. The Owner shall store items in areas not scheduled for asbestos abatement work.

I. Any movable items remaining in the scheduled work areas at the time of the mobilization of the AAC shall be removed by the AAC.

1.6 ASBESTOS ABATEMENT CONTRACTOR'S (AAC's) RESPONSIBILITIES

A. The AAC is responsible for visiting the site and verifying quantities of asbestos containing materials, locations of utilities, and waste out routes prior to submitting a bid.

B. Project phasing, start and completion dates are subject to change at the discretion of the Owner.

C. The Contractor shall provide all labor, tools, materials and scaffold necessary to complete the project safely, in a timely fashion, and in accordance with the specification and all applicable regulations.

1. All tools, ladders, equipment, etc. shall arrive at the project site in good condition and free of any visual residual asbestos contamination.

D. Any movable items remaining in the scheduled work areas at the time of the mobilization of the Contractor shall be removed by the Contractor.

E. The Contractor shall protect all non-movable furniture, cabinetry and equipment from damage throughout the duration of this project.

F. The Contractor shall supply, at their own expense, all construction materials, supplies, and all electrical, water, and waste connections, tie-ins, or extensions. Temporary service lines shall be installed to prevent tripping, slipping or falling. The Contractor must utilize a licensed electrician to install separate temporary electric panels, receptacles, and lights, all with ground fault interruption and current-overload protection. All temporary electrical set-ups shall be in accordance with OSHA regulation and NEMA standards.

G. The Contractor shall maintain current copies of certifications for workers on-site and shall keep copies of all pertinent specifications and regulations on-site. The API retains the right to prohibit work by employees without current certifications.

H. The Contractor shall maintain a detailed sign-in/sign-out log, which must be filled out by every person entering the work area. All entries shall be complete and legible.

I. The Contractor shall be responsible for security of the work site, fire/smoke detection, and maintenance of existing utility systems as it relates to the performance of this project.

J. The Contractor shall provide fire protection in accordance with all State and Local codes. This includes, but is not limited to:

1. Providing a written fire prevention and emergency action plan.

2. Providing multi-purpose ABC rated fire extinguishers, ensuring that on-site personnel are aware of the location and proper use of all fire extinguishers and other safety equipment.
3. Performing a fire watch of the overall work area.
4. Designating a safety coordinator to implement the above actions. The Contractors safety coordinator shall be responsible for:
    a. Fire/life safety entries shall be entered into the Contractors log daily and shall be submitted with the Contractor's final report.
    b. Daily entries shall include names, dates, duration, problems & corrective actions taken by the fire watch - must be signed by the safety coordinator.

K. Assure protection of AFD exhaust ducts from damage during asbestos abatement activities.

L. The Contractor Supervisor and API shall perform a visual inspection of the entire floor immediately below all active abatement work areas at the end of each 8-hour shift to verify that no water leaks, fallen material, or any other type of damage has occurred.

1. If water leaks, fallen material, or any other type of damage has occurred:
    a. All asbestos abatement work shall be halted.
    b. The API shall immediately notify the Asbestos Project Manager, Construction Manager and Owner for direction and input.
    c. The source of the leak or damage shall be determined.
    d. The containment breech issue shall be rectified before any asbestos abatement work will be permitted to continue.

M. As required by the Asbestos Control Regulation, the Contractor shall provide a minimum 18" square transparent viewing window consisting of shatterproof material greater than or equal to 1/8" in thickness located at a height appropriate for accessible viewing and in such a manner as to maximize visibility of the abatement work area.

N. During the performance of final cleaning of all surfaces inside the active abatement work area, all horizontal surfaces "outside the work area" shall also be cleaned. This includes the dirty, shower and clean rooms of decontamination chambers attached to the asbestos abatement work area being tested and all immediate surroundings of representative makeup air entering each independent asbestos abatement work area being tested.

1.7 ASBESTOS PROJECT INSPECTOR (API) RESPONSIBILITIES

A. The API shall act as the Owner's representative on the work site to assure and document compliance with this Specification and applicable regulations and to perform all project sampling and analysis required by the Philadelphia ACR.

B. The API shall be responsible to see that required information and notifications are posted and are accessible for review by all concerned parties.

C. The API shall keep a daily log documenting the progress and performance of the Contractor over the course of the project.

D. The API shall perform continuous inspections to monitor the performance of the Contractor and to assure and document compliance with this Specification and applicable regulations. Inspections shall be performed during all phases of the project including verifying compliance with standard operating procedures, checking engineering controls, personal protection and decontamination systems, and handling and disposition of the resulting asbestos waste materials.

E. The API shall be responsible for performing all project sampling and analysis required by the Philadelphia ACR.

1. The API shall also perform representative personal air sampling on themselves during the project as defined within OSHA 1926.1101 and 1910.1001. Personal air samples shall be collected to establish a time weighted average (TWA) and a short-term excursion limit (STEL). Such air samples shall be collected within the breathing zone and used to:

    a. Initially determine the level of respiratory protection;

    b. Subsequently to assure that such protections remain adequate throughout the project.

F. The API shall routinely perform smoke testing at all critical barriers throughout the performance of asbestos abatement activities until the receipt of acceptable clearance air sample results to verify the integrity of critical barriers and presence of an adequate negative pressure differential.

G. The API shall notify the Owner and Air Management Services of the City of Philadelphia if the Contractor is found to be in non-compliance with the specifications or those Municipal, State or Federal regulations applicable to this project.

1. The API shall serve written notice to the Contractor for all non-compliance actions.

H. The Contractor Supervisor and API shall perform a visual inspection of the entire floor immediately below all active abatement work areas at the end of each 8-hour shift to verify that no water leaks, fallen material, or any other type of damage has occurred.

1. If water leaks, fallen material, or any other type of damage has occurred:

    a. All asbestos abatement work shall be halted.

    b. The API shall immediately notify the Contractor and Owner for direction and input.

    c. The source of the leak or damage shall be determined.

    d. The containment breech issue shall be rectified before any asbestos abatement work will be permitted to continue.

I. The API shall conduct a detailed final inspection to ensure that no visible dust or debris remains on any surfaces. This includes all surfaces inside the abatement work area and all horizontal

surfaces in the immediate surroundings of representative makeup air entering each independent asbestos abatement work area tested.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 AIR MONITORING BY THE OWNER

A. The Owner shall employ the services of an API who is in licensed by the City of Philadelphia to perform air monitoring and quality assurance of the Contractors work practices.

B. The API shall collect pre-test and project air samples in accordance with the Philadelphia Asbestos Control Regulations. Project air monitoring during abatement activities shall include samples inside and outside the work area to ensure airborne fiber concentrations remain at acceptable levels. Acceptable airborne fiber concentrations outside the work area shall be < 0.010 f/cc for PCM and < 0.010 s/cc for TEM. The API may also perform discretionary random personnel monitoring. Pre-test and project samples shall be analyzed via Phase Contrast Microscopy (PCM), NIOSH Method 7403 or Transmission Electron Microscopy (TEM), EPA AHERA 40 CFR 763.

1. Transmission Electron Microscopy (TEM) sampling may be performed in locations outside the containment work areas at the Owner's discretion throughout the abatement project. Results shall be evaluated in accordance with the ACR.

C. The API shall provide clearance air sampling:

1. For Major Projects, five (5) clearance samples shall be collected and analyzed via TEM. Results shall be evaluated in accordance with the ACR.
2. For Small and Minor Projects, five (5) clearance samples shall be collected and analyzed via Phase Contrast Microscopy (PCM) or TEM. Results shall be evaluated in accordance with the ACR.
3. For Non-Friable Projects, a discretionary number of clearance samples shall be collected and analyzed via Phase Contrast Microscopy (PCM) or TEM. Results shall be evaluated in accordance with the ACR.
4. Clearance air sampling shall be performed using aggressive techniques. Sampling procedures and clearance criteria shall follow all requirements of the Philadelphia ACR.

D. The Owner shall be responsible for costs incurred for the initial required laboratory work. Any subsequent testing required due to limits exceeded during abatement or any clearance sampling shall be paid by the Contractor. These costs include both labor and analysis.

1. The API shall invoice the Owner on a separate invoice, for all costs relating to labor and analyses resulting from additional testing required due to limits exceeded during abatement or failure of first round clearance sampling.

2. The Contractors contract amount shall be reduced by an amount equal to the costs for labor and analyses resulting from additional testing required due to limits exceeded during abatement or failure of first round clearance sampling.
3. The Owner shall retain possession and ownership of all air sampling data and documentation.

Asbestos is sampled and analyzed by methods found in National Institute of Occupational Safety and Health (NIOSH) Publications:

- Method 7400 Asbestos and Other Fibers by PCM;
- Method 7402 Transmission Electron Microscopy; and
- Method 9002 Asbestos (bulk) by PLM.

The AAC has the responsibility of informing themselves fully of the requirements of these agencies and shall satisfy completely this Specification and all referenced regulations. All other applicable federal state and local regulations are incorporated by reference.

Asbestos projects are regulated under Philadelphia Asbestos Control Regulations and Asbestos Codes:

- Title 6 Chapter 6-600 - Asbestos Projects (Asbestos Control Regulations).

E. The Z-test method found in 40 CFR 763, Subpart E., Appendix A, is a test method in which inside and outside area averages can be used to pass an area based upon the outcome of the arithmetic comparison of both areas. However, the analysis and comparison of the inside and outside air samples via the Z-test method is not permitted as part of this project.

1. Inside the work area samples shall be analyzed using the geometric mean. Outside the work area samples shall be analyzed and compared independently.
    a. An Exceedance of the geometric mean inside the work area and/or an exceedance of 0.010 s/cc outside the work area shall require corrective action recleaning by the Contractor.
2. Inside and outside final clearance air samples shall be collected and analyzed via PCM or TEM. Results shall be evaluated in accordance with the ACR.
3. Acceptable airborne fiber concentrations for individual "outside the work area" air samples shall be < 0.010 f/cc for PCM and < 0.010 s/cc for TEM.
4. During all phases of the project, the API/Consulting Firm shall be required to notify the Department of Public Health in the event an “outside the work area” air sample is in exceedance of 0.01 s/cc.

3.2 AIR MONITORING BY THE ASBESTOS ABATEMENT CONTRACTOR

A. The Contractor shall perform representative personal air sampling as defined within OSHA 1926.1101 and 1910.1001. Personal air samples shall be collected to establish a time weighted average (TWA) and a short-term excursion limit (STEL). Such air samples shall be collected within the breathing zone and used to:

1. Initially determine the level of respiratory protection.

2. Subsequently to assure that such protections remain adequate throughout the project.

B. Sampling strategy and protocols shall be determined by a competent sampling professional according to NIOSH 7400 method. The Contractor shall have a competent person collect personal air samples.

C. Personal air sample results must be posted within 24 hours of sample collection.

D. Contractor personnel shall comply with the personal air sampling of the competent person and shall not interfere with or alter sampling protocol.

3.3 RESPIRATORY AND PERSONAL PROTECTIVE EQUIPMENT

A. The Contractor shall provide approved respirators and protective clothing to all workers. Authorized representatives of the City, State or other Government entity who arrive to inspect the work site shall be permitted access to the work area provided the visitor arrives with their own approved respirator. The Contractor shall provide protective clothing to these visitors.

1. The Contractor shall provide approved respirators to all visitors that can provide proof that a Pulmonary Function Test, Medical exam and chest x-ray has been performed on the visitor, and that a doctor has performed a pulmonary evaluation of the visitor indicating that the visitor has been deemed able to safely wear a respirator.

B. The Contractor shall require that each person entering the work area shall wear an approved respirator and protective clothing. There shall be no exceptions to this rule.

C. Respiratory protection shall be in compliance with:

1. OSHA regulations 29 CFR 1910.1001, 1926.1101, and 1910.134;
2. ANSI Z88.2-1980;
3. NIOSH 30 CFR Part 11 for type B and C respiratory protection;
4. NIOSH and DHHS 42 CFR Part 84 for non-powered, air-purifying particulate-filter respirators.

D. At a minimum, the respiratory protection at the start of the project shall be Type B (PAPR). After the initial exposure assessment establishes the expected airborne asbestos concentrations during removal, the respiratory protection shall be:

1. 0.01 – 1.0 f/cc - Dual Cartridge, Air Purifying respirator, Type A.
2. 1.0-2.5 f/cc - Powered Air Purifying Respirators - Type B (PAPR).
3. >2.5 f/cc- - Supplied Air with Constant Flow - Type C.

E. All persons performing asbestos abatement work requiring respiratory protection (including Type B) shall be clean shaven and have an unobstructed face mask seal. Only mustaches that do not exceed the corners of the upper lip and sideburns that do not extend below the earlobes are permitted.

F. For containments with an attached three (3) stage decontamination unit, asbestos workers shall wear a single disposable suit including hood and footwear. Before exiting the work area, the workers shall remove their respirator filters and disposable suit in the shower after appropriate wetting. These shall be disposed of as asbestos waste.

G. For containments utilizing a remote decontamination unit, asbestos workers shall wear two (2) disposable Tyvek-type suits. Before exiting the work area, the worker shall remove both suits and change into a clean disposable suit in the one-stage chamber. The worker shall immediately proceed to the remote centralized, decontamination chamber, equipped with a shower and clean room. Dispose of clean suit and respirator cartridges in the centralized decontamination chamber.

3.4 DECONTAMINATION FACILITIES

A. For Major Projects described in this Specification, the Contractor shall construct and place a three-stage decontamination unit at the entrance to the work area. For Minor and Non-Friable Projects, a one-stage decontamination unit shall be constructed and placed at the entrance to the work area, with a two-stage centralized decontamination unit/shower constructed prior to work in any abatement work areas. Decontamination units shall have a sturdy frame comprised of studs or equivalent.

B. Decontamination units shall be constructed as described below:

1. Three-stage unit (clean room, shower room, equipment room):
    a. Interior of the chamber shall be covered with two layers of six (6) mil polyethylene with triple flap airlocks installed between each chamber.
    b. Shall have a sturdy frame comprised of studs and ⅜ “plywood.
    c. Entrance shall be equipped with a secure, lockable plywood door with louver system.
    d. Shall have danger signs posted at the entrance.
    e. Shall be provided with hot and cold water for use in the shower room.
    f. Shower water shall be added to waste materials or pumped through a five (5) micron filter element prior to discharging it to the sanitary sewer or floor drains.

2. One-stage unit:
    a. Interior of the chamber shall be covered with two layers of six (6) mil polyethylene and triple flap airlocks shall be placed at entrance and exit.
    b. Shall have a sturdy frame comprised of studs or an approved equivalent.
    c. Shall have danger signs posted at the entrance.
    d. Asbestos workers shall wear two (2) disposable Tyvek-type suits. Before exiting the work area, the worker shall remove the outer suit in the single-stage decontamination chamber. The worker shall immediately proceed to the remote centralized, decontamination chamber, equipped with a shower and clean room.

The inner disposable suit and respirator shall be removed after appropriate wetting. Dispose of the inner suit and respirator cartridges in the centralized decontamination chamber. Workers shall shower with liquid bath soap and shampoo. Clean, dry towels shall be available for drying.

Hot and cold water shall be available for use in the shower room.

e. Shower water shall be added to waste materials or pumped through a five (5) micron filter element prior to discharging it to the sanitary sewer or floor drains.

2. The Contractor shall provide one decontamination chamber for every eight (8) workers.

C. The use of a remote decontamination unit for MAJOR PROJECTS requires the submission of an Alternative Method Request to the City of Philadelphia's Air Management Services, Asbestos Division, and receipt of approval by that office.

D. Asbestos abatement shall not commence until the Contractor can demonstrate to the API that the shower unit is fully operational.

3.5 GENERAL PREPARATION FOR ALL ASBESTOS ABATEMENT ACTIVITIES

A. The Contractor shall confine their apparatus, the storage of materials, tools, supplies and the activities of their workman to the limits established by the City and City ordinances.

B. The Contractor shall assure that building exits are not obstructed and that appropriate safety barriers are established to prevent access by unauthorized persons. The works areas are to be kept neat, clean and safe.

C. The Contractor shall post OSHA specified, asbestos specific danger signs at the entrance to each work area. Such signs shall also be posted when applicable to decontamination chambers, bag-out chambers, critical and separation barriers, and waste storage containers.

D. Provide isolation barriers to separate the abatement work areas from the remaining occupied areas of each floor.

E. All necessary building occupants remaining in the building during the asbestos abatement project shall be denied access to the asbestos abatement work area(s) by isolation barriers and/or locked doors.

F. All moveable objects shall be removed from the work area. Movable objects shall be wet wiped & HEPA vacuumed prior to their relocation to a clean area.

G. AFDs and HEPA vacuums require different maintenance schedules and attention depending on the model. Check the user's manual to determine and comply with the maintenance, filer replacement, and cleaning requirements of each AFD and HEPA vacuum being used.

1. At no time shall an AFD be dismantled, and the inner HEPA filter replaced while on site. Removal and replacement of HEPA filters shall be performed off site.

2. At no time shall a HEPA vacuum be opened for cleaning/emptying outside an active asbestos abatement work area.

3. Cleaning/emptying a HEPA vacuum shall be performed INSIDE an active asbestos abatement work area with a minimum negative pressure differential of -0.02 inches of water column.

    a. Cleaning/emptying of HEPA vacuums shall be performed directly near an operating AFD exhausting to the exterior.

    b. HEPA vacuums shall be cleaned/emptied only during gross removal of asbestos and/or equipment demolition. No HEPA vacuums shall be cleaned/emptied, or opened for any other reason, during final cleaning and/or encapsulation.

H. AFDs and all other supplies and equipment shall arrive at the project site in good condition and free of any visual residual asbestos contamination.

I. Assure HVAC systems associated with, or that pass through any abatement work areas are shut down. Provide appropriate lock and tag out devices at the shut off point of the fan.

J. De-energize the work areas and all conduit running through the work areas.

1. Appropriate lock and tag out devices shall be installed at the breakers.

2. The Contractor shall provide a temporary electric panel with ground fault interruption.

3. The Contractor shall supply sufficient temporary lighting to illuminate the work areas during asbestos abatement and paint stabilization. All active work areas shall be lighted to not less than the minimum illumination intensities listed in OSHA Regulation 29 CFR 1926.56(a), Table D-3 for Indoors: warehouses, corridors, hallways, and exit ways (e.g. - 5-foot candles).

K. Only approved noncombustible or flame-resistant materials shall be used for work area preparation. Polyethylene sheeting shall be certified to conform to NFPA 701.

L. The dropping, lowering, transporting or otherwise moving any open or packaged waste through any shaft during this project is strictly prohibited. When the asbestos abatement work area is a shaft, asbestos waste must be packaged and lowered in a controlled fashion to the base of the shaft. No dropping of waste in any shaft shall be permitted at any time.

M. The abatement contractor is responsible to provide site security for the duration of the abatement process.

3.6 PREPARATION AND ABATEMENT – MAJOR/MINOR WORK AREAS

A. This section is intended to specify the acceptable methods for the removal of all friable and non-friable asbestos containing material listed in *Section 1.01.B* utilizing full containment protocols.

B. The GC shall assure that exits from the building are not obstructed. The work areas are to be kept neat, clean, and safe.

C. Only approved noncombustible or flame-resistant materials shall be used in the construction of temporary enclosures. Polyethylene sheeting shall be certified to conform to NFPA 701.

D. Post OSHA specified, asbestos specific danger signs at the entrance to the work area. Such signs shall also be posted when applicable to decontamination chambers, bag-out chambers, critical and separation barriers, and waste storage containers.

E. All building occupants shall be removed from the work area floors during the performance of the removal project, unless access to the work area is restricted by an isolation barrier or lockable doors.

1. If required, wooden isolation barriers shall be erected to completely isolate the work area from any occupied areas of the building.

2. Isolation barriers shall be eight (8) feet high and shall be constructed of minimum ⅜" fire-rated plywood supported by 2'x3' stud framing, or equivalent, placed on sixteen-inch (16") centerlines. Appropriate footings and bracings shall be installed to provide proper support.

F. The GC shall confine their equipment, storage of materials, tools, supplies, and activities of their workers to the limits established by the City and local ordinances.

G. Assure any HVAC systems associated with or which course through the work area are sealed, shut down, and locked out.

H. Approved high quality HEPA equipped air filtration devices (AFDs) shall be placed so as to develop and hold a negative differential air pressure. Each AFD shall be equipped with a magnehelic gauge or manometer to measure pressure drop across the filters, indicating overload and a need to change filters. An automatic shutdown system shall be provided in the event of improper filter fit, a rupture in the HEPA filter, or a blocked air discharge.

1. The negative differential air pressure shall be sufficient to provide a minimum of four (4) air changes of the work area per hour. The GC shall install a manometer to confirm this differential, which should read minimum of -0.02 inches of water column.

2. Negative differential air pressure shall be continuously maintained 24 hours a day, from the time the isolation barrier is first established until final clearance air sampling is completed, and the Contractor is released by the API.

3. The AFD exhaust shall be vented outside of the building, where feasible.

I. For Major Project work areas, construct a three-stage decontamination unit at the work area entrance. For Minor Project work areas, construct and attach a one-stage decontamination unit at the work area entrance. A remote two-stage decontamination unit shall also be constructed at an appropriate location. Exact decontamination unit placements shall be at the discretion of the GC with approval from the on-site API.

J. Pre-clean the floor and horizontal surfaces via wet wipe and HEPA vacuum techniques.

1. All fixed objects, including but not limited to, unit-vents, radiators, motors, AHUs, ductwork, etc. shall be wet wiped and sealed with one (1) layer of six (6) mil polyethylene.

K. Install critical barriers consisting of two (2) separate identifiable layers of six-mil polyethylene over all windows, doors, openings between walls and ceilings, and any other critical openings inside the work area such that the work area is isolated from the rest of the building.

1. Ensure all electrical panels, control panels, and control boxes are protected with watertight critical barriers consisting of two (2) separate identifiable layers of six-mil polyethylene.
2. Areas where critical barriers are to be installed shall first be pre-cleaned via wet wipe and HEPA vacuum techniques.

L. Critical 'containment' barriers shall be erected to cover openings greater than six feet in width, consisting of two (2) separate identifiable layers of six-mil polyethylene. Studs or equivalent shall support these barrier(s). Note: these are considered critical barriers, and application of two additional layers of wall coverings shall be required.

M. All floor and wall surfaces (including polyethylene critical 'containment' barriers) shall then be covered with two (2) layers of six-mil polyethylene sheeting. Sheeting shall be installed in such a manner as to cause minimal damage to underlying surfaces. The GC shall ensure proper adhesion of the sheeting to problem areas, such as walls with peeling paint.

1. Wall coverings shall extend from ceiling level to floor level and overlap the floor sheeting. Floor coverings shall extend twelve inches (12") up behind the wall coverings. All seams shall be staggered as to overlap a minimum of twelve inches and be sealed with duct tape.
2. Note that floor coverings shall be omitted in areas where vinyl asbestos floor tile is scheduled for removal.

N. The GC shall de-energize the work area and all conduit running through the work area, if possible.

1. Appropriate lock and tag out devices shall be installed at the circuit breakers.
2. All conduit that cannot be de-energized shall be wrapped with a minimum of one (1) layer of six (6) mil polyethylene sheeting.
    a. Suspend OSHA approved, electrical - voltage and shock hazard warning tags from the energized conduit traveling through the work area every six feet. The warning tags shall remain in place for the duration of the abatement project.
3. The GC shall provide a temporary electrical panel board with ground fault interruption. All electrical power shall be brought into the work area via ground fault interrupters (GFIs).
4. The GC shall supply sufficient temporary lighting to illuminate the work areas during abatement.

O. Erect ladders, scaffolding, and/or raised work platforms to access elevated areas of ACM.

1. Ladders, scaffolding and/or raised work platforms shall be of sound condition and assembled per OSHA requirements on a level, secure base.
2. Ladders, scaffolding and/or raised work platforms shall not be overloaded.
3. Scaffold work platforms shall comply with OSHA Regulation 29 CFR 1926.451.

P. In locations where vinyl floor tile is scheduled for removal and floor coverings have been omitted, install temporary floor coverings consisting of one (1) layer of six (6) mil polyethylene beneath the pipe/pipe fitting to be removed extending at least five (5) feet in all directions.

Q. Upon completion of the work area preparation, and approval by the on-site API, install containment bags (glove bags) around all pipe/pipe fitting insulation in accordance with the ACR Section VI.C.3.e.2-5. The containment bag, once attached, shall be smoke tested using a smoke tube and aspirator bulb. The containment bags shall be utilized in order to further contain any airborne asbestos fibers released during the removal tasks and simplify the subsequent final cleaning tasks.

R. Removal of pipe/pipe fitting insulation shall be initiated only after the material has been treated with a solution of water and wetting agent. At the start of each work day, the pipe/pipe fitting insulation to be removed shall be wetted. This wetting shall be repeated at such intervals as to prevent the material from drying out.

S. Perform removal of pipe/pipe fitting insulation using the containment-bag technique. Containment bag removal practices shall conform to the ACR Section VI.C.3.e.7-20.

T. The API shall conduct a visual inspection prior to encapsulation. The on-site API shall approve the area when no visible dust is evident.

U. Prior to removing the glove-bag, any residue shall be removed using a stiff nylon brush or a scraper. The pipe surfaces shall then be wet wiped to remove any visible debris. The API shall conduct a visual inspection and shall approve encapsulation to be performed when no visible ACM dust or debris is evident on any surfaces.

V. Upon approval by the API, encapsulate the pipe surface prior to removing the containment bag. The API shall inspect the sealant/encapsulant to confirm adequate and proper application and approve subsequent removal of the glove bags. When acceptable, the API shall approve the removal of the glove-bag.

    1. A HEPA vacuum shall be used when evacuating and breaking the seal of the glove-bag.

W. Remove and dispose of all other friable ACM:

    1. Removal of asbestos shall be initiated only after the material has been treated with a solution of water and wetting agent. This wetting shall be repeated at such intervals as to prevent the asbestos from drying out. Removal shall be performed in a manner that minimizes the release of asbestos fibers.

        a. Continually mist the air with water using an airless sprayer to keep airborne fiber levels to a minimum.

        b. No standing water shall be tolerated inside of the work area. Standing water would have the potential of leaking to spaces below the work area. The GC shall designate a worker to constantly monitor the work area and vacuum or mop up any standing water resulting from the pre-wetting or air misting procedures.

        c. All wastewater generated in the decontamination chamber shower shall be retrieved and added to packaged asbestos waste materials or pumped through a five (5) micron filter element prior to discharging it to the sanitary sewer or floor drains.

d. All wastewater generated in the abatement work area shall be retrieved and added to packaged asbestos waste materials and/or placed in plastic lined leak-tight drums for disposal in accordance with VI.C.7 of the Asbestos Control Regulation.

X. Perform removal of vinyl floor tile. Mechanical methods may be employed.

1. Remove all carpeting, binding strips, cove base, and other restrictive moldings holding flooring at locations such as doorways, walls, thresholds, etc.
2. Adequately wet flooring prior to removal.
3. Crews shall be structured such that flooring is packaged as it is removed. Removed flooring shall not be permitted to accumulate in the work area, and shall be completely contained in proper asbestos waste containers, without further breakage, ready for disposal, before the end of each shift.

Y. All floor tile mastic is verified as non-asbestos throughout the building. Mastic removals may be performed using non-toxic organic solvents.

Z. Upon completion of removal, perform final cleaning of all surfaces in the work area. Assure that all surfaces to which asbestos insulation was applied are visibly free of insulation material. Any residue shall be removed using a stiff nylon brush or a scraper. Work area surfaces shall then be HEPA vacuumed and/or wet wiped to remove any visible debris. The scaffolding shall either be encapsulated or wet wiped clean to the API's satisfaction. AFDs shall remain in operation during this procedure.

AA. During the performance of final cleaning of all surfaces inside the active abatement work area, all horizontal surfaces “outside the work area” shall also be cleaned. This includes the dirty, shower and clean rooms of decontamination chambers attached to the asbestos abatement work area being tested and all immediate surroundings of representative makeup air entering each independent asbestos abatement work area being tested.

1. Remove all bulk trash and/or large construction debris items from the area.
2. Wet bulk piles of debris with a fine water mister or "Hudson" sprayer.
   a. Pick up large pieces by hand and/or shovel and place into asbestos waste bags. Broom sweeping is not permitted at any time on any asbestos abatement project.
3. Any residues shall be removed using a stiff nylon brush or scraper.
4. Floors, walls, ceilings, critical and containment barriers shall be swept with the exhaust of an electric leaf blower to dislodge any remaining dust within the asbestos abatement work area. Allow for the HEPA equipped air filtration devices (AFDs) to provide several air changes within the work area prior to vacuuming and wet wiping.
5. Surfaces shall then be HEPA vacuumed and/or wet wiped to remove any visible debris.

AB. The API shall conduct a detailed final inspection to ensure that no visible dust or debris remains on any surfaces. If any suspect or objectionable material is evident, the GC shall clean the material and sufficient surrounding areas to the satisfaction of the API, via wet-wipe and HEPA-vacuum techniques.

AC. Upon completion of removal, cleaning, encapsulation, and an acceptable visual inspection, final clearance samples shall be collected and analyzed. Refer to *Section* 3.1 - Air Monitoring by the Owner.

AD. If any of the results of clearance samples are unacceptable according to the Philadelphia ACR, the GC shall re-clean the work area via wet-wipe and HEPA-vacuum techniques. Following an acceptable inspection, the API shall re-test the area. This sequence shall be repeated until receipt of acceptable air sample results according to the Philadelphia ACR.

AE. Upon receipt of acceptable final visual inspections and acceptable air sample clearance results according to the Philadelphia ACR, the GC shall carefully dismantle critical barriers, plastic sheeting, tape and other materials used in the work area construction.

1. All asbestos containing and contaminated material shall be disposed of in accordance with Section 3.10 - ACM Waste Disposal.

AF. The GC shall remove all glue and tape adhesive reside from all walls, floors and all other surfaces in which glue and tape were utilized in containment preparations. The API shall conduct a post teardown inspection to ensure this task has been completed.

3.10 ACM WASTE DISPOSAL

A. The dropping, lowering, transporting or otherwise moving any open or packaged waste through any shaft during this project is strictly prohibited. When the asbestos abatement work area IS a shaft, asbestos waste must be packaged and lowered in a controlled fashion to the base of the shaft. No dropping of waste in any shaft shall be permitted at any time.

B. Approval must be obtained from the API prior for temporary storage of any asbestos waste containers or construction debris on site, prior to being loaded into appropriate dumpsters. The waste shall be appropriately packaged according to the type of waste. A polyethylene drop cloth and covering shall be provided and the storage areas restricted by barrier tape and appropriate signage. Asbestos waste containers must be distinctly stored separately from other waste. No long-term storage may occur in these areas.

C. The loading, transportation, and disposal of asbestos waste at the landfill shall occur in accordance with regulatory requirements of NESHAPS and applicable state and City guidelines and regulations.

D. Waste disposal containers shall conform to one of the following. Waste with sharp edges shall not be disposed of solely in polyethylene bags. All six-mil polyethylene bags shall be transparent so that when filled, the contents of the bag are readily visible.

E. The Contractor shall label asbestos waste with the name of the generator and the location from which the waste was generated.

F. The container used for transporting and disposing of ACM waste shall be clearly and properly labeled as specified in EPA and DOT regulations. In addition to generator labels, containers must carry the following labels:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD
-and-

DOT labels requirement: (Easily readable in sharp relief)

CAUTION
Contains Asbestos Fibers
Avoid Opening or Breaking Container
Breathing Asbestos is Hazardous
to your Health
RQ ASBESTOS
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G. During waste load out, post asbestos specific danger signs along the waste disposal route, and on and around the vehicle or dumpster being used to transport the waste off site.

   1. Drop cloths shall be utilized along routes in which bagged ACM waste is passed through the building. Proposed waste removal route shall be presented to the API and Asbestos Project Designer for approval prior to performing delivery of asbestos waste material to the intended waste container. The API must document the proposed route and the APIs subsequent approval in an activity log.

H. Waste routes must be approved by the Owner and on-site API prior to the commencement of work. All waste being transported through the building must be placed in covered/enclosed containers bearing proper warning signs. The waste route must be kept clean.

   1. The rolling of waste drums or the dropping of waste bags down stairs is strictly prohibited.
   2. After transport of waste through the building is completed, the Contractor shall wet mop the waste removal route to assure continued cleanliness and removal of any debris associated with the waste transport tasks.

I. All documentation of transportation and disposal transactions such as dump receipts, trip tickets and waste manifests shall be completed and delivered to the Owner for their records.

J. Should the Owner not receive a receipt of the waste shipment record within 35 days of Project Closeout, the Owner shall contact the Contractor to determine the status/disposition of the waste.

K. Should the Owner not receive a receipt of the waste shipment record within 45 days of Project Closeout, the Owner shall notify the EPA.

3.11 PROJECT CLOSEOUT

A. After achieving acceptable air sample clearance and dismantling the work area, the Contractor shall be released after the following items are completed:

1. Removal of all temporary signs, labels, tape and glue/tape adhesive residue.
2. Removal of all temporary devices, facilities, and equipment.
3. Cleaning the project site and storage areas of trash, etc.
4. Replacement/repair of any damage.
5. The Owner deems the repair work (if any) is acceptable for re-occupancy.
6. Removal of all waste containers (asbestos, scrap, and construction debris) from site and proper disposal of waste.

B. Upon completion of the project, the Contractor shall submit final documentation to the Owner, including but not limited to, all waste handling/shipping documentation/manifests.

PART 4 REFERENCES

1. See Appendix 1 – Phase I Environmental Site Assessment And Hazardous Materials Inventory

END OF SECTION 011100

SECTION 011130

LEAD IN CONSTRUCTION

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. This specification outlines the required tasks and procedures involved with construction activities such as demolition and/or removal of Lead-based Paint (LBP)/Lead Containing Coating (LCC) materials which are covered by this specification.

B. The General Contractor and/or Lead Abatement Contractor (LAC) must demonstrate they have the necessary personnel, equipment, materials, training, licenses and experience to complete a project of this nature in the required time period.

C. The Contractor shall supply all labor, materials, equipment, testing, permits, notifications, insurance and incidentals that are necessary and/or required to perform the work in accordance with applicable local, state and federal regulations; as may be necessary to comply with the OSHA Lead in Construction Standards 29CFR1926.62 and 29CFR1910.25 and for the demolition/construction activities as specified in this section or as indicated in associated drawings, sketches, or details of the work.

D. Demolition/construction activities associated with Lead Containing Coatings include the following components.

E. Lead Based Paint/Lead Containing Coatings Waste scope summarization includes, but is not limited to:

1. Lead Based Paint/Lead Containing Coatings as listed in Appendix 1 – Phase I Environmental Site Assessment And Hazardous Materials Inventory

F. This project shall include the LBP/LCC materials that are required to be modified, removed or demolished to facilitate the work indicated by this contract. This responsibility includes locations identified or locations not identified in the report.

G. Included in the lead work areas shall be buffer zones. These buffer zones shall be intended for staging areas as well as locations to install decontamination chambers, if applicable. Buffer zones are also intended to protect all occupants from airborne lead exposure in the event that "outside the work area" air samples show elevated levels of airborne lead particulate.

H. The Contractor and its Subcontractors shall inform themselves fully of the scope and scale of the lead related demolition/construction activities as it relates to this project.

I. The contractor shall coordinate with work being performed in adjacent areas. Coordination procedures shall be explained in a work plan and shall describe how the Contractor will prevent lead exposure to other contractors and/or occupants/personnel.

1.2 CODES AND REGULATIONS

A. All work and disposal shall be performed in compliance with all applicable Federal, State, and City regulations including but not limited to:

1. 29 CFR 1926.62 (OSHA).

2. 29 CFR 1910.25 (OSHA).

3. 40 CFR 300-399, EPA Comprehensive Environmental Response Compensation & Liability Act.

4. 40 CFR 260-299, Resource Conservation and Recovery Act (RCRA).

5. 42 CFR Part 84 & 30 CFR Part 11 (NIOSH/DHHS respirator standards).

6. This Specification.

1.3 SUBMITTALS

A. Occupational and Environmental Assessment Data Report (if objective data is used to justify excluding the initial occupational exposure assessment).

B. Lead Compliance Plan.

C. The contractor and subcontractors must identify a competent person. A Competent Person refers to a person employed by the contractor who is trained in the recognition and control of lead hazards in accordance with current federal, State, and local regulations and has the authority to take prompt corrective actions to control the lead hazard.

D. If applicable, a completed and signed hazardous waste manifest from treatment or disposal facility.

E. Fit test and medicals. These may be submitted as the crew is selected or changed.

F. A detailed written description of emergency procedures to be followed in the event of injury or fire. This submittal must include execution procedures, source of emergency assistance (including telephone numbers), and access procedures to be used by emergency personnel.

1.4 OWNER RESPONSIBILITIES

A. The Owner shall ensure work areas will be unoccupied prior to demolition/construction activity commencing.

B. The Owner shall make water and electricity available at the site at no cost to the Contractor. The Owner shall notify the Contractor of scheduled system shutdowns to ensure no interruptions to the project's engineering controls.

C. The Owner shall be responsible to remove all contents from the scheduled work areas. A list of such items includes, but is not limited to:

1. Personal items throughout the work areas.

2. All computers and computer accessories in any of the work areas.

3. Stored maintenance and building supply items, paper products, paints, cleaners, replacement ceiling tiles and florescent light bulbs, excess furniture, etc. located in any of the work areas scheduled for demolition and/or construction.

4. Any other items deemed appropriate by the Owner.

1.5 CONTRACTOR RESPONSIBILITIES

A. The Contractor is responsible for reviewing the Phase I Environmental Site Assessment And Hazardous Materials Inventory and visiting the site to locate LBP/LCC materials and locations of utilities, prior to submitting a bid.

B. The Contractor shall provide all labor, tools, materials and scaffold necessary to complete the project safely, in a timely fashion, and in accordance with the specification and all applicable regulations.

C. Any movable items remaining in the scheduled work areas shall be removed by the Contractor.

D. The Contractor shall protect all non-movable furniture, cabinetry and equipment from damage throughout the duration of this project.

E. The Contractor shall maintain current copies of all pertinent specifications and regulations on-site.

F. The Contractor shall provide fire protection in accordance with all State and Local codes. This includes, but is not limited to:

1. Providing a written fire prevention and emergency action plan.

2. Providing multi-purpose ABC rated fire extinguishers, ensuring that on-site personnel are aware of the location and proper use of all fire extinguishers and other safety equipment.

3. Performing a fire watch of the overall work area.

4. Designating a safety coordinator to implement the above actions. The Contractor's safety coordinator shall be responsible for:

    a. Fire/life safety entries shall be entered into the Contractor's log daily and shall be submitted with the Contractor's final report.

    b. Daily entries shall include names, dates, duration, problems & corrective actions taken by the fire watch-must be signed by the safety coordinator.

G. The contractor and subcontractors shall follow work permit procedures for all work including, but not limited to, working near potentially live electric, hot work, working at heights.

H. Hot work is defined as all work that causes or requires the use of open flames, arcs, sparks, or other forms of high temperature ignition sources that could initiate a fire or explosion.

1. Examples of hot work include welding, burning, soldering, hot tapping, drilling, grinding, abrasive blasting, chipping, the operation of impact wrenches, the operation of electronic or electrical equipment that is not intrinsically safe, opening explosion proof electrical enclosures and any other work that may generate sufficient heat that it would pose a possible ignition source.

I. The contractor shall use appropriate ladders, scaffolds, lifts, and/or hoists to provide safe access for work activities. Personnel safety lines and harnesses are required where appropriate.

1. Fall Protection equipment and guidelines shall comply with OSHA Regulation Standards 29 CFR1926.501.

2. The use of aerial lifts shall comply with OSHA Regulation Standards 29 CFR 1926.453 and ANSIA92.2-1969.

3. All stairs, platforms, catwalks and walking surfaces shall be kept, as is practical, free from obstructions, accumulation of water, and tripping hazards, and where elevated, be protected by OSHA specified top-rails, mid-rails, and toe boards.

4. Ladders of sufficient quantity and of suitable length or height shall be provided. Ladders shall be kept in good repair and inspected regularly. Personnel shall be instructed in the proper use of ladders. No structural alterations shall be made to any ladder.

5. Ladders shall arrive at the project site in good condition and free of any residual contamination.

PART 2 – PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 SCOPE OF WORK

A. The Owner may utilize an Industrial Hygienist or Air Monitoring Firm to perform daily quality assurance evaluations and air sampling outside the work area(s).

B. After all work areas are completed, the owner has the option to collect surface dust wipe samples inside of the work completed work areas. The clearance surface dust wipe criteria are as follows:

   1. The clearance surface dust wipe sample results collected inside the work area must be less than (<) 10 micrograms per square foot on all floor surfaces and less than (<) 100 micrograms per square foot on all windowsill surfaces.

C. The owner shall be responsible for costs incurred for the initial required laboratory work. Any subsequent testing required due to failed clearance sampling shall be paid by the contractor. These costs include both labor and analysis.

1. The Owner shall retain possession and ownership of all air and surface sampling data and documentation.

3.2 AIR MONITORING BY THE GENERAL CONTRACTOR

A. All personal air samples shall be collected via NIOSH 7082 sampling method and analyzed via NIOSH 7082 by Flame Atomic Absorption Spectroscopy (AAS).

B. An Initial Exposure Assessment (IEA) (OSHA29CFR1926.62) must be performed during the first shift.

1. An IEA requires an exposure assessment immediately before or at the initiation of the lead demolition/removal operation to ascertain expected lead-in-air exposures. During that operation and to provide information necessary to assure that all control systems planned are appropriate and will work properly.

2. If it is determined that the expected lead exposure, as a result of the IEA monitoring, will be below fifty micrograms of lead per cubic meter of air (50 ug/m3), averaged over an 8-hour work-day, then personal protective equipment (PPE - suits and respirators) and/or engineering controls shall not be required, but are optional.

a. PPE and appropriate lead demolition engineering controls <u>are required</u> until an IEA is established, or if the results of the IEA monitoring reveals expected lead exposure concentrations to be above 50 ug/m^3 8-hour time weighted average (TWA). The selection of the respiratory protection shall be appropriate to the lead exposure concentrations determined by the NEA monitoring.

3.3 RESPIRATORY AND PERSONAL PROTECTIVE EQUIPMENT

A. If required, the contractor shall provide approved respirators and protective clothing to all workers.

B. If it has been determined via the IEA that the OSHA Permissible Exposure Limit (PEL) is exceeded, the contractor shall require that each person entering the work areas to wear an approved respirator and protective clothing. There shall be no exceptions to this rule.

C. Respiratory protection shall be in compliance with:

1. OSHA regulations 29 CFR 1910.1001, 1926.1101, and 1910.134; ANSI Z88.2-1980;NIOSH 30CFR Part11 for type B and C respiratory protection;

2. NIOSH and DHHS 42 CFR Part 84 for non-powered, air-purifying particulate-filter respirators

D. If determined that respiratory protection is required, at a minimum, the respiratory protection shall be:

1. Dual Cartridge, Air Purifying respirator, Type A.

2. Powered Air Purifying Respirators (PAPR) - Type B.

3. Supplied Air with Constant Flow – Type C.

E. All persons performing lead removal work requiring respiratory protection shall be clean shaven and have an unobstructed face mask seal. Only mustaches that do not exceed the corners of the upper lip and sideburns that do not extend below the earlobes are permitted.

3.4 MEDICAL SURVEILLANCE

A. Under the occupational health standard for inorganic lead, a program of biological monitoring and medical surveillance is to be made available to all employees exposed to lead above the action level of 30 ug/m3 TWA for more than 30 days each year. This program consists of periodic blood sampling and medical evaluation to be performed on a schedule that is defined by previous laboratory results, worker complaints or concerns, and clinical assessment of the examining physician. Employers shall maintain complete and accurate medical records of employees for the duration of employment plus 30 years.

B. Any worker blood lead level increases of 10 micrograms/dl or greater or any blood lead level greater than 25 micrograms/dl will trigger an investigation of protective equipment and work practices. All workers on this project shall be informed of their blood lead levels as soon as the testing results are received.

3.5 DECONTAMINATION FACILITIES

A. Provide clean and contaminated change rooms and hand washing stations in accordance with this specification and 29 CFR1926.62.

3.6 GENERAL PREPARATION AND CONTROLS FOR ALL LEAD RELATED ACTIVITIES

A. Physical Boundary- Provide physical boundaries around the lead control area by roping off the area designated in the workplan or providing curtains, portable partitions or other enclosures to ensure that lead will not escape outside of the lead control area.

B. Warning Signs - Provide warning signs at approaches to lead control areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Signs shall comply with the requirements of 29 CFR1926.62.

C. Shutdown, lockout, and isolate HVAC systems that supply, exhaust, or pass through the lead control areas. Seal intake and exhaust vents in the lead control area with 0.15 mm 6 mil

plastic sheet and tape. Seal seams in HVAC components that pass through the lead control area.

D. To the extent feasible, use local exhaust ventilation or other collection systems. Local exhaust ventilation systems shall be evaluated and maintained in accordance with 29 CFR1926.62.

E. Vent local exhaust outside the building and away from building ventilation intakes or ensure exhaust system shall connected to HEPA filters prior to discharge.

F. Use locally exhausted, power actuated tools or manual hand tools.

G. Manual or power sanding or grinding of lead containing or coated materials is not permitted unless tools are equipped with HEPA attachments or wet methods are applied. The dry sanding or grinding of surfaces that contain lead is prohibited. Provide methodology for removing lead in the Lead Compliance Plan. Select lead removal processes to minimize contamination of work areas outside the control area with lead-contaminated dust or other lead-contaminated debris or waste and to ensure that unprotected personnel are not exposed to hazardous concentrations of lead. Describe this removal process in the Lead Compliance Plan.

H. Perform manual or mechanical removal in the lead control areas using barriers and powered locally exhausted tools.

3.7 LEAD WASTE DISPOSAL

A. All removed LBP components that will not be recycled, lead containing dust and waste water shall be disposed of in accordance with the Hazardous and Universal Waste Disposal Regulations set forth by the Resource Conservation and Recovery Act (RCRA); 40 CFR 260-299.

B. All lead-contaminated material classified as hazardous waste will be transported to and disposed of at an EPA or State approved hazardous waste treatment, storage, or disposal facility off site.

C. Dispose of lead contaminated waste/rinse water as hazardous or non-hazardous waste on the basis of sample analysis (TCLP) results.

D. All documentation of transportation and disposal transactions such as dump receipts, trip tickets, and waste manifests shall be completed and include in the final report for the building owner.

3.8 PROJECT CLOSE OUT

A. After achieving acceptable air sample clearance and dismantling the work area, the Contractor shall be released after the following items are completed:

1. Removal of all temporary signs, labels, tape and glue/tape adhesive residue.

2. Removal of all temporary devices, facilities, and equipment.

B. Upon completion of the project, the Contractor shall submit final documentation to the Owner, including but not limited to, all waste handling/shipping documentation/manifests.

END OF SECTION 011130

SECTION 011140

STORAGE TANK REMOVAL

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. This specification outlines the general requirements for the cleaning and removal (e.g., closure) of petroleum-containing underground storage tanks (USTs) and above ground storage tanks (ASTs) as per 25 Pa. CODE § 245 Administration of the Storage Tank and Spill Prevention Program.

1. Regulated Underground Storage Tanks are defined as tanks used to contain regulated substances with a capacity of more than 110 gallons where 10 percent or more of the volume is below the surface of the ground.

2. Regulated Substances include, but are not limited to, petroleum, including crude oil and/or fraction thereof and hydrocarbons which are liquid at standard conditions of temperature and pressure including but not limited to, petroleum products such as, fuel oil, used oil, oil sludge, oil reuse, diesel, kerosene, and gasoline.

3. Tanks that meet ALL the following requirements are NOT REGULATED and are not required to follow PADEP storage tank regulations:

    a. The tank was emptied before December 22, 1988.

    b. The tank has remained out of operation since before December 22, 1988.

    c. The tank does not pose a current or potential threat to human health and the environment.

4. Tanks which store heating oil used on the premises where stored are NOT REGULATED USTs.

5. ASTs which store less than 30,000 gallons of heating oil used on the premises where stored are NOT REGULATED.

B. Decisions regarding regulated and un-regulated USTs will be made by an environmental professional and/or a PADEP-certified Tank Contractor

C. Regulated tanks must be closed by a PADEP-certified Tank Contractor and in accordance with applicable regulations.

D. The closure of unregulated tanks do not require a PADEP-certified Tank Contractor.

E. The Owner's Representative will observe tank cleaning and removal, and will conduct soil sampling after removal of USTS, whether REGULATED or NOT REGULATED. Sampling and analysis will conform to PADEP guidance for tank closures.

1.2 CODES AND REGULATIONS

A. Pennsylvania Department of Environmental Protection (PADEP)

1. Administration of the Storage Tank and Spill Prevention Program (25 Pa Code 245). Closure Requirements for Underground Storage Tank Systems (Document 263-4500-601).

2. Closure Requirements for Underground Storage Tank Systems (Document 263-4500-601).

3. Applicability of Chapter 245.453-Assessing the Site at Closure or Change-In-Service- to UST Systems Closed Prior to the Effective Date of the Federal Regulations (Document 263-0900-014).

4. Site Assessment Sampling Requirements at Regulated Storage Tank System Closures (document 2630-BK-4699, Rev. 9/2020.

5. 2020 Management of Fill Policy (Document 258-2182-773).

6. Residual Waste and Special Handling Waste Streams (Document 258-2000-764).

7. 25 Pa. Code Chapters 287 to 299 (residual waste regulations).

8. 25 Pa. Code Chapters 271 to 285 (municipal waste regulations) Solid Waste Management Act, 35 P.S. §§ 6018.101 et seq.

9. Land Recycling and Environmental Remediation Standards Act, 35 P.S. §§ 6026.101 et seq.

10. The Storage Tank and Spill Prevention Act (the Act of July 6, 1989, as amended 35 P.S. Section 6021.101 et seq.) and Chapter 245.454.

11. API Publication 2015, Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks.

B. City of Philadelphia, Department of Licenses and Inspections.

C. Code of Federal Regulations (CFR) – 40 CFR Part 261 Subpart C.

1.3 SUBMITTALS

A. The Contractor shall provide copies of PADEP-Certified Installer Certificate, both individual and company.

B. The Contractor shall provide copies of all worker certifications associated with OSHA 40 Hour Hazardous Waste Site Health and Safety Training in accordance with 29 CFR 1910.120.

C. Contractor shall provide a Site-specific Health and Safety Plan.

D. Submit at the pre-construction meeting the name, address and sampling requirements of the proposed facility to receive fill.

E. Contractor shall submit tickets/receipts/records/manifests/bills of lading for any material shipped offsite. Submittal of these documents shall be required for payment.

1.4 OWNER RESPONSIBILITIES

A. The Owner will pay the PADEP registration fees for tanks that require registration prior to removal.

B. Owners Representative will conduct soil sampling to support the characterization and disposal of materials to be transported offsite.

C. Owners Representative will provide to Contractor soil sampling diagram, chain-of-custody for samples, and laboratory report to support disposal approvals.

D. Owner's Representative will observe UST cleaning and removals and collect soil samples for analysis to document soil conditions after removal.

E. If regulated tank, Owner's Representative will prepare the PADEP UST System Closure Report Form.

1.5 MEASUREMENT AND PAYMENT

A. The measurement of petroleum-containing soils with concentrations that are unacceptable for reuse on-site and requiring disposal at a permitted facility, will be based on the measured weight of soil delivered to the receiving facility. Weights shall be measured at the receiving facility scale or other means acceptable to the Owner and confirmed in writing. Payment for disposal will not be made until final tickets/receipts/records/manifests/bills of lading are provided.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

3.1 GENERAL REQUIREMENTS

A. The Contractor shall furnish all labor, material, tools, transportation and equipment necessary to remove and dispose of UST(s), associated electrical, structural, and product equipment, (e.g., dead men, anchor straps, piping, manways, piping, pumps, and dispenser(s), if present). This section specifies requirements for the environmental and tank assessment, permitting, removal and disposal of the UST(s). Generally, the work shall include, but not be limited to:

B. Submitting all necessary notices, obtaining all permits and licenses, and paying for all fees, and other costs in connection with the work. Obtaining all necessary approvals of all governmental departments having jurisdiction.

C. Conducting tank removal in a manner that minimizes interference with adjacent structures, if any.

D. Containerizing, removing, and properly disposing of residual stored products and sludges from the designated tanks and appurtenant equipment.

E. Clean, remove, and dispose of [UST(s) and appurtenant piping for the tank(s). The work shall include removal and proper disposal of fuel and residual sludges in the tanks and associated piping between the tanks and the building.

F. If a release is verified, the PADEP-certified tank contractor will notify the Owner and/or Owner's Representative and will report the release to the PADEP in accordance with §245.304 (c) (2). The contractor will provide a copy of the Notification of Release to the Owner.

G. Perform remediation of contaminated material, if necessary, as directed by the Owners Representative at the unit price established for the work.

H. Coordinate with the Owners Representative relative to the collection, sampling and analysis of impacted soils. Refer to ENVIRONMENTAL SOILS MANAGEMENT PLAN.

I. If a regulated tank is removed, support the preparation of the UST System Closure Report Form by completing and certifying Section II. Tank Handling Information. Owner's Representative will submit the Form to PADEP

END OF SECTION 011140

SECTION 011150

ENVIRONMENTAL SOILS HANDLING

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. This specification outlines the required tasks and procedures involved with the characterization, handling and disposal of unsuitable soil and related debris.

B. The Contractor is to assume that all soils, not cleared for on-site reuse, are to be transported offsite.

C. Soils that will be removed from the site are to be managed in accordance with the Pennsylvania Department of Environmental Protection (PADEP) Management of Fill Policy (2020).

D. Contractor shall supply all labor, materials and equipment to do all site preparation, clearing of work areas, excavation to the depth shown and/or indicated, support of utilities, maintenance of excavation, removal of all water, backfilling, disposal of excess material, grading, compaction, removal of contaminated materials/debris, contaminated liquids and all incidental work for the removal, transportation and disposal or treatment of excess or unusable material as shown on drawings, as specified and/or as recommended by the Owner's Representative

E. The prices bid for the items shall include all excavation, backfill, transportation and disposal. Excavation shall be in open cut, unless otherwise required due to safety reasons, protection of existing utilities, or other substantiated reason. Following bid submittal, no extra compensation will be allowed where hand excavation and backfill are employed. The Contractor shall be responsible for planning the work to avoid conflicts, obstructions, and other potential impediments to excavation identified in the project documents or visible at the work site prior to bid submittal.

F. Included in the excavation are concrete slabs, footings and foundations, asphalt paving, curbing, and road base materials as shown within the area depicted on project plans. Removal of these structures and materials is depicted on contract drawings.

G. If testing indicates that the volume of excavated materials meet the criteria of clean fill as per the Management of Fill Policy, no special handling requirements are imposed.

H. If localized petroleum or substances of potential human health or environmental concern are encountered in site soils beyond the limits provided in the attached drawings, at the recommendation of the Owner's Representative, the Contractor will excavate no more than an additional five (5) feet in any direction from the limits of the excavation. The contaminated soils, as identified on the drawings or recommended by the Owner's Representative, shall be excavated and stockpiled as described in 1.01, prior to loading into dump trailers for export and disposal or treatment. The Contractor may load directly into dump trailers if a permitted treatment or disposal facility has approved receipt of the materials for disposal. Analysis of contaminated soils shall be performed as required by the disposal facility by the Owner's Representative. This material shall be managed in accordance with all applicable federal, state and local regulations. Any additional excavation of contaminated materials will be at the direction of the Owners Representative.

I. All soil stockpiles shall be placed on 15-mil plastic sheeting and covered with 15-mil polyethylene plastic sheeting at the end of each working day. The plastic cover sheeting shall be weighted utilizing hay bales to prevent the 15-mil polyethylene plastic from blowing off these soil stockpiles and to prevent stormwater runoff from eroding these soil stockpiles.

J. The Contractor shall separate concrete, asphalt and construction debris from soil. The Contractor shall remove concrete, asphalt and construction debris immediately after excavation activities are completed. Debris shall be managed off-site in accordance with all applicable federal, state and local regulations.

K. The excavation shall be backfilled by the Contractor in accordance with the provisions of the Contract Specifications. Backfill material will meet the definition of Clean Fill as defined by the PADEP Management of Fill Policy. Certificates of Clean Fill or testing results will be required to demonstrate the materials are clean fill. All materials shall be approved by the Owner's Representative before being brought on-site.

1.2 CODES AND REGULATIONS

A. All work and disposal or treatment shall be performed in compliance with all applicable Federal, State, and City regulations including, but not limited to:

1. Pennsylvania Department of Transportation Officials (PennDOT)

    a. PennDOT Publication 408 - Standard Specification for Construction

2. United States Environmental Protection Agency (USEPA)

a. Test Method for Evaluating Solid Waste (SW-846)

b. Resource Conservation and Recovery Act (RCRA), 42 U.S.C. §6901 et seq.

3. Pennsylvania Department of Environmental Protection (PADEP)

a. 2020 Management of Fill Policy (Document 258-2182-773)

b. Residual Waste and Special Handling Waste Streams (Document 258-2000-764)

c. 25 Pa. Code Chapters 287 to 299 (residual waste regulations)

d. 25 Pa. Code Chapters 271 to 285 (municipal waste regulations) Solid Waste Management Act, 35 P.S. §§ 6018.101 et seq.

e. Land Recycling and Environmental Remediation Standards Act, 35 P.S. §§ 6026.101 et seq.

4. Code of Federal Regulations (CFR) – 40 CFR Part 261 Subpart C

1.3 PERMITS

A. The Contractor shall be responsible for obtaining all necessary permits and approvals required for the performance of the work. Permits shall include at a minimum construction permits, waste hauling and disposal permits and all other permits required to complete the work in compliance with all applicable regulations. The Contractor will be required to submit proof of such compliance prior to starting the work.

1.4 SUBMITTALS

A. Submit at the pre-construction meeting the name, address and sampling requirements of the proposed facility to receive fill.

B. Submit tickets/receipts/records/manifests/bills of lading for any material shipped offsite. These documents shall be required for payment.

1.5 OWNER RESPONSIBILITIES

A. Owners Representative will conduct soil sampling to support the characterization and disposal of materials to be transported offsite. Sample collection will be based on Contractors volume estimate, the Management of Fill Policy, and the selected disposal facility described in Section 1.04.A.

B. Owners Representative will provide to Contractor soil sampling diagram, chain-of-custody for samples, and laboratory report.

C. If excavated materials characterize as clean fill, the Owner's Representative will prepare and provide a Clean Fill Certificate, if requested by the receiving facility/site.

1.6 MEASUREMENT AND PAYMENT

A. The measurement of soils deemed unsuitable for use on site and requiring disposal or treatment at a permitted facility, will be based on the unit rate per ton of soil delivered to the receiving facility. Weights shall be measured at the receiving facility scale or other means acceptable to the Owner and confirmed in writing. Payment for disposal or treatment will not be made until final tickets/receipts/records/manifests/bills of lading are provided.

1.7 DEFINITIONS

A. Clean Fill– Uncontaminated, non water-soluble, non-decomposable, inert solid material used to level an area or bring an area to grade. Uncontaminated means that no regulated substance concentrations exceed the Clean Fill Concentration Limits as per the Management of Fill Policy. The term includes soil, rock, stone, dredged material, used asphalt, and brick, block or concrete from construction and demolition activities that is separate from other waste and recognizable as such (25 Pa. Code §§ 271.101 and 287.101).

B. Contaminated (Regulated, Non-hazardous) Fill - Soil, rock, stone, dredged material, used asphalt, historic fill, and brick, block or concrete from construction and demolition activities that is separate from other waste and recognizable as such that has been affected by a spill or release of a regulated substance and the concentrations of regulated substances exceed the Clean Fill Concentration Limits.

PART 2 – PRODUCTS

2.1 FILL TRANSPORT

A. The Contractor shall provide transport fill material in a using equipment or containers that are free and clear of deleterious material, sealed or lined such that no spillage or leakage can occur between locations during transport. Equipment or containers used for transport of material shall be managed to prevent cross contamination of clean fill.

PART 3 -- EXECUTION

3.1 GENREAL REQUIREMENTS

A. The contractor shall handle, transport, reuse or dispose of all excess fill material consistent with all applicable regulations.

B. The Contractor shall clearly define, in writing, the means and methods to manage fill material prior to the start of work and clearly document the conformance during the completion of the work.

C. The Contractor shall be responsible for providing a clean work area. Debris, soil and other materials dislodged from equipment onto access roads or adjacent properties shall be immediately collected and removed by the Contractor.

D. Testing and ultimate disposal documentation shall be retained and copies provided to the Owner, consistent with the Submittals Section.

END OF SECTION 011150

SECTION 012200

UNIT PRICES

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

C. Defect assessment and non-payment for rejected work.

1.2 RELATED REQUIREMENTS

A. Document 00 2113 - Instructions to Bidders: Instructions for preparation of pricing for Unit Prices.

B. Document 00 4322 - Unit Prices Form: List of Unit Prices as supplement to Bid Form

C. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

1.3 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.4 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.5 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

B. Owner will take all measurements and compute quantities accordingly.

C. Assist by providing necessary equipment, workers, and survey personnel as required.

D. Measurement Devices:

1. Weigh Scales: Inspected, tested and certified by the applicable state Weights and Measures department within the past year.
2. Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle.
3. Metering Devices: Inspected, tested and certified by the applicable state department within the past year.

E. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight

F. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

G. Measurement by Area: Measured by square dimension using mean length and width or radius.

H. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

I. Stipulated Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

J. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Architect prior to starting work.

K. Contractor's Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes, calculate and certify quantities for payment purposes.

1.6 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

B. Payment will not be made for any of the following:

1. Products wasted or disposed of in a manner that is not acceptable.
2. Products determined as unacceptable before or after placement.
3. Products not completely unloaded from the transporting vehicle.
4. Products placed beyond the lines and levels of the required Work.
5. Products remaining on hand after completion of the Work.
6. Loading, hauling, and disposing of rejected Products.

1.7 DEFECT ASSESSMENT

A. Replace Work, or portions of the Work, not complying with specified requirements.
B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct one of the following remedies:
    1. The defective Work may remain, but the unit price will be adjusted to a new unit price at the discretion of Architect.
    2. The defective Work will be partially repaired to the instructions of the Architect, and the unit price will be adjusted to a new unit price at the discretion of Architect

C. If, in the opinion of Owner, it is not practical to remove and replace the Work, Owner will direct one of the following remedies:
    1. The defective Work may remain, but the unit price will be adjusted to a new unit price at the discretion of Owner.
    2. The defective Work will be partially repaired to the instructions of the Owner, and the unit price will be adjusted to a new unit price at the discretion of Owner.

D. The individual specification sections may modify these options or may identify a specific formula or percentage price reduction.

E. The authority of Owner to assess the defect and identify payment adjustment is final.

1.8 SCHEDULE OF UNIT PRICES

A. Unit Price No. 1: Replacement of Damaged Brick Veneer.
    1. Description: Replace brick veneer
    2. Unit of Measurement: SF.
    3. Estimated Quantity: as indicated on drawings.

B. Unit Price No. 2: Repointing of Brick Mortar Joints.
    1. Description: Repair brick mortar joints.
    2. Unit of Measurement: LF
    3. Estimated Quantity: as indicated on drawings.

C. Unit Price No. 3: Repair of Overhead Spalls in Concrete.
    1. Description: Replace brick veneer.
    2. Unit of Measurement: SF
    3. Estimated Quantity: as indicated on drawings.

D. Unit Price No. 4: Repair of Fine Cracks in Brick Mortar with Sealant.
    1. Description: Repair sealant to brick mortar joints
    2. Unit of Measurement: SF
    3. Estimated Quantity: as indicated on drawings.

E. Unit Price No. 5: Replacement of Brick Mortar Joints.
    1. Description: Repair brick mortar joints.
    2. Unit of Measurement: LF
    3. Estimated Quantity: as indicated on drawings.

F. Unit Price No. 6: Repair of Interior Glazed Block
   1. Description: Repair of Interior Glazed Block
   2. Unit of Measurement: SF
   3. Estimated Quantity: as indicated on drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 012200

SECTION 012500

SUBSTITUTION PROCEDURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 012300 "Alternates" for products selected under an alternate.
2. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitution Request Form: Provide detailed explanation on Contractor's letterhead.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.

b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
   a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
   b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 – PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    b. Requested substitution provides sustainable design characteristics that specified product provided for achieving LEED prerequisites and credits, if applicable.
    c. Substitution request is fully documented and properly submitted.
    d. Requested substitution will not adversely affect Contractor's construction schedule.
    e. Requested substitution has received necessary approvals of authorities having jurisdiction.
    f. Requested substitution is compatible with other portions of the Work.
    g. Requested substitution has been coordinated with other portions of the Work.
    h. Requested substitution provides specified warranty.
    i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
2. Project Partner and Property owner will review all substitutions that meet compliance requirements and have final approval.

B. Substitutions for Convenience: Not allowed unless otherwise indicated.

C. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
    b. Requested substitution does not require extensive revisions to the Contract Documents.
    c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    d. Requested substitution provides sustainable design characteristics that specified product provided.
    e. Substitution request is fully documented and properly submitted.
    f. Requested substitution will not adversely affect Contractor's construction schedule.
    g. Requested substitution has received necessary approvals of authorities having jurisdiction.
    h. Requested substitution is compatible with other portions of the Work.
    i. Requested substitution has been coordinated with other portions of the Work.
    j. Requested substitution provides specified warranty.
    k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2. Project Partner and Property owner will review all substitutions that meet compliance requirements and have final approval.

PART 3 – EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012600

CONTRACT MODIFICATION PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

1.2 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within 10 working days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect. The Contractor shall have fifteen (15) working days after the discovery of an unforeseen condition or an item that is not otherwise documented as part of the scope of the Work to

submit a Change Order Request (COR). If the COR is not submitted within the required time frame, or the work item is started prior to approval by the Architect, Project User, Rebuild, or Owner, any additional cost for the work item shall be disallowed and the cost will be assumed by the Contractor.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

1.4 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.
B. For any Change Order, the Contractor must submit a detailed proposal that provides the cost of materials, labor, overhead, and profit. Contractor may only submit Change Orders with markups for overhead and profit in accordance with the not-to-exceed percentage limits allowable by Rebuild. The current limits are below:
   1. Maximum Markup Percentage Allowable on Self-Performed Work:

Net Cost of Labor and Materials for Self-Performed Work	Percentage Limit
Up to $25,000	12%
From $25,000 to $50,000	10%
Over $50,000	8%

   2. Maximum Markup Percentage Allowable on Work Performed by Subcontractors is 8% of the net cost of labor and materials.
C. All Change Orders relating to price and/or time are subject to prior acceptance or approval by the Rebuild Office, or express ratification of Change Order work already for the Rebuild Office. The Rebuild Office shall make the final determination as to net cost of labor and materials.
D. If, after submission of a cost proposal for a change order, PAID, the Rebuild Office, the Project User, and the Contractor cannot agree upon a price within a reasonable amount of time, the Rebuild Office may direct the Project User to direct the Contractor to perform or complete the extra or additional work notwithstanding that there is no agreement between the parties as to

price, and the Contractor shall proceed to perform the work under Force Account so as to avoid any delay or interference to the progress of the work. In all such cases, the Contractor shall promptly comply and maintain proper Force Account time sheets and records per the Rebuild Rulebook Section VIII.8.

1.5 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900

PAYMENT PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
   1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including Application for Payment forms with Continuation Sheets and Contractor's Construction Schedule.
   2. Submit the final Schedule of Values to Architect prior to the commencement of work in a form acceptable to the owner.
   3. Final Schedule of Values should reflect the requirements and lines as required by Owner, including Rebuild.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
   1. Identification: Include the following Project identification on the Schedule of Values:
      a. Project name and location.
      b. Name of Architect.
      c. Architect's project number.
      d. Contractor's name and address.
      e. Date of submittal.
   2. Submit draft of AIA Document G703 Continuation Sheets.
   3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
   4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
   5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

6. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include cost each item on a separate line. Separate out and show general overhead expenses for each item in addition to the cost.
    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place are to be shown as separate line items in the Schedule of Values under the General Conditions.
8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

    1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Each Application for Payment shall include a monthly report and updated EOP/LCP tracker information.

C. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

D. Payment Application Times: Progress payments shall be submitted to Architect by the 10th of the month. The period covered by each Application for Payment is one month, ending on the 20th.

E. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.

F. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

    1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
    2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

G. Transmittal: Submit a signed and notarized original copy of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
   1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

   1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
   2. When an application shows completion of an item, submit final or full waivers.
   3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
   4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

   1. List of subcontractors.
   2. Schedule of Values.
   3. Contractor's Construction Schedule (preliminary if not final).
   4. Submittals Schedule (preliminary if not final).
   5. List of Contractor's staff assignments.
   6. List of Contractor's principal consultants.
   ~~7. Copies of building permits.~~
   8. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
   9. Initial progress report.
   10. Report of preconstruction conference.
   11. Certificates of insurance and insurance policies.

J. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

   1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
   2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

K. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final, liquidated damages (see contract) settlement statement.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100

PROJECT MANAGEMENT AND COORDINATION

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination Drawings.
2. Project meetings.
3. Requests for Interpretation (RFIs).

1.2 DEFINITIONS

A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid

conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Preparation of the Rebuild Contract Participation Worksheet (also known as Project Budget Template). The Contractor (First-Tier Contractor) shall add all Second-Tier Contractors with which the Contractor intends to contract.
4. Update as the Project Budget Template as all Subcontracts are executed and as other changes to the project plan occur.
5. Preparation of and update to a Subcontracting Schedule.
6. Installation and removal of temporary facilities and controls.
7. Delivery and processing of submittals.
8. Progress meetings.
9. Preinstallation conferences.
10. Project closeout activities.
11. Startup and adjustment of systems.
12. Project closeout activities.

1.4 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
    a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    b. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
3. Number of Copies: Submit three opaque copies of each submittal. Architect will return one copy.
4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

1.5 PROJECT MEETINGS

A. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    a. The Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. Review of mockups.
    i. Possible conflicts.
    j. Compatibility problems.
    k. Time schedules.
    l. Weather limitations.
    m. Manufacturer's written recommendations.
    n. Warranty requirements.
    o. Compatibility of materials.
    p. Acceptability of substrates.
    q. Temporary facilities and controls.
    r. Space and access limitations.
    s. Regulations of authorities having jurisdiction.
    t. Testing and inspecting requirements.
    u. Installation procedures.
    v. Coordination with other work.
    w. Required performance results.
    x. Protection of adjacent work.
    y. Protection of construction and personnel.
    z. Subcontracting Schedule
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

B. Progress Meetings: Participate in progress meetings at biweekly intervals, or more frequently as progress of the Project may warrant. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of Owner, Architect, Rebuild and/or other City agencies or representatives, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
        1.) Review schedule for next period.

    b. Review present and future needs of each entity present, including the following:
        1.) Interface requirements.
        2.) Sequence of operations.
        3.) Status of submittals.
        4.) Deliveries.
        5.) Off-site fabrication.
        6.) Access.
        7.) Site utilization.
        8.) Temporary facilities and controls.
        9.) Work hours.
        10.) Hazards and risks.
        11.) Progress cleaning.
        12.) Quality and work standards.
        13.) Status of correction of deficient items.
        14.) Field observations.
        15.) RFIs.
        16.) Status of proposal requests.
        17.) Pending changes.
        18.) Status of Change Orders.
        19.) Pending claims and disputes.
        20.) Documentation of information for payment requests.

3. Minutes: Architect will record and distribute the meeting minutes to Owner, the Contractor and uploaded to Unifier.

1.6 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project name.
2. Date.
3. Name of Contractor.
4. Name of Architect.
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

C. Architect's Action: Architect will review each RFI, determine action required, and return it with a response. Allow three working days for Architect's response for each RFI, unless prior approval for shorter response time has been issued by the Architect. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for coordination information already indicated in the Contract Documents.
    d. Requests for adjustments in the Contract Time or the Contract Sum.
    e. Requests for interpretation of Architect's actions on submittals.
    f. Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.

3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 1 Section "Contract Modifications."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

D. On receipt of Architect's action, immediately distribute the RFI response to affected parties. Review response and notify Architect within three days if Contractor disagrees with response.

1.7 WEB-BASED PROJECT MANAGEMENT INFORMATION SYSTEM

A. Contractor shall be required to use Rebuild's web-based Project Management Information System build on the Oracle Primavera Unifier system. This system will facilitate review of design and construction documentation by the Project User, Rebuild and City project partners, as well as provide a central location for project information. The Project Management Information System will be used for purposes of hosting and managing Project communication and documentation until Final Completion.

1. Contractor will be provided a single User account for the system by Rebuild.
2. Contractor will not be able to use the Rebuild system to coordinate with subcontract and Contractor shall use own discretion for a web-based project management system and processes to coordinate with subcontractors.

B. The Oracle Primavera Unifier system will be used for core functions including but not limited to:

1. Storage of project contacts
2. Submission and review of payment applications
3. Submission and review of project schedules
4. Submission of Potential Change Order requests
5. Log risks and issues
6. Submission and review of meeting agendas, minutes, and bi-weekly updates
7. Storage of permits
8. Storage of Daily Observations
9. Transmission of Architect's Supplemental Instructions
10. Storage of Drawings and Specifications
11. Submissions and review of Submittals and Requests for Information
12. Storage of inspector reports
13. Facilitation of closeout procedures

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 013100

Rebuild Project Management Information System

Rebuild projects require that Project Users, Lead Designers, and General Contractors utilize Rebuild's Project Management Information System built on the Oracle Primavera Unifier. This system will facilitate review of design and construction documentation by Rebuild and City project partners, as well as provide a central location for project information to key partners. Implementation information can be found below, categorized by project phase.

Rebuild has procured and will issue licenses to one representative of each of the organizations listed below as "Users". Note that subcontractors to the General Contractor or subconsultants to the lead Designer will not be given licenses to the system. Subcontractor/subconsultant management systems and processes are left to the discretion of the General Contractor and Lead Designers.

DURING DESIGN

Users:

- Rebuild Project Manager
- Project User (as applicable)
- PRA Manager (as applicable)
- Lead Designer

Core functions include but are not limited to:

- Storage of project contacts
- Submission and review of payment applications
- Submission and review of project schedules
- Submission and review of meeting agendas, minutes, and monthly updates
- Storage of permits
- Submission of professional service deliverables
- Submission of designs for review

DURING CONSTRUCTION

Users:

- Rebuild Project Manager
- Project User (as applicable)
- PRA Manager (as applicable)
- Lead Designer
- General Contractor (or equivalent)
- Construction Inspector
- EOP Monitor

Core functions include but are not limited to:

- Storage of project contacts

- Submission and review of payment applications
- Submission and review of project schedules
- Submission of Potential Change Order (PCO) requests
- Log risks and issues
- Submission and review of meeting agendas, minutes, and bi-weekly updates
- Storage of permits
- Storage of Architect/Engineer Daily Observations
- Transmission of Architect's Supplemental Instructions
- Storage of Drawings & Specifications
- Submission and review of Submittals and Requests for Information
- Storage of inspector reports
- Facilitation of closeout processes

SECTION 013200

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's Construction Schedule.
2. Submittals Schedule.
3. Daily construction reports.
4. Field condition reports.

B. See Division 1 Section "Payment Procedures" for submitting the Schedule of Values.

C. See Division 1 Section "Photographic Documentation" for submitting construction photographs.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

E. Major Area: A story of construction, a separate building, or a similar significant construction element.

1.3 SUBMITTALS

A. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Architect's final release or approval.

B. Contractor's Construction Schedule: Submit three opaque copies of initial schedule, large enough to show entire schedule for entire construction period.

C. CPM Reports: Concurrent with CPM schedule, submit three copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.

D. Daily Construction Reports: Submit two copies at monthly intervals.

E. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

1.4 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 – PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
2. Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.
1. Contract completion date shall not be changed by submission of a schedule that shows an early or later completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
2. Submittal Review Time: Include review and resubmittal times indicated in the General and Supplementary Conditions. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
3. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Work Restrictions: Show the effect of the following items on the schedule:
   a. Coordination with existing construction.

b. Limitations of continued occupancies.
c. Uninterruptible services.
d. Partial occupancy before Substantial Completion.
e. Seasonal variations.
f. Environmental control.

5. Work Stages: Indicate important stages of construction for each major portion of the Work.
6. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 10 days after date established for the Notice to Proceed.
   a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
3. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.

C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
   a. Preparation and processing of submittals.
   b. Mobilization and demobilization.
   c. Purchase of materials.
   d. Delivery.
   e. Fabrication.
   f. Utility interruptions.
   g. Installation.
   h. Work by Owner that may affect or be affected by Contractor's activities.
   i. Testing, adjusting, and balancing.
2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.

3. Processing: Process data to produce output data on a computer-drawn, time- scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
    a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

D. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Principal events of activity.
4. Immediately preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.

E. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
2. Equipment at Project site.
3. Material deliveries.
4. High and low temperatures and general weather conditions.
5. Accidents.
6. Stoppages, delays, shortages, and losses.
7. Meter readings and similar recordings.
8. Orders and requests of authorities having jurisdiction.
9. Services connected and disconnected.
10. Equipment or system tests and startups.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report.

PART 3 – EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals and in conjunction with each Application for Payment, update schedule to reflect actual construction progress and activities.

1. Revise schedule immediately after Application for Payment or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect, Owner, key subcontractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013233

PHOTOGRAPHIC DOCUMENTATION

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Periodic construction photographs.
3. Final Completion construction photographs.
4. Time-lapse sequence construction videotapes.

B. Related Requirements:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.
2. Section 013300 "Submittal Procedures:" Submitting schedules and reports.
3. Section 017700 "Closeout Procedures:" Submitting digital media as Project Record Documents at Project closeout.
4. Section 017900 "Demonstration and Training:" Submitting videotapes of demonstration of equipment and training of Owner's personnel.

1.2 SUBMITTALS

A. Key Plan: Submit for review by the Architect, two copies of key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same label information as corresponding set of photographs.

B. Construction Photographs: Submit one photo CD of photographic views to be utilized for Architects review of each application for payment.

1. Digital Images: Submit a complete set of digital image electronic files as a Project Record Document on CD-ROM or other acceptable medium. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as the sensor, uncropped.

PART 2 – PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in uncompressed TIFF format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1600 by 1200 pixels

PART 3 – EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image- editing software.

1. Date and Time: Include date and time in filename for each image.
2. Field Office Images: Maintain one set of images on CD-ROM in the field office at Project site, available at all times for reference. Identify images same as for those submitted to Architect.

C. Preconstruction Photographs: Before commencement of excavation, take color, digital photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.

1. Flag excavation areas before taking construction photographs.
2. Take photographs to show existing conditions adjacent to property before starting the Work.
3. Take photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

D. Periodic Construction Photographs: Take 40 color, digital photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken and as directed by the Architect.

E. Architect-Directed Construction Photographs: From time to time, Architect will instruct Contractor about number and frequency of color, digital photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.

F. Time-Lapse Sequence Construction Photographs: Take 12 color, digital photographs as indicated, to show status of construction and progress since last photographs were taken.

1. Frequency: Take photographs monthly, coinciding with the cutoff date associated with each Application for Payment.
2. Vantage Points: Following suggestions by Architect and Contractor, photographer to select vantage points. During each of the following construction phases, take not less than 12 of the required shots from same vantage point each time to create a time-lapse sequence as follows:
    a. Commencement of the Work, through completion of subgrade construction.
    b. Above-grade structural framing.
    c. Exterior building enclosure.
    d. Interior Work, through date of Substantial Completion.

G. Final Completion Construction Photographs: Take 40 color digital photographs after date of Substantial Completion for submission as Project Record Documents. Architect will direct photographer for desired vantage points.

1. Do not include date stamp.

H. Additional Photographs: Architect may issue requests for additional photographs, in addition to periodic photographs specified.

1. Three days' notice will be given, where feasible.
2. In emergency situations, take additional photographs within 24 hours of request.
3. Circumstances that could require additional photographs include, but are not limited to, the following:
    a. Special events planned at Project site.
    b. Immediate follow-up when on-site events result in construction damage or losses.
    c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
    d. Substantial Completion of a major phase or component of the Work.
    e. Extra record photographs at time of final acceptance.
    f. Owner's request for special publicity photographs.

END OF SECTION 013233

SECTION 013300

SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 RELATED DOCUMENTS

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
B. Related Requirements:

1. Section 012900 “Payment Procedures” for submitting Applications for Payment and the Schedule of Values.
2. Section 013100 “Project Management and Coordination” for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
3. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
4. Section 014000 “Quality Requirements” for submitting test and inspection reports and for mockup requirements.
5. Section 017700 “Closeout Procedures” for submitting warranties.
6. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
7. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
8. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
9. Divisions 02 through 32 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's and Owner's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's and Owner's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule/Log: Submit a schedule/log of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and Owner and additional time for handling and reviewing submittals required by those corrections.
   1. An example Submittal Log by Rebuild is provided as an attachment to this Section.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. General: Electronic copies of CAD Drawings (2009 CAD or Revit) of the Contract Documents will be offered by Architect for Contractor's use for a fee.

   1. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
   2. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement.
   3. The following digital data files will by furnished for each appropriate discipline:
      a. Floor plans.
      b. Reflected ceiling plans.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
   3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittals Schedule and Log: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities. Provide Submittal Schedule and Log in digital tabular form (Microsoft Excel Format); include the following information:
    1. Specification section name and number
    2. Type of product
    3. Type of submittal (Product Data, Shop Drawing, Sample, Informational)
    4. Number /name of room or space (if applicable)
    5. Date of Submittal Conference for this item
    6. Contractor’s scheduled submittal date (if not included in a Submittal Conference)
    7. Contractor’s scheduled receipt of reviewed submittal date
    8. Sequential review time (additional 7 Days) required or specified for this item.
    9. Time allowance for re-submittal process if required.
    10. List of products which matches basis of design or specified model or item in lieu of submittal.

D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

    1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect or Construction Manager will advise Contractor when a submittal being processed must be delayed for coordination.
    2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
    3. Resubmittal Review: Allow 15 days for review of each resubmittal.
    4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

    1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
    2. Name file with submittal number or other unique identifier, including revision identifier.
        a. File name shall use project identifier and Specification Section number followed by a decimal point and then a two digit number (061000.01). Resubmittals shall include an “R” followed by a hyphen and a two digit number (061000.01R-01).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect and Construction Manager.
4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software containing the following information:
    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name of Construction Manager.
    e. Name of Contractor.
    f. Name of firm or entity that prepared submittal.
    g. Names of subcontractor, manufacturer, and supplier.
    h. Category and type of submittal.
    i. Submittal purpose and description.
    j. Specification Section number and title.
    k. Specification paragraph number or drawing designation and generic name for each of multiple items.
    l. Drawing number and detail references, as appropriate.
    m. Location(s) where product is to be installed, as appropriate.
    n. Related physical samples submitted directly.
    o. Indication of full or partial submittal.
    p. Transmittal number, numbered consecutively.
    q. Submittal and transmittal distribution record.
    r. Other necessary identification.
    s. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:

    a. Project name.
    b. Number and title of appropriate Specification Section.
    c. Manufacturer name.
    d. Product name.

F. Options: Identify options requiring selection by Architect

G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect and Owner on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.

3. Resubmit submittals until they are marked with approval notation from Architect's and Construction Manager's action stamp

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's and Construction Manager's action stamp.

PART 2 – PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Post electronic submittals as PDF electronic files directly to Project Web site specifically established for Project.
   a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
   a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
   b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
   a. Manufacturer's catalog cuts.
   b. Manufacturer's product specifications.
   c. Standard color charts.
   d. Statement of compliance with specified referenced standards.
   e. Testing by recognized testing agency.

f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:
   a. Wiring diagrams showing factory-installed wiring.
   b. Printed performance curves.
   c. Operational range diagrams.
   d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:
   a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Dimensions.
   b. Identification of products.
   c. Fabrication and installation drawings.
   d. Roughing-in and setting diagrams.
   e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
   f. Shopwork manufacturing instructions.
   g. Templates and patterns.
   h. Schedules.
   i. Design calculations.
   j. Compliance with specified standards.
   k. Notation of coordination requirements.
   l. Notation of dimensions established by field measurement.
   m. Relationship to adjoining construction clearly indicated.
   n. Seal and signature of professional engineer if specified.
   o. Wiring Diagrams: Differentiate between manufacturer-installed and field- installed wiring.
2. Mechanical and electrical shop drawings: The mechanical and electrical systems indicated on the drawings are essentially diagrammatic. Provide dimensioned shop drawings for all plumbing piping, ductwork, heating system piping, underground hot water piping, hot water boilers, conduit raceways, cable tray and accessories to indicate complete systems and details.
   a. Provide shop drawings at ¼ inch per foot minimum scale in all mechanical rooms, boiler rooms, telecommunication (MDF and IDF) rooms and electrical rooms, and elsewhere where accuracy or location is necessary for coordination or installation purposes.

b. Mechanical: Include separate ductwork shop drawings at not less than ¼ inch per foot scale showing dimensioned duct penetrations through structure (floors, roof and walls); indicate all equipment locations, weights and pad details for all HVAC equipment.
c. Include all critical dimensions for all equipment, including operational space required by the equipment manufacturer.

3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
4. Submit Shop Drawings in the following format:
   a. PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Submit samples for basis of design products or products specifically called out in the documents by brand, make, model and the like only where specifically requested in the specifications.
2. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
3. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of applicable Specification Section.
   e. Specification paragraph number and generic name of each item.
4. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
5. Disposition: Maintain sets of approved Samples at Project site, available for quality- control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   a. Number of Samples: Submit two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    a. Number of Samples: Submit three sets of Samples. Architect and Owner will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
        1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
        2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.
5. Submit product schedule in the following format:
    a. PDF electronic file.

F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."

G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."

H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."

I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."

J. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

R. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

S. Research/Evaluation Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
   1. Name of evaluation organization.
   2. Date of evaluation.
   3. Time period when report is in effect.
   4. Product and manufacturers' names.
   5. Description of product.
   6. Test procedures and results.
   7. Limitations of use.

T. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

U. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

V. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

W. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

X. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
   1. Preparation of substrates.
   2. Required substrate tolerances.
   3. Sequence of installation or erection.
   4. Required installation tolerances.
   5. Required adjustments.
   6. Recommendations for cleaning and protection.

Y. Manufacturer's Field Reports: Prepare written information documenting factory- authorized service representative's tests and inspections. Include the following, as applicable:
   1. Name, address, and telephone number of factory-authorized service representative making report.
   2. Statement on condition of substrates and their acceptability for installation of product.
   3. Statement that products at Project site comply with requirements.
   4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
   5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   6. Statement whether conditions, products, and installation will affect warranty.
   7. Other required items indicated in individual Specification Sections.

Z. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

AA. Construction Photographs and Videotapes: Comply with requirements specified in Division 01 Section " Photographic Documentation."

BB. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.

1. Architect will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file, signed, and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 – EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect and Construction Manager.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S AND OWNER'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect and Construction Manager will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect and Construction Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:

    1. Reviewed.
    2. Reviewed with Notations.
    3. Revise and Resubmit.
    4. Rejected.
    5. No Action Taken or Required.

C. Informational Submittals: Architect and Owner will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect and Owner will forward each submittal to appropriate party.

D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect and Owner.

E. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

F. Submittals not required by the Contract Documents may be returned by the Architect without action.

ATTACHMENTS

1. Rebuild Submittal Log Example

END OF SECTION 013300

EXAMPLE ONLY

SUBMITTAL LOG print date 12/6/2022 PROJECT
NAME ADDRESS *(Update Info)*

Number	Section	Page	From Company	Submittal Description	Copy To	Planned Start of Trade Work	Planned Submittal Date	Actual Submittal Date	Submittal Return Date +14	Planned Resubmittal Date	Actual Resubmittal Date	Resubmittal Return Date +14	Action	Reviewed By
1	Division 1		PRA	Narrative- Monthly (for all projects over 4 weeks)	Rebuild/PRA/AE	*Enter*	*Monthly*							Rebuild/AE/PPR
2			PRA	Certificate of Insurance (including Workers Comp)	Rebuild/PRA/AE	*Estimated*	*Pre Construction*							Rebuild/AE/PPR
3			PRA	Certificate of Payment and Performance Bond	Rebuild/PRA/AE	*Dates*	*Pre Construction*							Rebuild/AE/PPR
4			PRA	Bid Award	Rebuild/PRA/AE	*This*	*Pre Construction*							Rebuild/AE/PPR
5			PRA	Executed Contract	Rebuild/PRA/AE	*Column*	*Pre Construction*							Rebuild/AE/PPR
6			GC	Project Baseline Schedule	Rebuild/PRA/AE	.....	*Pre Construction*							Rebuild/AE/PPR
7			GC	Schedule of Values	Rebuild/PRA/AE	...	*Pre Construction*							Rebuild/AE/PPR
8			GC	LCP Tracker (confirmation of use Prime & Subs)	Rebuild/PRA/AE	...	*Pre Construction*							Rebuild/AE/PPR
9			GC	Project Estimated Hours	Rebuild/PRA/AE		*Pre Construction*							Rebuild/AE/PPR
10			GC	Project Estimated WMBE Targets Summary Sheet	Rebuild/PRA/AE		*Pre Construction*							Rebuild/AE/PPR
11			GC	Project Worforce Diversity Plan	Rebuild/PRA/AE		*Pre Construction*							Rebuild/AE/PPR
12			PRA/GC	Project Contact List (including subcontractors)	Rebuild/PRA/AE		*Pre Construction*							Rebuild/AE/PPR
13			PRA	Pre-Construction Meeting Minutes	Rebuild/PRA/AE		*For Record*							Rebuild/AE/PPR
13			GC	Onsite Labor Osha 10 Cards	Rebuild/PRA/AE		*Pre Construction*							Rebuild/AE/PPR
14			GC	OSHA 300 Form Posted	Rebuild/PRA/AE		*Pre Construction*							Rebuild/AE/PPR
15			GC	Company Safety Program	Rebuild/PRA/AE		*Pre Construction*							Rebuild/AE/PPR
16			GC	Site Specific Safety Plan	Rebuild/PRA/AE		*Pre Construction*							Rebuild/AE/PPR
17			GC	Phasing and Logistics Plan	Rebuild/PRA/AE		*Pre Construction*							Rebuild/AE/PPR
18			PRA/GC	Project Specific Submittal log (PD, Shop Drawings, Samples)	Rebuild/PRA/AE		*Pre Construction*							Rebuild/AE/PPR
19			GC	Submittal Cover Sheet Form	Rebuild/PRA/AE		*Pre Construction*							Rebuild/AE/PPR
20			PRA	Project Labor Agreement (contracts above 3 million)	Rebuild/PRA/AE	n/a	*As Required*							Rebuild/AE/PPR
21			PRA	Workforce MOU	Rebuild/PRA/AE	n/a	*As Required*							Rebuild/AE/PPR
22			PRA/GC	Maintain Permits Log- (L&I, PWD, etc)	Rebuild/PRA/AE		*Pre Construction*							Rebuild/AE/PPR
23			CITY	Street Department Approval	Rebuild/PRA/AE		*As Required*							Rebuild/AE/PPR
24			CITY	PWD Approval	Rebuild/PRA/AE		*As Required*							Rebuild/AE/PPR
25			CITY	Percent for Art Approval	Rebuild/PRA/AE		*As Required*							Rebuild/AE/PPR
26			AE	Zoning permit	Rebuild/PRA/AE		*As Required*							Rebuild/AE/PPR
27			AE/GC	Building Permit	Rebuild/PRA/AE		*Pre Construction*							Rebuild/AE/PPR
28			PRA/GC	Street /Sidewalk Closure Permit	Rebuild/PRA/AE		*As Required*							Rebuild/AE/PPR
29			GC	Dust Mitigation Permit	Rebuild/PRA/AE		*As Required*							Rebuild/AE/PPR
30			GC	PPR Site Activity Permit	Rebuild/PRA/AE		*Pre Construction*							Rebuild/AE/PPR
31			PRA	Notice to Proceed	Rebuild/PRA/AE		*For Record*							Rebuild/AE/PPR
32			PRA	Construction Kick Off Meeting Minutes	Rebuild/PRA/AE		*For Record*							Rebuild/AE/PPR
33			GC	Project Schedule Update	Rebuild/PRA/AE		*Monthly*							Rebuild/AE/PPR
34			GC	2 Week Look Ahead	Rebuild/PRA/AE		*Bi Weekly*							Rebuild/AE/PPR
35			GC	Payment Request (Rebuild format)	Rebuild/PRA/AE		*Monthly*							Rebuild/AE/PPR
36			PRA/GC	Project Specific Submittal log - Monthly Update	Rebuild/PRA/AE		*Monthly*							Rebuild/AE/PPR
37			GC	Change Order Request Form- KIRA	Rebuild/PRA/AE		*As Required*							Rebuild/AE/PPR
38			GC	Change Order Request Log	Rebuild/PRA/AE		*Monthly*							Rebuild/AE/PPR
39			GC	Request for Information Form	Rebuild/PRA/AE		*As Required*							Rebuild/AE/PPR
40			GC	Request for Information Log	Rebuild/PRA/AE		*As Required*							Rebuild/AE/PPR
41			Rebuild	EOP Review at 25% Project Completion	Rebuild/PRA/AE									Rebuild/AE/PPR
42			PRA	Construction Kick Off Meeting Minutes	Rebuild/PRA/AE		*For Record*							Rebuild/AE/PPR
43			PRA	Project Meeting Minutes- Bi-weekly	Rebuild/PRA/AE		*Bi Weekly*							Rebuild/AE/PPR
44			AE	AE Project Field Reports	Rebuild/PRA/AE		*Bi Weekly*							Rebuild/AE/PPR
45			Rebuild/AE	Notice of Correction	Rebuild/PRA/AE		*As Required*							Rebuild/AE/PPR
46			GC	Daily Report	Rebuild/PRA/AE		*Daily*							Rebuild/AE/PPR
47			GC	Report of Injury	Rebuild/PRA/AE		*As Required*							Rebuild/AE/PPR
48			GC	Maintain Special inspections Log	Rebuild/PRA/AE		*As Required*							Rebuild/AE/PPR
49			GC	Environmental Remediation Plan & Program	Rebuild/PRA/AE	N/A	*As Required*							Rebuild/AE/PPR
50			GC	Environmental Remediation Waste Disposal Certificates	Rebuild/PRA/AE	N/A	*As Required*							Rebuild/AE/PPR
51			GC	LEED certifications, (KIRA)	Rebuild/PRA/AE	N/A	*As Required*							Rebuild/AE/PPR
52			GC	Commisioning, as required	Rebuild/PRA/AE	N/A	*As Required*							Rebuild/AE/PPR
53			GC	L& I inspection Reports	Rebuild/PRA/AE		*As Required*							Rebuild/AE/PPR
54			PRA/GC	Project Specific Submittal log - Monthly Update	Rebuild/PRA/AE		*Monthly*							Rebuild/AE/PPR
55			PRA/GC	Notice of Substantial Completion	Rebuild/PRA/AE		*Closeout*							Rebuild/AE/PPR

EXAMPLE ONLY

SUBMITTAL LOG print date 12/6/2022 PROJECT
NAME ADDRESS *(Update Info)*

Number	Section	Page	From Company	Submittal Description	Copy To	Planned Start of Trade Work	Planned Submittal Date	Actual Submittal Date	Submittal Return Date +14	Planned Resubmittal Date	Actual Resubmittal Date	Resubmittal Return Date +14	Action	Reviewed By
56			GC	Punchlist Closeout	Rebuild/PRA/AE		*Closeout*							Rebuild/AE/PPR
57			GC	As built Documents	Rebuild/PRA/AE		*Closeout*							Rebuild/AE/PPR
58			GC	O & M Manuals	Rebuild/PRA/AE		*Closeout*							Rebuild/AE/PPR
59			GC	O & M Training	Rebuild/PRA/AE		*Closeout*							Rebuild/AE/PPR
60			GC	Temporary Certiciate of Occupancy- Certificate of Occupancy	Rebuild/PRA/AE	N/A	*As Required*							Rebuild/AE/PPR
61			PRA/GC	Project Closeout Audit- NICOLE	Rebuild/PRA/AE		*Closeout*							Rebuild/AE/PPR
62			PRA		Rebuild/PRA/AE									Rebuild/AE/PPR
63			PRA		Rebuild/PRA/AE									Rebuild/AE/PPR
64			PRA		Rebuild/PRA/AE									Rebuild/AE/PPR
65			PRA		Rebuild/PRA/AE									Rebuild/AE/PPR
66			PRA		Rebuild/PRA/AE									Rebuild/AE/PPR
(Spec section) -01	Division 2		GC	*Product Data per specs..*	Rebuild/PRA/AE	*Enter*	*As Required*							AE/LA/PE
			GC	*Product Data per specs..*	Rebuild/PRA/AE	*Estimated*								AE/LA/PE
			GC	*Product Data per specs*	Rebuild/PRA/AE	*Dates*								AE/LA/PE
			GC	*Product Data per specs*	Rebuild/PRA/AE	*This*								AE/LA/PE
			GC	*Product Data per specs*	Rebuild/PRA/AE	*Column*								AE/LA/PE
			GC	*Product Data per specs*	Rebuild/PRA/AE	.....								AE/LA/PE
			GC	*Product Data per specs*	Rebuild/PRA/AE	...								AE/LA/PE
			GC	*Product Data per specs*	Rebuild/PRA/AE	...								AE/LA/PE
			GC	*Product Data per specs*	Rebuild/PRA/AE									AE/LA/PE
			GC	*Product Data per specs*	Rebuild/PRA/AE									AE/LA/PE
			GC	*Samples per specs*	Rebuild/PRA/AE									AE/LA/PE
			GC	*Shop Drawings per specs*	Rebuild/PRA/AE									AE/LA/PE
			GC	*Mock ups per specs*	Rebuild/PRA/AE									AE/LA/PE

SECTION 014000

QUALITY REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this section.

C. Related Requirements:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.
2. Section 01 3200 - Construction Progress Documentation: Developing a schedule of required tests and inspections.
3. Section 01 3300 - Submittal Procedures: Submission of informational submittals.
4. Section 01 4100 - Code-Required Special Inspections and Procedures: Procedures for structural tests and special inspections.
5. Section 01 7300 - Cutting and Patching: Repair and restoration of construction disturbed by testing and inspecting activities.
6. Sections of Divisions 02 through 33: Specific test and inspection requirements.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

D. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.

E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

I. Testing Agency/Special Inspector: An entity or design professional acting as the approved agency engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

    1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with

special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect in writing (RFI) for a decision before proceeding.

1.4 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1. Contractor shall submit to authorities having jurisdiction, sufficient data substantiating qualifications of the Testing Agency/Special Inspectors to perform the required testing and inspections. Data shall be submitted at the time of application for a building permit.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

C. Reports: Prepare and submit certified written reports that include the following:
1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.

8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and re-inspecting.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in- service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency/Special Inspector Qualifications: An NRTL, an NVLAP, or an independent agency or design professional acting as the approved agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with

additional qualifications specified in individual sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
3. Engage a testing agency, approved in accordance with the requirements of the Pennsylvania Uniform Construction Code to conduct special tests and inspections required by authorities having jurisdiction in accordance with the provisions of the 2006 International Building Code. The tests for this project are identified in Section 01 45 33 – Code-Required Special Tests and Procedures.
4. Require testing agency to provide certified copies of resumes for each engineer or specialist indicating current certifications, licenses, or both.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor’s responsibilities include the following:

    a. Provide test specimens representative of proposed products and construction.
    b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
    d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
    e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.

2. Testing Agency/Special Inspector Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
a. Allow seven days for initial review and each re-review of each mockup.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed, unless otherwise indicated.

K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual sections in Divisions 02 through 33.

1.6 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are specifically indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services. Where quality control services are not assigned, they shall be the responsibility of the Contractor.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents are the Contractor’s responsibility.

B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality- control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency/special inspector to perform these quality-control services.
a. Do not employ same entity engaged by Owner, unless agreed to in writing by Owner.
2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 3300 - Submittal Procedures.

D. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality- assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents.

1. Distribution: In addition to submission to authorities having jurisdiction, distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

B. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

C. Comply with the Contract Document requirements for Section 01 73 10 - Cutting and Patching.

D. Protect construction exposed by or for quality-control service activities.

E. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014100

STRUCTURAL TESTS & SPECIAL INSPECTIONS

PART 1 – GENERAL

1.1 SUMMARY

A. This section specifies services necessary for and reasonably incidental to performing special inspection services.

1.2 REFERENCES

Comply with the most recent publication of referenced standards below, unless noted otherwise. In the ACI publications referred to herein, the advisory provisions shall be considered mandatory, as though the word "shall" has been substituted for "should" wherever it appears.

A. American Institute of Steel Construction (AISC)

1. AISC 360 “Steel Construction Manual – 14th Edition”

B. American Concrete Institute (ACI)

1. ACI 318 “Building Code Requirements for Structural Concrete” (2008)
2. ACI 350 “Code Requirements for Environmental Engineering Concrete Structures and Commentary” (2006)

C. The American Society for Nondestructive Testing (ASNT)

1. SNT-TC-1A “Personnel Qualification and Certification in Nondestructive Testing”
2. ASNT Central Certification Program (ACCP)

D. American Welding Society (AWS)

E. City of Philadelphia Department of Licenses and Inspections

1. Special Inspections Program (OP-1304)

F. Concrete Reinforcing Steel Institute (CRSI)

G. International Accreditation Service (IAS)

H. International Code Council (ICC)

1. 2018 International Building Code (IBC)

I. International Organization for Standardization/International Electro-technical Commission (ISO/IEC)

1. ISO/IEC 17020 “Conformity Assessment – Requirements for the operation of various types of bodies performing inspection.”

J. National Institute for Certification in Engineering Technologies (NICET)

K. Precast/Pre-stressed Concrete Institute (PCI)

1.3 DEFINITIONS

A. Department: City of Philadelphia Department of Licenses and Inspections

B. Special Inspection: Inspection as herein required of the materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with the Contract Documents and reference standards.

C. Continuous Special Inspection: The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.

D. Periodic Special Inspection: The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work.

E. DPRC-SI: Design Professional in Responsible Charge of Special Inspections.

F. Building Official: The officer or other designated authority charged with the administration and enforcement of this specification, or a duly authorized representative.

1.4 SUMMARY

A. This Section includes the following:

1. Administrative and procedural requirements for Special Inspection services.

B. Special Inspections are applicable to the following specification sections:
1. Section 024119 – Selective Structure Demolition
2. Section 312000 – Earthwork
3. Section 033000 – Cast-in-Place Concrete
4. Section 034500 – Precast Architectural Concrete
5. Section 042000 – Unit Masonry

6. Section 051200 – Structural Steel Framing
7. Section 055100 – Metal Stairs
8. Section 051200 – Metal Fabrications

C. The Owner is responsible for funding the special inspection program and contracting with a registered Design Professional in Responsible Charge of Special Inspections (DPRC-SI) to act as the Owner's agent and to provide for specially qualified inspectors and agencies. The selection of the Special Inspection Agencies and/or Special Inspectors shall be made by the DPRC-SI, acting as the Owner's agent. The Agency[s] and/or Inspector[s] shall not be hired by, and shall be independent of, the Contractor. The list of special inspection agencies and/or inspectors shall be submitted to the Building Official or his designated representative for approval.

D. Special Inspections are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.

1.5 RESPONSIBILITIES

A. Duties and responsibilities of the Owner, DPRC-SI, Special Inspectors and/or Special Inspection Agencies, Contractor, and City of Philadelphia Building Department shall include those detailed in the attached Department "Special Inspections Duties and Responsibilities Agreement" Form.

1.6 QUALITY ASSURANCE

A. Special Inspection Agency Qualifications:

1. Agency is required to be registered with the Department, listing the specific qualifications, in accordance with The Philadelphia Code, Chapter 9-1300 Inspection Businesses.
2. Agency shall meet one of the following requirements:
   a. Agency maintains current accreditation as a special inspection agency by the IAS within the scope of accreditation issued by IAS.
   b. Agency maintains current accreditation as a special inspection agency in accordance with ASTM E329.
   c. Agency is certified by the ICC, or other approval entity as determined by the DPRC-SI, subject to Department approval.
   d. The agency has been accredited in accordance with ISO/IEC 17020.
   e. The DPRC-SI shall provide for Department review and approval, the agency[s] project history/experience of comparable projects as applicable for the special inspections required for the submitted project.

B. Special Inspector Qualifications:

1. Inspectors are required to be registered with the Department, listing the specific qualifications, in accordance with The Philadelphia Code, Chapter 9-1300 Inspection Businesses.
2. Special Inspectors shall meet one of the following requirements:

a. Maintain current certification by ICC as a special inspector for the discipline(s) which the individual is requesting approval.
b. Professional Engineer with experience in the area of Special Inspections required, submitted by the DPRC-SI, including Engineers-In-Training with one-year related experience working under the supervision of the P.E.
c. Present documentation of approved, current certifications in the specific field of special inspection given in the following sections.

C. Fabrication Inspector Qualifications:

1. Special inspections of factory fabrication described in IBC Section 1704 are not required where the work is done on the premises of a fabricator meeting one of the following requirements:
   a. Accredited by IAS under its Fabricator Inspection Accreditation Program and a certificate of accreditation indicating the scope of fabrication issued by IAS is noted on the IAS website.
   b. Approval of a fabricator by the Department shall be based upon review of the fabricator's quality control manuals and auditing of fabricator practices by an approved accreditation agency. At completion of fabrication, the fabricator shall submit a certificate of compliance to the Building Official stating that the work was performed in accordance with the approved construction documents.
2. Inspector of Structural Steel Fabrication, meet one of the following requirements:
   a. Current Certified Welding Inspector (CWI) in accordance with the provisions of AWS American Welding Society QC1.
   b. Current ICC S1 and S2 Structural Welding Inspector.
   c. Current certified personnel meeting the requirements of ASNT Level III or Level II in accordance with SNT-TC-1A or ACCP certified personnel.
3. Inspector of Pre-Cast Concrete Fabrication, meet one of the following requirements:
   a. Current ICC Reinforced Concrete certificate.
   b. PCI Quality Control Technician/Inspector Level II certificate.
   c. ACI-certified personnel as appropriate.

D. Field Inspector Qualifications:

1. Engineers and/or Geologists in Training licensed in the Commonwealth of Pennsylvania shall be under the direct supervision of the registered engineer for the specific field of inspection listed.
2. Inspector of Welding, meet one of the following requirements:
   a. Current Certified Welding Inspector (CWI) in accordance with the provisions of AWS QC1.
   b. Current AWS Senior Certified Welding Inspector (SCWI).
   c. Current ICC S2 Structural Welding Inspector.
   d. Current certified personnel meeting the requirements of ASNT Level III or Level II in accordance with SNT-TC-1A or ACCP certified personnel.
3. Inspector of High-Strength Bolting and Steel Frames, meet one of the following requirements:
   a. Current ICC Structural Steel & Bolting Special Inspector certificate.

b. Engineer-In-Training (EIT) with one year related experience.

4. Inspector of Reinforced Concrete, meet one of the following requirements:
   a. Current ICC Reinforced Concrete Special Inspector certificate.
   b. ACI Certified Concrete Construction Special Inspector.
   c. Engineer-In-Training (EIT) with one year related experience.
5. Inspector of Pre-Stressed Concrete, meet one of the following requirements:
   a. ICC Pre-Stressed Concrete Certificate.
   b. PCI Quality Control Technician/Inspector Level II certificate.
   c. Engineer-In-Training (EIT) with one year related experience.
6. Inspector of Pre-Cast Concrete Erection, meet one of the following requirements:
   a. Current Certified Welding Inspector (CWI) in accordance with the provisions of AWS QC1.
   b. Current ICC S2 Structural Welding Inspector certificate.
   c. Current certified personnel meeting the requirements of ASNT Level III or Level II in accordance with SNT-TC-1A or ACCP certified personnel.
7. Inspector of Post-Installed Concrete Anchor Installation, meet one of the following requirements:
   a. Approval of this work shall be provided by a Structural Engineer licensed in the Commonwealth of Pennsylvania.
   b. ACI/CRSI certified for adhesive anchor installation.

8. Inspector of Structural Masonry, meet one of the following requirements:
   a. Current ICC Structural Masonry certificate.
   b. Engineer-In-Training (EIT) with one year related experience.
9. Inspector of Verification of Soils, meet one of the following requirements:
   a. Current NICET Level II certification in Geotechnical Engineering
   b. Technology/Construction.
   c. Current NICET Level II soils certificate in Construction Materials Testing.
   d. Current ICC Soils Special Inspector certificate.
   e. Licensed Geologist with one year related experience.
   f. Engineer-In-Training (EIT) with one year related experience.
   g. Geologist-in-Training (GIT) with one year related experience.
10. Inspector of Excavation and Filling, meet one of the following requirements:
   a. Current NICET Level II certificate in Geotechnical Engineering Technology/Construction.
   b. Current NICET Level II soils certificate in Construction Materials Testing.
   c. Current ICC Soils Special Inspector certificate.
   d. Licensed Professional Geologist in the Commonwealth of Pennsylvania with one year related experience.
   e. Engineer-In-Training (EIT) with one year related experience.
   f. Geologist-in-Training (GIT) with one year related experience.
11. Inspector of Deep Foundations and Helical Pile Foundations, meet one of the following requirements:
   a. Current NICET Level II certificate in Geotechnical Engineering Technology/Construction.
   b. Current NICET Level II soils certificate in Construction Materials Testing.

c. Federal Highway Administration – National Highway Institute Drilled Shafts Course, or Certificate and Driven Pile Foundations (Construction Monitoring) Course Certificate with one year related experience.
d. Licensed Professional Geologist in the Commonwealth of Pennsylvania with one year related experience.
e. Engineer-In-Training (EIT) with two year related experience.
f. Geologist-in-Training (GIT) with two year related experience.

12. Inspector of Underpinning, meet one of the following requirements:
    a. Inspections of this work shall be reported continuously, conducted by a Geotechnical, Civil, or Structural Engineer licensed in the Commonwealth of Pennsylvania and submitted by the DPRC-SI.
13. Inspector of Demolition, meet one of the following requirements:
    a. Registered Design Professional licensed in the Commonwealth of Pennsylvania with qualifying relevant experience* in demolition of structures.
    b. Licensed/Registered Design Professional of Record licensed with the Commonwealth of Pennsylvania with qualifying relevant experience* in demolition of structures.
    c. Inspector providing certification/approval of accepted completion of OSHA Standards 29 CFR 1926 Subpart T- Demolition and applicable 29 CFR 1910 standard.
    d. Qualifying Special Inspector with relevant experience* inspecting the demolition of structures.
    e. *Relevant experience is defined as direct participation and practice related to the demolition activities that are the subject of the special inspection where such participation has led to accumulation of knowledge required for the proper execution of such inspection.
14. Inspector of Test Safe Loads, In-Situ Load Tests, and Preconstruction Load Tests shall be a Professional Structural Engineer licensed in the Commonwealth of Pennsylvania.

1.7 SUBMITTALS FOR REVIEW

A. The Contractor, DPRC-SI, Special Inspection Agency(s), and Special Inspector(s) shall submit to the Department all items required in the Contract Documents and in OP-1304.

B. Submit, to the Engineer, proposed revisions to the Contract Documents as a result of deficiency reports.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 DUTIES AND RESPONSIBILITIES

A. The Owner, or DPRC-SI acting as the Owner's agent, shall submit a completed "Special Inspections Duties and Responsibilities Agreement" form to the Department plans examiner along with the building permit application. The Department plan review and construction

inspection supervisors, plans examiners and inspectors shall have the below responsibilities in the following stages of the special inspections process. Department duties and responsibilities are further detailed in OP-1304.

1. Plans Examination Stage:
    a. Review Department "Statement of Special Inspections Schedule" form from the DPRC-SI for compliance with special inspection requirements.
    b. Review and approve qualifications of fabricators for building components assembled off-site and installed on-site.
    c. Review and approve qualifications of special inspection agencies and special inspectors.
    d. Approve the application and plans upon confirmation of code compliance.
2. Inspection Stage:
    a. Monitor special inspection activities on the jobsite.
    b. Review inspection reports.
    c. Verify construction deficiency reports and the reports of deficiency repairs/corrections.
    d. Perform final inspection.

B. The Contractor shall be responsible for providing additional testing and inspections as noted in the Contract Documents.

3.2 SPECIAL INSPECTIONS PROCEDURE

A. Plans Examination:

1. The DPRC-SI shall submit to the Department a completed "Statement of Special Inspections Schedule", which is attached to this specification section, indicating the types of special inspections to be performed for the project.
2. The DPRC-SI shall submit to the Department a list of components, fabricator names, and fabricator locations where special inspections will occur in the shop. Structural load bearing members and assemblies fabricated off site shall be inspected by qualified Special Inspection Agencies or Inspectors.
3. When required, the Special Inspector/Agency identified by the DPRC-SI, shall provide documentation that off-site fabricated components meet the specifications.
4. The DPRC-SI shall submit to the Department a list with names and qualifications of the Special Inspection Agency(s) and Special Inspector(s) to be assigned to the project.

B. Building Inspection:

1. Prior to proceeding with the work, a meeting between the Department, DPRC-SI, Special Inspectors, and Contractor shall be held in order to establish the specified project requirements and review the requirements of OP-1304 and the Contract Documents.
2. The Contractor shall be responsible for providing the Special Inspector(s) with access to the approved plans, shop drawings, and submittals and the location of the area(s) to be inspected.

3. The Contractor shall be responsible for retaining, at the jobsite, all special inspection records submitted by the Special Inspector(s) and providing access to these records for review by the Department's inspector upon request.
4. The Contractor shall provide a proposed schedule of inspections for the Special Inspector(s) and the Department's inspector prior to the commencement of construction activities. The Contractor shall provide a revised schedule on a biweekly basis during the duration of construction, unless otherwise specified by the Department and DPRC-SI.
5. The Special Inspector(s) shall inspect the work in accordance with the "Statement of Special Inspections Schedule" form, for compliance with the Contract Documents.
6. The Special Inspector(s) shall submit all required inspection and testing reports to the Contractor and DPRC-SI.
7. The Special Inspector(s) shall immediately submit deficiency reports to the Contractor for all work which is found deficient with the Contract Documents and/or installation standard. The DPRC-SI shall determine if a design revision is required to repair/replace the issues described in the deficiency report. The Contractor shall make the necessary corrections as described by the DPRC-SI, before any of the deficient work is covered by additional construction. After completion, the Special Inspector(s) shall report on the corrected work in place.
8. If there is a delay by the Contractor in making the corrections required in the deficiency report, the Special Inspector(s) shall notify the Department's inspector and the DPRC-SI prior to the completion of that phase of the work.
9. The Department's inspector shall be provided the opportunity to witness the corrective work by the Contractor and/or obtain the Special Inspector(s) report of the corrections.

C. Coordination:

1. Contractor shall coordinate sequence of activities to accommodate the required special inspections with a minimum of delay and to avoid removing and/or replacing construction to accommodate testing and inspections.
2. Contractor shall be responsible for scheduling special inspections. Schedule times for tests, inspections, obtaining samples, and all other required activities due to special inspections.
3. Contractor shall notify the Special Inspector(s) 48 hours prior to the need for field inspections and 7 days prior to the need for off-site shop or plant inspections. Contractor shall reimburse the Owner for cancelled or postponed special inspections, except as due to unforeseen weather conditions or other circumstances beyond the control of the Contractor and/or subcontractor(s).
4. Contractor shall schedule special inspections as efficiently as possible. Contractor shall reimburse the Owner for special inspection fees where the Special Inspection Agency(s) is not utilized or is under-utilized for the scheduled special inspections. The Owner shall reserve the right to cancel special inspections requests where the quantity of testing and inspections is insufficient and/or not specifically itemized.

D. Final Inspection:

1. The DPRC-SI shall provide the Department's inspector with all deficiency reports, all deficiency report corrections compiled by the Special Inspection Agency(s) and Special Inspector(s), and all design revisions produced by the DPRC-SI, which did not require an amended permit.
2. The DPRC-SI shall submit to the Department's inspector the "Special Inspections Program Final Compliance" form, which is attached to this specification section, in its entirety when each inspection item is completed.

3.3 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes.

B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.

C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 014100

SECTION 014200

REFERENCES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association (The) www.aluminum.org	(703) 358-2960
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664

AASHTO	American Association of State Highway and Transportation Officials	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists www.aatcc.org	(919) 549-8141
ABAA	Air Barrier Association of America www.airbarrier.org	(866) 956-5888
ABMA	American Bearing Manufacturers Association www.abma-dc.org	(202) 367-1155
ACI	American Concrete Institute www.concrete.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530
AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955
AHRI	Air-Conditioning, Heating, and Refrigeration Institute, The www.ahrinet.org	(703) 524-8800
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700

AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts, Inc. www.aosaseed.com	(405) 780-7372
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989
API	American Petroleum Institute www.api.org	(202) 682-8000
ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)	
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723
ASME	ASME International (American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (973) 882-1170
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9500
ATIS	Alliance for Telecommunications Industry Solutions www.atis.org	(202) 628-6380
AWCMA	American Window Covering Manufacturers Association (Now WCMA)	
AWCI	Association of the Wall and Ceiling Industry www.awci.org	(703) 534-8300

AWI	Architectural Woodwork Institute www.awinet.org	(571) 323-3636
AWPA	American Wood Protection Association (Formerly: American Wood Preservers' Association) www.awpa.com	(205) 733-4077
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
BICSI	BICSI, Inc. www.bicsi.org	(800) 242-7405
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International) www.bifma.com	(616) 285-3963
CCC	Carpet Cushion Council www.carpetcushion.org	(610) 527-3880
CDA	Copper Development Association www.copper.org	(800) 232-3282 (212) 251-7200
CEA	Consumer Electronics Association www.ce.org	(866) 858-1555 (703) 907-7600
CFFA	Chemical Fabrics & Film Association, Inc. www.chemicalfabricsandfilm.com	(216) 241-7333
CGA	Compressed Gas Association www.cganet.com	(703) 788-2700
CIMA	Cellulose Insulation Manufacturers Association www.cellulose.org	(888) 881-2462 (937) 222-2462
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583

CPA	Composite Panel Association www.pbmdf.com	(703) 724-1128
CRI	Carpet and Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRRC	Cool Roof Rating Council www.coolroofs.org	(866) 465-2523 (510) 485-7175
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200 (800) 328-6306
CRRC	Cool Roof Rating Council www.coolroofs.org	(866) 465-2523
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute) www.cti.org	(281) 583-4087
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
ECA	Electrical Components Association www.ec-central.org	(703)907-8024
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500
EJCDC	Engineers Joint Contract Documents Committee http://content.asce.org/ejcdc/	(703) 295-6000
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040
ESD	ESD Association (Electrostatic Discharge Association) www.esda.org	(315) 339-6937
ETL SEMCO	Intertek ETL SEMCO (Formerly: ITS - Intertek Testing Service NA) www.intertek-etlsemko.com	(800) 967-5352
FM Approvals	FM Approvals LLC www.fmglobal.com	(781) 762-4300
FM Global	FM Global (Formerly: FMG - FM Global) www.fmglobal.com	(401) 275-3000
FSA	Fluid Sealing Association www.fluidsealing.com	(610) 971-4850
GA	Gypsum Association www.gypsum.org	(301) 277-8686

GANA	Glass Association of North America www.glasswebsite.com	(785) 271-0208
GRI	(Part of GSI)	
GSI	Geosynthetic Institute www.geosynthetic-institute.org	(610) 522-8440
HI	Hydronics Institute www.gamanet.org	(908) 464-8200
HI/GAMA	Hydronics Institute/Gas Appliance Manufacturers Association Division of Air-Conditioning, Heating, and Refrigeration Institute (AHRI) www.ahrinet.org	(908) 464-8200
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
IAPSC	International Association of Professional Security Consultants www.iapsc.org	(515) 282-8192
ICBO	International Conference of Building Officials www.iccsafe.org	(888) 422-7233
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(770) 830-0369
ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830
ICPA	International Cast Polymer Association www.icpa-hq.org	(703) 525-0320
IEC	International Electrotechnical Commission www.iec.ch	41 22 919 0211
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IES	Illuminating Engineering Society of North America www.iesna.org	(703) 525-0320
IEST	Institute of Environmental Sciences and Technology www.iest.org	(847) 255-1561

IGMA	Insulating Glass Manufacturers Alliance www.igmaonline.org	(613) 233-1510
ILI	Indiana Limestone Institute of America, Inc. www.iliai.com	(812) 275-4426
ISA	Instrumentation, Systems, and Automation Society, The www.isa.org	(919) 549-8411
ISO	International Organization for Standardization www.iso.ch	41 22 749 01 11
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(877) 464-7732 (801) 341-7360
ITS	Intertek Testing Service NA (Now ETL SEMCO)	
ITU	International Telecommunication Union www.itu.int/home	41 22 730 51 11
LGSEA	Light Gauge Steel Engineers Association www.arcat.com	(202) 263-4488
LMA	Laminating Materials Association (Now part of CPA)	
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333
MCA	Metal Construction Association www.metalconstruction.org	(847) 375-4718
MFMA	Maple Flooring Manufacturers Association, Inc. www.maplefloor.org	(888) 480-9138
MFMA	Metal Framing Manufacturers Association, Inc. www.metalframingmfg.org	(312) 644-6610
MH	Material Handling (Now MHIA)	
MHIA	Material Handling Industry of America	(800) 345-1815
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(630) 942-6591

NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(800) 797-6223 (281) 228-6200
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926
NAGWS	National Association for Girls and Women in Sport	(800) 213-7193 ext. 453
NAIMA	North American Insulation Manufacturers Association www.naima.org	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCMA	National Concrete Masonry Association www.ncma.org	(800) 557-2848
NCTA	National Cable & Telecommunications Association www.ncta.com	(202) 222-2300
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.netaworld.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(888) 300-6382 (269) 488-6382
NFPA	NFPA (National Fire Protection Association) www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776
NGA	National Glass Association www.glass.org	(866) 342-5642 (703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association) www.nofma.or g	(901) 526-5016
NOMMA	National Ornamental & Miscellaneous Metals Association www.nomma.org	(888) 516-8585
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association	(888) 846-7622

	www.nrmca.org	(301) 587-1400
NSF	NSF International	(800) 673-6275
	(National Sanitation Foundation International)	(734) 769-8010
	www.nsf.org	
NSSGA	National Stone, Sand & Gravel Association	(800) 342-1415
	www.nssga.org	(703) 525-8788
NTMA	National Terrazzo & Mosaic Association, Inc. (The)	(800) 323-9736
	www.ntma.com	(540) 751-0930
NWFA	National Wood Flooring Association	(800) 422-4556
	www.nwfa.org	(636) 519-9663
PDI	Plumbing & Drainage Institute	(800) 589-8956
	www.pdionline.org	(978) 557-0720
PGI	PVC Geomembrane Institute	(217) 333-3929
	http://pgi-tp.cee.uiuc.edu	
RCSC	Research Council on Structural Connections	
	www.boltcouncil.org	
RFCI	Resilient Floor Covering Institute	
	www.rfci.com	(706) 882-3833
SAE	SAE International	(877) 606-7323
	www.sae.org	(724) 776-4841
SCTE	Society of Cable Telecommunications Engineers	(800) 542-5040
	www.scte.org	(610) 363-6888
SDI	Steel Deck Institute	(847) 458-4647
	www.sdi.org	
SDI	Steel Door Institute	(440) 899-0010
	www.steeldoor.org	
SEFA	Scientific Equipment and Furniture Association	(877) 294-5424
	www.sefalabs.com	(516) 294-5424
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers See ASCE)	
SIA	Security Industry Association	(866) 817-8888
	www.siaonline.org	(703) 683-2075
SJI	Steel Joist Institute	(843) 626-1995
	www.steeljoist.org	
SMA	Screen Manufacturers Association	(561) 533-0991
	www.smacentral.org	
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association	(703) 803-2980
	www.smacna.org	
SPFA	Spray Polyurethane Foam Alliance	(800) 523-6154
	(Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division)	
	www.sprayfoam.org	
SPIB	Southern Pine Inspection Bureau (The)	(850) 434-2611
	www.spib.org	
SPRI	Single Ply Roofing Industry	(781) 647-7026

	www.spri.org	
SSINA	Specialty Steel Industry of North America	(800) 982-0355
	www.ssina.com	(202) 342-8630
SSPC	SSPC: The Society for Protective Coatings	(877) 281-7772
	www.sspc.org	(412) 281-2331
STI	Steel Tank Institute	(847) 438-8265
	www.steeltank.com	
SWI	Steel Window Institute	(216) 241-7333
	www.steelwindows.com	
SWPA	Submersible Wastewater Pump Association	(847) 681-1868
	www.swpa.org	
TCA	Tilt-Up Concrete Association	(319) 895-6911
	www.tilt-up.org	
TCNA	Tile Council of North America, Inc.	(864) 646-8453
	www.tileusa.com	
TEMA	Tubular Exchanger Manufacturers Association	(914) 332-0040
	www.tema.org	
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org	(703) 907-7700
TMS	The Masonry Society	(303) 939-9700
	www.masonrysociety.org	
TPI	Truss Plate Institute, Inc.	(703) 683-1010
	www.tpinst.org	
TPI	Turfgrass Producers International	(800) 405-8873
	www.turfgrasssod.org	(847) 649-5555
TRI	Tile Roofing Institute	(312) 670-4177
	www.tileroofing.org	
UL	Underwriters Laboratories Inc.	(877) 854-3577
	www.ul.com	(847) 272-8800
UNI	Uni-Bell PVC Pipe Association	(972) 243-3902
	www.uni-bell.org	
USITT	United States Institute for Theatre Technology, Inc.	(800) 938-7488
	www.usitt.org	(315) 463-6463
WASTEC	Waste Equipment Technology Association	(800) 424-2869
	www.wastec.org	(202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau	(800) 283-1486
	www.wclib.org	(503) 639-0651
WCMA	Window Covering Manufacturers Association	(212) 297-2122
	www.wcmanet.org	
WDMA	Window & Door Manufacturers Association	(800) 223-2301
	(Formerly: NWWDA - National Wood Window and Door	(312) 321-6802
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California) www.wicnet.org	(916) 372-9943
WMMPA	Wood Moulding & Millwork Producers Association	(800) 550-7889
	www.wmmpa.com	

WSRCA	Western States Roofing Contractors Association www.wsrca.com	(800) 725-0333
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up- to-date as of the date of the Contract Documents.

ICC	International Code Council www.iccsafe.org	(888) 422-7233
ICC-ES	ICC Evaluation Service, Inc. www.icc-es.org	(800) 423-6587 (562) 699-0543

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

COE	Army Corps of Engineers www.usace.army.mil	(202) 761-0011
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-7923
DOC	Department of Commerce www.commerce.gov	(202) 482-2000
DOD	Department of Defense http://dodssp.daps.dla.mil	(215) 697-6257
DOE	Department of Energy www.energy.gov	(202) 586-9220
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322
FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(800) 488-3111
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112

LBL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-4000
NCHRP	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999
PBS	Public Buildings Service (See GSA)	
PHS	Office of Public Health and Science http://www.hhs.gov/ophs/	(202) 690-7694
RUS	Rural Utilities Service (See USDA)	(202) 720-9540
SD	State Department www.state.gov	(202) 647-4000
TRB	Transportation Research Board http://gulliver.trb.org	(202) 334-2934
USDA	Department of Agriculture www.usda.gov	(202) 720-2791
USP	U.S. Pharmacopeia www.usp.org	(800) 227-8772
USPS	Postal Service www.usps.com	(202) 268-2000

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to- date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from U.S. Access Board	(800) 872- 2253 (202) 272-0080

	www.access-board.gov	
CFR	Code of Federal Regulations Available from Government Printing Office www.gpoaccess.gov/cfr/index.html	(866) 512- 1800 (202) 512- 1800
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
DSCC	Defense Supply Center Columbus (See FS)	
FED-STD	Federal Standard (See FS)	
FS	Federal Specification Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil/	(215)697-2664
	Available from Defense Standardization Program www.dsp.dla.mil	
	Available from General Services Administration www.gsa.gov	(202) 619-8925
	Available from National Institute of Building Sciences www.wbdg.org/ccb	(202) 289-7800
FTMS	Federal Test Method Standard (See FS)	
MIL	(See MILSPEC)	
MIL-STD	(See MILSPEC)	
MILSPEC	Military Specification and Standard Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697- 2664
UFAS	Uniform Federal Accessibility Standards Available from Access Board www.access-board.gov	(800) 872- 2253 (202) 272-0080

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000

TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. See Divisions 2 through 16 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

C. See Division 2 Section "Dewatering" for disposal of ground water at Project site.

1.2 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.3 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to Architect, testing agencies, and authorities having jurisdiction.

B. Water Service: Water from Owner's existing water system is not available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service: Electric power from Owner's existing system is not available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Pavement: Comply with Division 2 pavement Sections.

B. Portable Chain-Link Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8- inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and bottom rails. Provide galvanized steel bases for supporting posts.

C. Lumber and Plywood: Comply with requirements in Division 6 Section "Rough Carpentry."

D. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36/C 36M.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Site offices for staff and meeting space will be required in temporary structure or made available within the existing structure.

1. The Field Office shall have the following amenities and equipment:
    a. Telephone.
    b. Fax machine.
    c. Toilet and lavatory.
    d. Potable water.

2. The Field Office shall contain a set of the Drawings (or reproduction thereof) as approved by the Philadelphia Department of Licenses and Inspections.

a. The building permit and all subsequent permits shall also be located in the Field Office.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. The Contractor is not responsible for the cost of charges and fees for any utilities serving the Premises, including without limitation gas, telephone, electric, sewer rents, water, and stormwater meter charges.
2. The Contractor shall not waste or misuse utilities
3. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service underground, unless otherwise indicated.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install telephone line(s) for each field office.

1. Provide additional telephone lines for the following:
   a. Provide a dedicated telephone line for each facsimile machine and computer in each field office.
2. At each telephone, post a list of important telephone numbers including police and fire departments, Contractor's home office, Architect's office, Owner's office, and principal subcontractors' field and home offices.
3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

J. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail in field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

D. Vehicle Parking: Conduct the Work so as to ensure the least possible obstruction to vehicular traffic and inconvenience to the general public and the residents in the vicinity of the Work and to ensure the protection of persons, property and natural resources. No road or street shall be closed to the public except with the permission of the Owner and the proper governmental authority.
1. Prohibit parking on existing pavement and landscaping.
2. Parking along the roadside, out of the traffic lanes, is permitted, as long as the road is not obstructed.
3. Designated existing parking facilities may be used by construction personnel and for construction vehicles.
    a. Parking is subject to Owner restrictions and limitations of liability.
    b. Identify vehicles per Owner requirements.
    c. Prohibit heavy vehicles and construction equipment in parking areas.
    d. Maintain construction parking areas. free of construction soiling and debris, and for repairing damage resulting from use.
4. Provide or Construct temporary construction personnel surface parking areas.
    a. Location: Permanent parking areas or Owner acceptable areas.
    b. Surface: Gravel or Paved.
5. When site space is not adequate, provide additional offsite parking.
6. Permanent Pavements And Parking Facilities:
    a. Before Substantial Completion, bases for permanent roads and parking areas may be used for construction traffic.
    b. Prohibit traffic loading beyond paving design capacity. Prohibit tracked vehicles.

7. Maintenance:
    a. Maintain traffic and parking areas in sound condition and free of excavated material, mud, snow, and ice.
    b. Maintain existing and permanent paved areas used for construction operations. Promptly repair damage. Remove standing water.
8. Removal, Repair:
    a. Repair existing and permanent facilities damaged by use, to original and specified condition.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
    1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
    2. Remove snow and ice as required to minimize accumulations.

F. Project Identification and Temporary Signs: Provide Project identification and other signs. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.

    1. Project identification sign shall state the name of the Project and name all designees who are affiliated with the Project and as per funding agency requirements. A preliminary drawing of the sign shall be submitted to the Architect and Owner for approval prior to execution and installation. The approved sign shall be displayed so that it is visible from the street.
        a. Construction Sign – all construction and demolition sites require by L&I to have signage.
        b. Signage must be at least 3 feet by 5 feet in a permanent location
        c. Signage must identify the following:
            1.) Property Address
            2.) Property Owner
            3.) Contractor
            4.) Building Rendering
            5.) Contact info (311 or 911) in case of violations
            6.) Classification (Commercial or residential)
            7.) Work completion date
    2. Provide temporary, directional signs for construction personnel and visitors.
    3. Maintain and touch up signs so they are legible at all times.

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.

H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

    1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

I. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

J. Temporary Use of Permanent Stairs: Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.

G. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. The Owner, Rebuild and Property Owner will not be responsible for the loss, theft or damage to work, tools, equipment and construction.

H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Prohibit smoking in construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MAINTENANCE, REPAIR, AND REPLACEMENT

A. Standard of Care
1. Contractor shall perform all necessary maintenance, repairs, and replacements to keep the Premises, including all structural and nonstructural portions of the Premises, water supply systems, storm and sanitary sewer disposal systems, the fire suppression systems, the heating, ventilation, air conditioning and electrical systems, and the mains and conduits necessary to supply utilities, in good condition and repair and in compliance with all Applicable Laws, reasonable wear and tear excepted.
2. Contractor shall maintain all portions of the Premises in a clean and orderly condition, free of garbage, rubbish, dirt, snow, and ice

B. Trash Clean Up and Removal
1. Contractor shall provide a complete and proper arrangement for the frequent and adequate sanitary handling and disposal, away from the Premises, of all trash, garbage, and other refuse caused as a result of Contractor activities and the activities of its contractors in connection with the Rebuild Improvements.
2. Contractor shall provide and use compactor-type metal receptacles or alternate equipment approved by PAID, for all such garbage, trash, and other refuse. Contractor shall not pile boxes, cartons, barrels, pallets, or other similar items, in an unsightly or unsafe manner, on or about the Premises.

C. Contractor shall not cause or suffer any waste, disfigurement or injury to the Premises.

D. Vandalism. Contractor shall promptly repair damage caused by third parties, including but not limited to injury or damage caused by vandalism or malicious mischief. Subtenant shall remove graffiti from, or cover graffiti on, the Premises within five (5) days of its application or within a shorter time-frame as may be required by Applicable Laws

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

   1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
   2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 1 Section "Closeout Procedures."

END OF SECTION 015000

SECTION 015300

EXISTING UTILITY PRECAUTIONARY MEASURES

PART 1 – GENERAL

1.1 EXISTING UNDERGROUND UTILITIES

A. Attention is directed to the existing underground structures adjacent to, parallel with, or over trenches. The Contractor will be held responsible for any damage done to such structures in the prosecution of the work. He shall exercise every precaution necessary to prevent damage in working underneath or adjacent to any underground structure. Any damage done to such structures shall be repaired by the Contractor. There will be no additional compensation for any work and materials necessary for protecting, supporting, or repairing active underground structures, or for removing abandoned structures (if any), as such costs are included in the prices bid under this Contract.

B. The Contractor shall obtain from the appropriate utility company or City Department, verification of the current status of structures shown on the Plans as abandoned, before working near such structures.

C. The underground structures shown on the Plans are plotted from record information, and are not guaranteed to be complete and correct as to location, size, and depth. The Contractor shall obtain all necessary information on existing underground structures by digging test holes. There will be no separate or additional payment for this work.

D. If interference develops that is not otherwise provided for in the Contract Documents, the Contractor shall notify the utility company involved and make arrangements to overcome the interference to satisfaction of the Project Manager, without additional cost to the City or Owner.

E. In the event that some portion of the Work of the Contract is outside of the public right-of-way, the Contractor shall engage a utility locator service to identify and mark the existing utilities within the limits of disturbance. The Contractor shall be responsible for coordination with any affected utilities, and any resultant changes to the Work shall require approval by PWD. No additional payment shall be made for the engagement of the utility locator service as necessary.

1.2 NOTIFICATION OF UTILITIES

A. Pursuant to the requirements of PA Act 287 (December 10 1974), as amended, of the Legislature of the Commonwealth of Pennsylvania, titled "Underground Utilities Line Protection Law", the Contractor shall call each utility company and City Department that follows, three days before beginning excavation.

1.	PECO Energy	PA One Call System	1-800-242-1776
2.	PGW	PA One Call System	1-800-242-1776
3.	Philadelphia Parks and Recreation Department		(215) 685-3635 (215) 683-3679
4.	SEPTA		(215) 580-4000
5.	Drainage Information Unit		(215) 685-6271 (215) 685-6272
6.	Water Main Information		(215) 685-6273 (215) 685-6274, (215) 685-6275
7.	Water Main Information		(215) 686-5572
8.	Verizon	PA One Call System	1-800-242-1776
9.	Street Lighting Section		(215) 686-5515
10.	Communications Service Section (Division of Technology, Electrical Bureau)		(215) 686-3951
11.	Cable Companies (Comcast, Greater Media, and Wade Communications)	PA One Call System	1-800-242-1776
12.	Veolia Energy Philadelphia, Inc	PA One Call System	1-800-242-1776

B. The Contractor shall notify the appropriate utility company or City Department three days before working in the vicinity of underground structures which the Plans show in close proximity to the work, and he shall fully cooperate with the company or Department involved.

1.3 HYDRO-HAMMER PROHIBITED

A. The use of a Hydro-Hammer or similar equipment for removal of existing paving on this project is hereby prohibited. Such equipment is prohibited because of the great possibility of damage to existing underground structures (e.g., water and gas mains, services, and laterals), and also to the probability of excessive breakage of adjacent existing paving.

1.4 PECO ENERGY FACILITIES

A. Rearrangement of PECO Energy aerial facilities requires a four week notice and payment in advance. There will be no separate or additional payment for this work.

B. Attention is directed to the existing underground PECO Energy facilities above or near the proposed trenches in various locations. These facilities shall be protected and supported by the Contractor during construction.

C. Excavation near utility poles supporting PECO Energy facilities shall require that the Contractor contact PECO and request that a PECO representative evaluate the need for pole protection.

D. It is expected that if any PECO facilities become uncovered as a result of construction activities, they will be properly supported throughout the duration of the proposed work.

E. Maintain safe working distances from PECO aerial facilities. Relocation of PECO Energy aerial facilities requires 12 weeks' notice & payment in advance.

1.5 PROVISIONS FOR EXCAVATING NEAR PECO ENERGY ENERGIZED UNDERGROUND TRANSMISSION LINES.

A. At least 10 days before the beginning of any excavation, the Contractor shall contact the Supervising Engineer, Underground Transmission, at
PECO Energy Oregon Shops
2610 S. Columbus Blvd., Philadelphia, PA 19148, (215) 731-3254.
At that time, the Contractor's work schedule will be reviewed to determine inspection requirements and precautionary measures required.

B. Three days before any excavation begins, the Contractor shall call the PA One-Call system, 1-800-242-1776, and specify the location where excavation work will be done. This call will result in the location of PECO Energy facilities being marked

C. A PECO Energy representative will inspect the job site periodically and will be available as required by calling (215) 731-3254. Presence of this representative or any other PECO representative at the job site does not relieve the Contractor of any responsibility involving injury to workmen or the public, or damage to any underground transmission facilities, including the pipe and its coating and the Contractor's equipment.

D. Excavation near utility poles supporting PECO Energy facilities shall require that the Contractor contact PECO and request that a PECO representative evaluate the need for pole protection.

E. Excavation in the vicinity of the underground transmission line will be performed as follows:

1. Large equipment (i.e., scrapers, bulldozers, etc.) may be used to excavate in the vicinity of the underground pipe line up to but not closer than 4 feet from the marked center line.
2. Small equipment (i.e., backhoe, etc.) may be used to excavate in the vicinity of the underground pipe line up to but not closer than 2 feet from the marked center line.
3. Hand excavation shall be used to remove the remaining material and uncover the underground pipe line.

F. The Contractor shall take care not to damage any transmission facilities, including the coating of

the pipe during excavation. Any damage is to be reported promptly to PECO Energy. The PECO Energy representative will decide whether repairs are required. All repairs shall be made according to PECO Energy specification S-7512.

G. Before excavation begins, the Contractor shall present for PECO Energy review and approval a plan showing how the pipe is to be supported, where it will be undercut, and how the pipe will be protected from damage by equipment while uncovered.

H. After excavation is complete and at least five days before any backfilling operation is to commence, the Contractor shall notify the Supervising Engineer, Underground Transmission. At that time the pipe coating shall be tested in the presence of a PECO Energy representative to assure the integrity of the coating. This testing shall be conducted according to PECO Energy specification S-7512. All necessary repairs will be made to the pipe coating prior to backfilling.

I. At no time shall equipment of any kind run over any exposed transmission facility or pipe without appropriate protection.

J. The Contractor shall backfill the area around the pipe from 12 inches below the pipe with corrective backfill described in PECO Energy specification 148-P-7 (for thermal sand) or 148-P-8 (for fluidized thermal backfill). Backfill shall extend to a minimum of 12 inches above the top of the pipe. Choice of backfill shall be discussed with the Supervising Engineer, Underground Transmission. Backfill shall be installed as described in the specification. Care shall be taken to prevent damage to the coating during the backfill operation.

K. In the event that an underground transmission line is exposed, then the Contractor will be responsible for all cost for any of the following required work:
   1. Testing of the somastic coating on the transmission pipe line to insure its integrity.
   2. Repair of any damage to the somastic coating.
   3. Backfilling the area around the transmission pipe with corrective backfill.

   This work shall meet requirements contained in the PECO Energy written standards and specifications.

L. Information concerning PECO Energy tests, standards or specifications, can be obtained from the Supervising Engineer, Underground Transmission Section.

1.6 PGW FACILITIES

A. Attention is directed to the existing gas mains above or near the trenches in various locations. These gas mains will be abandoned as necessary, and new mains laid as necessary, by the Philadelphia Gas Works. The Contractor shall make all necessary arrangements with the Gas Works, and shall fully cooperate with them in connection with their structures. The Contractor shall notify the Philadelphia Gas Works three days before beginning work.

B. PGW cautions all contractors to use care when performing work near PGW facilities. When making perpendicular crossings under PGW facilities, it is recommended that the stipulations of PGW's GS 40.7 & 53.8 be followed where practical so that the unnecessary disturbance of PGW

structures is avoided.

1.7 PROVISIONS FOR PASSING UNDER EXISTING PGW FACILITY

A. Installations crossing under 6 inch and smaller gas pipes shall be punched or bored.

B. Installations crossing under 8 inch and larger gas pipes shall be accomplished by boring a hole no larger than the diameter of the conduit, water service or sewer lateral.

C. The intended conduit or lateral bored shall have a minimum clearance of 1’0” from the bottom of the gas main to the top of the conduit or lateral pipe.

D. The distance from the trench wall of the boring operation to the marked center line of the gas pipe shall be at least equal to the distance from the top of the gas pipe to the bottom of intended conduit or lateral bored as shown in PGW Distribution Standards, Drawing No. GS 40.8.

E. A copy of PGW standard drawing No. GS 40.8 can be obtained from PGW Distribution Department, 800 W. Montgomery Avenue, Philadelphia, PA (215-684- 6664).

F. All voids between the conduit, water service or sewer lateral pipe and the punched or bored opening shall be filled with grout.

G. The Contractor shall determine the actual location and depth of the gas pipe.

H. Test openings to determine depth of gas pipe shall be as small as possible. Any excavation immediately above the pipe and within 18 inches of the outside edge of the structure must be performed using prudent techniques. This can only be done with the use of hand tools or vacuum excavation. Any damage to PGW facilities including coating damage must be reported immediately. Repairs will be made at the expense of the Contractor.

I. Backfilling and paving restoration of test openings will be at the expense of the Contractor.

J. If foreign structures come within 6 inches of PGW gas facilities, an insulating spacer must be installed per D.S. 23.3.

K. PGW shall be given a minimum of three days notice to start of test openings or installation of water main, water services, sewer pipe, or sewer laterals. Call 800- 242-1776.

1.8 VERIZON FACILITIES

A. Attention is directed to the existing Verizon structures, ductbanks, and crossings above or near the trenches in various locations. The contractor must locate all facilities in the field relevant to the work and the facilities should be maintained in-place and not disturbed.

B. The Contractor is responsible to support, protect and maintain all Verizon structures, in place, undisturbed.

C. Any/all Verizon trenches disturbed shall be returned to original condition or better.

D. The Contractor is financially responsible if any damage occurs and Verizon is required to repair, adjust, relocate, etc. any underground structures. Financial responsibility will include, but is not limited to, customer service interruptions.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 015300

SECTION 015310

TRAFFIC REGULATIONS

PART 1 – GENERAL

1.1 REFERENCE STANDARDS

A. It is the Contractor's responsibility to make himself thoroughly familiar with the most recent revisions or amendment to the Pennsylvania Department of Transportation (PennDOT) standard specifications for the maintenance and protection of traffic during construction including the following:

1. Publication 68, Regulations -- Traffic Signs, Signals and Markings (67 PA Code, Chapter 211).
2. Publication 213, Work Zone Traffic Control (67 PA Code, Chapter 211).
3. Publication 408, Specifications (as revised).

B. Conform fully to above standard specifications. Meet all requirements for providing, placing, maintaining, and removing all necessary pavement markings, warning devices, signs, and barricades.

1.2 SUBMITTALS

A. Notify Shawn McKeown; Construction Engineer Right-of-Way Unit; Philadelphia Streets Department, ten (10) days prior to starting work, and five (5) days prior to completing work on this project. Notification can be made via e mail to shawn.mckeown@phila.gov and shall include Bid Number; Work Number and expected start date.

B. One week prior to starting work under this Contract, submit for all necessary permits to Kevin Koch, Chief Highway Engineer, MSB, 1401 JFK Blvd., 9th Flr., Philadelphia, PA 19102-1685.

C. For all street closures permits under this Contract, submit application for street closure to Right- of-Way Unit no later than ten (10) days prior to the start of work. Applications should be faxed to (215) 686-5062.

Application can be found at "http://philadelphiastreets.com/transportation- highways-street_closure-intro.aspx"

D. Between the period November 1st and April 1st, the Contractor shall notify the District Highway Engineer of any steel plates used to cover excavations made in snow emergency routes.

E. Any traffic management and pedestrian safety plans submitted by the Contractor to the Streets Department shall also be provided to PWD.

PART 2 - PRODUCTS

2.1 STEEL PLATES FOR DECKING

A. Each steel plate used for decking over trenches shall have clearly marked on the center of the plate the following information:

WD
Contractor's Name

B. Each letter shall be four inches high, in a space four inches wide, and each stroke forming each character shall be 3/4 inch wide. The lettering shall always be clear and legible.

C. Should the letters be painted, the paint used shall be white, of good quality and durability for painting on steel. The paint lettering shall be promptly repainted should it become obliterated during the contract period.

2.2 TEMPORARY PAVING

A. Temporary paving shall be Superpave Bituminous Binder (PG 64-22 19mm mix), underlain by a minimum six inches (6") of compacted subbase PennDOT 2A aggregate.

PART 3 – EXECUTION

3.1 TEMPORARY NO PARKING SIGNS

A. Where traffic requirements specified under this Contract require use of the existing parking lanes to maintain traffic flow at various locations, where full width street restoration is required, and where the proposed trenches are located in existing parking lanes, the Contractor shall post temporary no parking signs after 6:00 p.m. the night before the start of work at each location. Signs shall indicate the dates and hours that those areas will be closed. Obtain the "Temporary No Parking" signs from the Highway District indicated on the Contract Drawings.

1. 1st Highway District, 48th & Parkside (215) 685-0168

2.	2nd Highway District, 11th & Wharton	(215) 685-1858
3.	3rd Highway District, 990 Spring Garden Street	(215) 685-3922
4.	4th Highway District, 6249 Wissahickon	(215) 685-2191
5.	5th Highway District, Whitaker & Luzerne	(215) 685-9843
6.	6th Highway District, Bustleton & Bowler	(215) 685-0352

3.2 MAINTAINING TRAFFIC

A. Provide and maintain egress and ingress to and from the nearest intersecting public street, unless otherwise directed in writing by the Project Manager, for all local traffic which has origin, destination, or service connections, including loop-type, built-up, or Cul-de-Sac areas, within the limits of the Contract.

B. On streets upon which people are dependent on commuter service, ample provision shall be made for accommodation of passengers.

C. Provide and maintain approaches for vehicular and pedestrian access to transit stops; residential, business, industrial, and other public and private establishments.

D. Provide and maintain approaches to and crossings of intersecting streets until base and surface courses and pavements have properly cured.

E. Traffic signs in operation for guidance and direction of traffic shall remain in place or be removed or relocated, as directed by the Project Manager.

F. During the prosecution of work under this Contract, the Contractor shall provide for the safe passage of pedestrian traffic around the work area at all times. Provide at least a six foot (6') wide walking lane whenever possible.

G. Any unrestored surface shall be protected from pedestrian traffic at all times. Any excavation to be left open at the end of a business day and/or as site-specific traffic needs dictate (school opening/closing times, for example) shall be fully protected by fencing or other adequate measure to prevent pedestrian access to the worksite. Any damage or degradement to the Work attributable to insufficient site protection shall be the Contractor’s sole responsibility and repairs made at no additional expense to the City.

H. At the end of each workday, the Contractor will be responsible for leaving the site in an orderly fashion that will permit vehicle access in the event of a medical or fire emergency within the block.

I. When the Contractor sets up his equipment, he shall make every effort to take up as little space as possible. Parking and travel lanes where work is not being done shall not be obstructed unnecessarily.

J. Upon completion of work, the Contractor shall reinstall, repair, and/or replace any traffic signs, signals, and poles that were removed or damaged during the prosecution of work to the satisfaction of the Traffic Engineer.

3.3 STEEL PLATE FOR DECKING

A. The Contractor is reminded that steel decking plate is not permitted for traffic use in State Routes.

B. During working hours establish and maintain travel lanes using steel plates and flagmen as necessary to allow through traffic. During non-working hours, backfill or deck with steel plates all excavations.

C. All steel plate shall be adequately secured to the surface to prevent lateral movement avoiding an unsafe condition.

D. The size of the steel plate shall be large enough to span the opening, be firmly placed to prevent rocking and shall overlap the edges of trenches and openings and be sufficiently ramped to provide smooth riding and safe condition.

E. Where defections are more than ¾", heavier sections of plates or immediate supports shall be installed.

F. Prior to placing any Steel plating, the contractor shall provide the Right of Way Unit of the Department of Streets inspector with an emergency telephone number in the event any steel plating or decking is dislodged. Upon notice from the city, the contractor shall remove or restore any dislodged steel plating or decking to a safe condition within six hours upon receipt of notice by the city. In the event it becomes necessary for the City to restore or remove any steel plating or decking; the contractor shall reimburse the City for all costs.

G. The location or any steel plate remaining in the public right of way for more than 72 hours must be reported to the Streets Department as follows:

Time	Location	Phone No
8:00 AM to 5:00 PM Monday through Friday	Right of Way Unit	215.686.5501
5:00 PM to 8:00 AM Monday through Friday	City Dispatcher	215.686.4514*
5:00 PM Friday to 8:00 AM Monday	City Dispatcher	215.686.4514*

*Request that the dispatcher also notify the Highway Division at 215-686-5621

3.4 SPECIAL REQUIREMENTS FOR STATE ROUTES

A. Any excavation in a State Route must remain protected from traffic at all times or be stabilized with temporary paving in accordance with PennDOT guidelines. Exposed earth or stone backfill is not acceptable surfacing on any trench at any time. Minimum temporary surface restoration for traffic use is two inches (2") of Superpave Wearing Course, Class PG 64-22 over six inches (6") of compacted subbase material PennDOT 2A aggregate.

B. For work in State Routes special temporary paving regulations shall be in effect. In sections where the trench has been opened but the proposed system/structure has not yet been installed, the Contractor may elect (with the permission through permit of PennDOT) to leave the street closed to traffic. At the end of the construction work day, the street shall be smooth, even, and drivable. Additionally, the Contractor is responsible for ensuring the street is swept clean to the satisfaction of PWD at the end of each working day.

C. The Contractor shall note that for work in a State Route, before the start of construction, the Contractor will be required to obtain a highway occupancy permit from PennDOT.

3.5 MAINTENANCE OF TRAFFIC REQUIREMENTS

A. The Maintenance of Traffic Requirements required under this Contract are affixed to the end of these Contract Specifications, and are an integral part thereof. These requirements are in general conformity with the outlines set forth by the Streets Department. The Traffic Engineer may find it necessary to alter or increase these measures on any particular location. As a minimum, the Contractor shall incorporate the attached requirements in his proposed traffic measures and submit them to the permits officer to obtain the necessary street occupancy and/or closure permits.

END OF SECTION 015310

SECTION 015639
TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

B. Related Requirements:

1. Section 024119 - Selective Demolition
2. Section 312000 - Earth Moving
3. Section 329300 - Plants

1.3 DEFINITIONS

A. Caliper: Diameter of a trunk measured by a diameter tape at a height 6 inches above the ground for trees up to and including 4-inch size at this height and as measured at a height of 12 inches above the ground for trees larger than 4-inch size.

B. Tree-Protection: Individual tree guard surrounding single tree trunk delineating area not to be disturbed during construction and indicated on drawings.

C. Critical Root Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, as indicated on Drawings, and defined by the drip line of individual trees or the perimeter drip line of groups of trees unless otherwise indicated.

D. Diameter Breast Height (DBH): Diameter of a trunk as measured by a diameter tape at a height 54 inches above the ground line.

E. Drip line: Outermost circumference of a tree canopy or the outermost extents of the collective canopy of a group of trees.

F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at the Project Site.

1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:

(a.) Tree-service firm's personnel and equipment needed to make progress and avoid delays.
(b.) Arborist's responsibilities.
(c.) Quality-control program.
(d.) Coordination of Work and equipment movement with the locations of protection zones.
(e.) Trenching by hand or with air spade within protection zones.
(f.) Field quality control.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, and locations of protection-zone fencing and signage, showing relation of equipment-movement routes and material storage locations with protection zones.
2. Detail fabrication and assembly of protection-zone fencing and signage.
3. Indicate extent of trenching by hand or with air spade within protection zones.

C. Samples: For each type of the following:

1. Organic Mulch: 1-quart volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.

D. Arborist Report: Written report prepared by Certified Arborist for care and protection of trees affected by construction during and after completing the Work.

1. Report shall be submitted prior to any removals on site and shall include but is not limited to: recommendations for soil amendments at existing trees to remain, watering (volume) during all work (at no additional cost to Owner), any required treatment for pests or disease, decompaction procedures within critical root zones, and any required root pruning. Soil amendment recommendations shall be coordinated with the work of Section 329113 and shall include list of products, timing, and methodology.

2. Report shall include Tree Pruning Schedule with dates for such work. The written pruning schedule shall detail scope and extent of pruning for all trees to remain that interfere with or are affected by construction. Report shall include:

(a.) Species and size of tree.

(b.) Location on site plan. Include unique number identifier for each as shown in Contract Documents.
(c.) Reason for pruning.
(d.) Description of pruning to be performed.
(e.) Timing of pruning to be performed.
(f.) Description of maintenance by tree service firm following pruning.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For arborist and tree service firm.

B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

C. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
3. Identify any pests or disease as trees or other plants to remain that should be addressed in maintenance recommendations.

D. Quality-control program.

1.7 QUALITY ASSURANCE

A. Arborist Qualifications: Certified Arborist as certified by ISA.

B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work. Tree service firm shall have experience working in plaza areas with tight conformance to grade conditions.

C. Quality-Control Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work without damaging trees and plantings. Include dimensioned diagrams for placement of protection zone fencing, the arborist's and tree-service firm's responsibilities, instructions given to workers on the use and care of protection zones, and enforcement of requirements for protection zones.

1.8 FIELD CONDITIONS

A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Moving or parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Backfill Soil: Planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.

1. Planting Soil: Planting soil as specified in Section 329113 "Soil Preparation."

B. Protection Fencing: Fencing fixed in position and meeting the following requirements:

1. Tree Guard (Type 1): Fencing constructed of two 2-by-4-inch horizontal rails, with 4-by-4-inch preservative-treated wood posts spaced not more than 60 inches apart, and lower rail set 6 inches above existing grade. Plastic barrier fabric (color: orange) to be used as infill between posts.
   (a.) Height: 48 inches.

2. Critical Root Zone Protection (Type 2): Fencing constructed of 1 ¾” x 1” 13 GA U Channel steel posts. Plastic barrier fabric (color: orange) to be used as infill between posts.

   (a.) Height: 48 inches

C. Plastic Barrier Fabric: high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb/ft.; remaining flexible from minus 60 to plus 200 deg F; inert to most chemicals and acids; minimum tensile yield strength of 2000 psi and ultimate tensile strength of 2680 psi; secured with plastic bands or galvanized-steel or stainless-steel wire ties on protection fencing support system.

1. Height: As required
2. Color: High-visibility orange, nonfading

PART 3 - EXECUTION

3.1 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

B. Prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

A. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Tie a 1-inch blue vinyl tape around each tree trunk at 54 inches above the ground.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

C. Critical Root Zone Protection: Mulch areas inside critical root zone protection areas and other areas indicated. Do not exceed indicated thickness of mulch.

1. Apply 4-inch uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches of tree trunks.

3.3 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.

1. Critical Root Zone Protection Fencing: Set or drive posts into ground to a minimum three (3) foot depth without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Director's Representative.

B. Tree Protection: Install guards under direct supervision of arborist. The intent of the guard placement is to allow hand removal of pavers without disturbing individual tree guard protection.

C. Maintain protection zones free of weeds and trash.

D. Maintain all protection zone fencing in good condition as acceptable to Director's Representative and remove when construction operations are complete, and equipment has been removed from the site.

1. Do not remove Tree Protection Fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
2. Temporary access for activities such as hand removal of pavers is permitted within the critical root zone protection area, subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.4 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312000 "Earth Moving" unless otherwise indicated.

B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.

C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches back from new construction and as required for root pruning.

D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.5 SOIL DECOMPACTION AT EXISTING TREES

A. Contractor shall follow direction on decompaction procedures within critical root zones of existing trees as described in Arborist's written report.

3.6 ROOT PRUNING

A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows, unless arborist has provided detailed written instructions specific to the trees at this location:

1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
2. Cut Ends: Coat cut ends of roots more than 1-1/2 inches in diameter with an emulsified asphalt or other coating formulated for use on damaged plant tissues and that is acceptable to arborist.
3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
4. Cover exposed roots with burlap and water regularly.
5. Backfill as soon as possible according to requirements in Section 312000 “Earth Moving”

B. Root Pruning at Edge of Protection Zone: Prune tree roots 12 inches outside of the protection zone by cleanly cutting all roots to the depth of the required excavation.

C. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

3.7 CROWN PRUNING

A. Prune branches that are affected by temporary and permanent construction. Prune branches as directed by arborist.

1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
3. Pruning Standards: Prune trees according to ANSI A300 (Part 1).

B. Unless otherwise directed by arborist and acceptable to Director’s Representative, do not cut tree leaders.

C. Cut branches with sharp pruning instruments; do not break or chop.

D. Do not paint or apply sealants to wounds.

E. Provide subsequent maintenance pruning during Contract period as recommended by arborist.

F. Chip removed branches and dispose of off-site.

3.8 REGRADING

A. Lowering Grade within Protection Zones: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.

   1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.

B. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone as recommended by arborist, unless otherwise indicated on drawings. Maintain existing grades within the protection zone.

C. Temporary Minor Fill within Protection Zones: Where existing grade is 2 inches or less below elevation of finish grade, temporarily fill with specified soil. Place backfill soil in a single uncompacted layer and hand grade to required finish elevations.

3.9 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.10 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Director's Representative.

   1. Submit details of proposed pruning and repairs.
   2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
   3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Director's Representative.

B. Trees: Remove and replace trees indicated to remain that are more than 25 percent dead or in an unhealthy condition or are damaged during construction operations that Director's Representative determines are incapable of restoring to normal growth pattern.

   1. Replacement Trees: Provide new trees of same size and species as those being replaced for each tree that measures 4 inches or smaller in caliper size.
   2. Restitution Planting: Provide new tree(s) of 4-inch caliper size for each tree being replaced that measure more than 4 inches in caliper size. Provide one additional tree for each 4-inch caliper increment above 4". For example, a 6-inch caliper restitution credit would equal two (2) 4-inch caliper trees. Tree shall be planted at same location or elsewhere within park.

      (a.) Species: As selected by Director's Representative.

3. Plant and maintain new trees as specified in Section 329300 "Plants."

C. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 2-inch uniform thickness to remain. Do not place mulch within 6” of tree trunks.

D. Soil Aeration: Where directed by Director’s Representative, aerate surface soil compacted during construction. Aerate 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill 2-inch-diameter holes a minimum of 12 inches deep at 24 inches o.c. Backfill holes with an equal mix of augured soil and sand.

3.11 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 015639

SECTION 015713

TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The work of this section includes all temporary erosion and sediment control and related and incidental operations, including:

1. Compost Sock installation and maintenance.
2. Inlet Protection installation and maintenance.
3. Rock construction entrance installation and maintenance.
4. Maintenance and repairs of erosion and sediment control measures.
5. Temporary seeding.

B. Related Requirements:

1. Section 31 10 00, “Site Clearing”.
2. Section 31 20 00, “Earth Moving”.

1.3 REFERENCES

A. Work and materials shall conform to the latest editions of the following standards:

1. Pennsylvania Code, Chapter 102, Erosion and Sediment Control
2. Pennsylvania Department of Environmental Protection, Erosion and Sediment Pollution Control Manual, latest edition.

1.4 ACTION SUBMITTALS

A. All products used for erosion and sedimentation control which may include, but may not be limited to, compost sock, inlet protection, rock construction entrance, erosion control blanket, temporary seeding, other maintenance or erosion and sediment control measures.

1.5 QUALITY ASSURANCE

A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
B. Codes and Standards: Perform work in compliance with applicable requirements of governing authorities having jurisdiction. Construction operations shall be carried out in a manner such that soil erosion, air pollution, and water pollution is minimized. State, County, and Municipal laws concerning pollution abatement shall be followed.
C. The recommendations and Standards set forth in Chapter 102 of the Pennsylvania Code (Erosion and Sediment Control Handbook), published by the PA Department of Environmental Protection, shall be applicable where the work is not specifically detailed in this specification, the accompanying drawings or the Erosion and Sediment Control Plan.
D. The Contractor shall take action to remedy unforeseen erosion conditions and to prevent damage to adjacent properties as a result of increased runoff and/or sediment displacement. Stockpiles of wood chips, hay bales, crushed stone, and other mulches shall be held in readiness to deal immediately with emergency problems of erosion. All erosion control checks and structures shall be inspected after heavy rainfalls, and if damaged, repaired or replaced.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. All materials and products shall meet the approval of the engineer. Cut sheets for all items shall be submitted for review and approval prior to installation.

1. Compost Socks shall be as indicated on details.
2. Inlet Protection shall be as indicated on details
3. Rock Construction Entrance shall be as indicated on details.
4. Erosion Control Blanket shall be Bionet SC150BN Extended Term Biodegradable Erosion Control Blanket by North American Green, distributed by Jobsite Products, Inc. Harleysville, PA, or approved equal.
5. Seed Types shall be as indicated on contract drawings.
6. Pumped water filter bags shall be as indicated on contract drawings.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. All temporary erosion and sediment control measures indicated on the drawings and specified herein shall be in place before the beginning of any earthwork or site work phase.

B. Erosion and sediment control measures shall be inspected weekly and after every precipitation event.
C. Install compost sock and inlet protection according to manufacturer's directions.
D. Inspect compost sock after every precipitation event.
E. Remove (or spread) compost sock upon project completion and ground stabilization.
F. Install Ground Stabilization Fabric and AASHTO #1 aggregate for Construction Entrance.
G. Maintain clean stone layer throughout the course of construction.
H. All graded or cleared areas shall receive temporary seeding if subject to erosion for a period of 72 hours or more. See Parts 3.9 and 3.10 of Section 312000, Earth Moving.
I. Prepare area to be seeded by hand raking and grading prior to seeding.
J. Temporary seeding shall consist of sod, a blend of turf-type tall fescue and Kentucky Blue Grass (100 percent by weight) or equivalent and shall be placed at 30 lbs per acre or 10 lbs per 1,000 square feet.
K. Mulch newly seeded areas to prevent erosion prior to seed germination and stabilization.
L. Provide adequate maintenance conforming to requirements of the City of Philadelphia Water Department.
M. Remove sediment from compost socks, inlet protections, and pavement areas after each major storm event.

END OF SECTION 015713

SECTION 015719

ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.1 The project shall incorporate environmental controls during construction to protect the atmosphere, waterways, groundwater, plants, animal habitats, soils, utilities, etc., both on and off site.

1.2 Comply with the following Standards or Agencies:

A. Commonwealth of Pennsylvania Department of Environmental Protection (PADEP):

1. Erosion and sediment pollution control program manual (latest edition)

B. City of Philadelphia:

1. City Code
2. Requirements by the Department of Licenses + Inspections

C. Philadelphia Water Department
1. Philadelphia Stormwater Management Guidance Manual, Current Version

1.3 Establish and enforce ecological preservation measures which will avoid pollution of the atmosphere, waterways, groundwater, plants, soils, animal habitats, landfills, wetlands, the site, adjacent sites, roadways, etc. Prevent spilling of chemicals or waste. Provide emergency plans and methods for abatement of accidental spills of toxic substances.

1.4 Until permanent work establishes sediment control, provide temporary control, using vegetative cover with seeding, mulch, and binder within five (5) days after completion of grading of any given area. As a temporary measure, provide silt fences or compost filter socks, arranged along the toe of surface drainage ways and inlets, in such a manner that water will pass through the silt fences and filter the sediment. Replace silt fences or compost filter socks when they become clogged and ineffective. They shall be inspected as required by PWD/PADEP requirements.

1.5 During pipe laying work, prevent silt from entering the piping systems by use of hay bales, silt fence, temporary closures of pipe ends, or other means as best suited to the conditions.

1.6 Perform earth moving in phases to minimize the area and extent of exposed land. Control the rate of water runoff by diversion ditches, benches, berms, and other earth-formed shaping so that the rate of flow is retarded and silting shall be minimized. Reshape and restore conditions showing evidence of earth erosion.

1.7 Keep dust down at all times, including non-working days, weekends, and holidays. Wet down or treat disturbed soil with dust suppressers as required and approved. Do not leave areas of disturbed earth unworked for long periods of time. Provide temporary or permanent earth stabilization promptly. If required install perimeter fencing tarpaulins to control dust leaving the site. Use wet-cutting methods for cutting concrete, asphalt, and masonry. Do not shake out bags containing dust-causingsubstances.

1.8 Provide mufflers on internal combustion engine equipment. Maximum noise level shall be 90 dbA at 50 feet. Limit hours of operation of noisy construction to limits set by City ordinance.

1.9 Legally dispose of debris, chemicals, contaminated fill, and waste off the site. Collect and contain materials before disposal in orderly fashion and by means which prevent contamination of air, water and soil. Store chemicals in watertight containers. Do not burn materials on the site. Meet all local, state, or federal requirements.

1.10 Dump trucks shall be tarpaulin-covered so that spillage does not occur. Provide a gravel surfaced truck wheel washing area at entrances. Clean all truck wheels of mud, spoil, and debris before the trucks leave the site.

1.11 Maintain in working order environmental protection measures until they are no longer required. Terminate environmental control measures when there is no longer a threat of pollution. Remove temporary control measures. Complete or, if necessary, restore permanent construction that may have been delayed or damaged because of interference with environmental controls.

END OF SECTION 015719

SECTION 015800

PROJECT IDENTIFICATION AND SIGNS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

Requirements include the following which shall be provided by the Contractor for General Construction:

A. Furnish, install and maintain project identification sign.
B. Provide temporary on-site information signs to identify Owner's temporary relocation.
C. Remove signs on completion of construction.
D. Allow no other signs to be displayed without approval of owner.

1.2 RELATED REQUIREMENTS

A. Section 011100 – Summary of Work
B. Section 015000 – Temporary Facilities and Controls
C. Section 0151719 – Environmental Controls

1.3 PROJECT IDENTIFICATION SIGN

A. Two (2) digitally printed signs, not less than 4 feet x 8 feet, with graphic content as shown on sample exhibit (1) on the next page of this section.
B. Erect/Fasten on the site at location shown on drawing or as directed by the owner.

1.4 INFORMATIONAL SIGNS

A. Provide at all public entrances, stairways and temporary gates digitally printed signs with lettering indicating Owner's relocated address. Each sign to be 3 feet by 3 feet and up to 100 letters, with graphic content as shown on sample exhibit (2) on the next page of this section. Allow for a total of eight [8] signs.
B. Erect/Install at appropriate locations to provide required information. Coordinate location with owner/owner's representative.

1.5 QUALITY ASSURANCE

A. Digital Sign Printer: Professional experience in type of work required.

B. Finishes: Adequate to resist weathering and fading for scheduled construction period.

PART 2 PRODUCTS

2.1 SIGN MATERIALS

A. Sign surfaces: Dibond material (aluminum sheets with plastic core).
   1. Thickness: at least 3 millimeters
B. Hardware used to secure sign: Galvanized bolts with plastic fasteners.

PART 3 EXECUTION

3.1 PROJECT IDENTIFICATION SIGN

A. Sign should be printed/manufactured with style, sizes and colors shown on exhibit attached on page 3 of this section.

3.2 INFORMATION SIGNS

A. Signs should be printed/manufactured in style, sizes and colors as shown in Exhibit 2
B. Install at a height for optimum visibility, on ground-mounted poles or attached to temporary structural surfaces.

3.3 MAINTENANCE

A. Maintain signs, fasteners, and hardware in a neat, clean condition; repair damaged sign if needed.
B. Relocate informational signs as required by progress of work.

3.4 REMOVAL

A. Remove signs, supports, fasteners at completion of project.

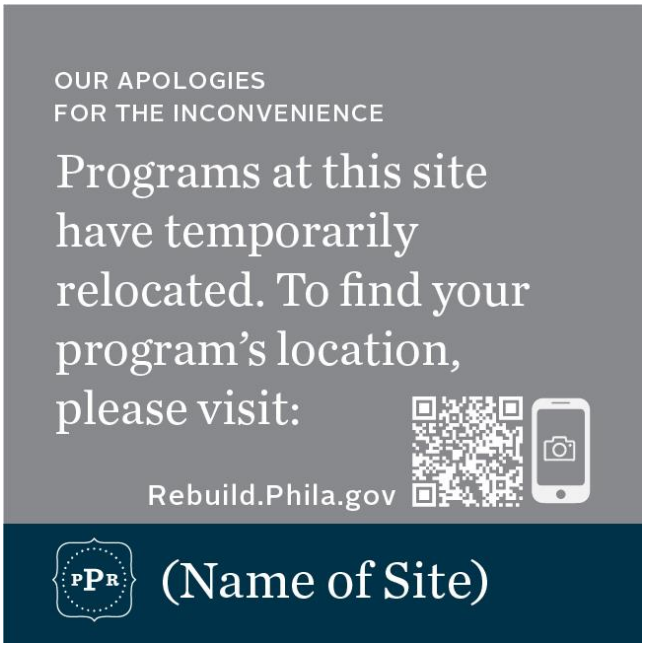
END OF SECTION 015800

Sample – Exhibit 1 - PROJECT IDENTIFICATION SIGN

Note for Sample - Exhibit 1 –
City of Philadelphia and City Council logos are on ALL signs.
The following logos are dependent on project delivery and Owner (see below).

- PPR - only when site is a PPR site.
- FLP - only when site is a FLP site.
- PPR/FLP - need to show both when a co-located site exists.
- PHDC - logo used when project is being bid through PRA.
- Project User -logo used when project is bid through a Project User
- Funders – It may be required for funder logos to be included on the project sign. This will be at the direction of Rebuild.

Sample – Exhibit 2 - INFORMATION SIGNS (PPR & FLP)



Note for Sample - Exhibit 2

- PPR Info Sign - QR code to direct to the Rebuild.Phila.gov website
- FLP Info Sign – QR code to direct to the freelibrary.org website

SECTION 016000

PRODUCT REQUIREMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 012300 "Alternates" for products selected under an alternate.
2. Section 012500 "Substitution Procedures" for requests for substitutions.
3. Section 014200 "References" for applicable industry standards for products specified.
4. Section 017700 “Closeout Procedures” for submitting warranties for Contract closeout.
5. Divisions 2 through 33 for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor through Construction Manager of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
    a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
    b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.

3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 – PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or “or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

Commented [LT1]: This section restricts or comparable product

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:
   a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered.
   b. Non-restricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
4. Manufacturers:

a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered.
b. Non-restricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 01650

GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1. DESCRIPTION

A. Summary. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the owner's operational needs. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training.

B. Purpose. Commissioning during the construction phase is intended to achieve the following specific objective according to the Contract Documents:

1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
2. Verify and document proper performance of equipment and systems.
3. Verify that O&M documentation left on site is complete.
4. Verify that the Owner's operating personnel are adequately trained.

1.2. COORDINATION

A. Commissioning Team. The members of the commissioning team consist of the designated representative of the Owner, CM, Commissioning Authority (CA), the Architect and Design Engineers (particularly the mechanical engineer), the Mechanical Contractor (MC), the TAB representative, the Electrical Contractor (EC), the Controls Contractor (CC) and the Plumbing Contractor (PC). If known, the Owner's building or plant operator/engineer is also a member of the commissioning team.

B. Management. The CA has been hired by the Owner. The CA directs and coordinates the commissioning activities and is part of the design team. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

C. Scheduling. The CA will work with the Cx team according to established protocols to schedule the commissioning activities. The CA will provide sufficient notice to the Cx team for scheduling commissioning activities. The CM will integrate all commissioning

activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

1.3. COMMISSIONING PROCESS

A. Commissioning Process. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.

1. Commissioning during construction begins with a scoping meeting conducted by the CA where the commissioning process is reviewed with the commissioning team members.
2. Additional meetings will be required throughout construction, scheduled by the CA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems.
3. Equipment documentation is submitted to the CA during normal submittals, including detailed start-up procedures.
4. The CA works with the CM, Prime Contractors and Equipment Suppliers in developing startup plans and startup documentation formats.
5. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels with pre-functional checklists being completed before functional testing.
6. The Prime Contractors, under their own direction, execute and document the pre-functional checklists and perform startup and initial checkout. The CA documents that the checklists and startup were completed according to the approved plans. This will include the CA witnessing start-up of selected equipment.
7. The CA develops specific equipment and system functional performance test procedures. The Prime Contractors review the procedures.
8. The procedures are executed by the Prime Contractors, under the direction of, and documented by the CA.
9. Items of non-compliance in material, installation or setup are corrected at the Prime Contractors' expense and the system retested.
10. The CA reviews the O&M documentation for completeness.
11. Commissioning is completed before Substantial Completion.
12. The CA reviews and coordinates the training provided by the Prime Contractors and verifies that it was completed.
13. Deferred testing is conducted, as specified or required.

1.4. RELATED WORK

A. Specific Commissioning (Cx) requirements are given in the following sections of these specifications. All of the following sections apply to the Work of this section:

220800 Plumbing Cx	Describes the Cx responsibilities of the Plumbing Contractor and the pre-functional testing and startup responsibilities.
269950 Electrical Cx	Describes the Cx responsibilities of the Electrical Contractor and the pre-functional testing and startup responsibilities.
230800 Mechanical Cx	Describes the Cx responsibilities of the Mechanical, Controls and TAB Contractors and the pre-functional testing and startup responsibilities of each.

1.5. RESPONSIBILITIES

A. The responsibilities of various parties in the commissioning process are provided in this section. The responsibilities of the Plumbing Contractor are in Division 22, Mechanical Contractor, TAB and Controls Contractor are in Division 23, and Electrical Contractor in Division 26. It is noted that the services for the Construction Management Firm, Architect, MEP Designers/Engineers, and Commissioning Authority are not provided for in this contract. That is, the Contractors are not responsible for providing their services. Their responsibilities are listed here to clarify the commissioning process.

B. <u>All Parties</u>

1. Follow the Commissioning (Cx) Plan.
2. Attend commissioning scoping meeting and additional Cx meetings, as necessary.

C. <u>Owner</u>

Design, Construction and Acceptance Phase

1. Manage the CA contract.

D. <u>Mechanical, Electrical and Plumbing Designers/Engineers</u>

Design, Construction and Acceptance Phase

1. Perform normal submittal review, construction observation, as-built drawing preparation, etc., as contracted. One site observation should be completed just prior to system startup.
2. Provide any design narrative and sequences documentation requested by the CA. The designers shall assist (along with the contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

3. Participate in the resolution of system deficiencies identified during commissioning, according to the contract documents.
4. Prepare and submit the final as-built design intent and operating parameters documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.
5. Edit and update one-line diagrams developed as part of the design narrative documentation and those provided by the vendor as shop drawings for the various HVAC, Electrical, and Plumbing systems.

E. Commissioning Authority (CA)

The CA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CA may assist with problem-solving non-conformance or deficiencies, but ultimately that responsibility resides with the Prime Contractors and the A/E. The primary role of the CA is to develop and coordinate the execution of a testing plan and observe/document performance. The Contractors will provide all tools or the use of tools to start, check-out and functionally test equipment and systems.

Design, Construction and Acceptance Phase

1. Coordinate the commissioning work and, with the CM, ensure that commissioning activities are being scheduled into the master schedule.
2. Plan and conduct a commissioning scoping meeting, start-up and deficiency meetings as required.
3. Request and review additional information required to perform commissioning tasks, including O&M materials, control sequences, contractor start-up and checkout procedures.
4. Before startup, gather and review the current control sequences and interlocks and write detailed testing procedures.
5. Review normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs.
6. Write and distribute pre-functional tests and checklists.
7. Perform site visits, as necessary, to observe component and system installations. Attends selected planning and job-site meetings to obtain information on construction progress.
8. Witness all or part of the HVAC/Plumbing piping test and flushing procedure, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in the Cx Report. Notify the CM of any deficiencies in results or procedures.
9. Approve pre-functional tests and checklist completion by reviewing pre-functional checklist reports and by selected site observation and spot-checking.
10. Approve systems startup by reviewing start-up reports and by selected site observation.
11. Review TAB execution plan.

12. Analyze any functional performance trend logs and monitoring data to verify performance.
13. Compile and maintain a commissioning record and building systems book(s).
14. Review and approve the preparation of the O&M manuals.
15. Provide a final commissioning report.

F. Architect/Engineering Firm

Design, Construction and Acceptance Phase

1. Facilitate the coordination of the commissioning work by the CA, and, with the CA, ensure that commissioning activities are being scheduled into the master schedule.
2. Review and approve the final *Construction Commissioning Plan.*
3. Attend a commissioning scoping meeting and other commissioning team meetings as needed.
4. When necessary, observe and witness pre-functional checklists, startup and functional testing of selected equipment
5. Review commissioning progress and deficiency reports.

G. Equipment Suppliers

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
2. Assist in equipment testing per agreements with Prime Contractors.
3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor. Through the contractors they supply products to, analyze specified products and verify that the designer has specified the newest most updated equipment reasonable for this project's scope.
4. Provide information requested by CA regarding equipment sequence of operation and testing procedures.
5. Review test procedures for equipment installed by authorized factory representatives.

1.6. SYSTEMS TO BE COMMISSIONED

A. The following systems will be commissioned in this project:

SYSTEM

SYSTEM
Central Building Automation System (BAS) for HVAC
HVAC Primary Equipment and Systems
HVAC terminal devices (20%)
Verification of TAB Data
Domestic Heating Hot Water System (Boiler/pumping system only)
Lighting Control System

PART 2 – PRODUCTS – (NOT APPLICABLE)

PART 3 - EXECUTION

3.1. REPORTING

A. The CA will provide field reports to the Owner/CM as construction and commissioning progresses.

B. The CA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos and progress reports.

C. A final summary report by the CA will be provided to the Owner. All acquired documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved issues, etc., will be compiled in appendices and provided with the summary report. Pre-functional checklists, functional tests and monitoring reports will not be part of the final report, but will be stored in the Commissioning Record.

3.2. START-UP, PREFUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT

A. The following procedures apply to all equipment to be commissioned, according to Section 1.6, “Systems To Be Commissioned.”

1. Pre-functional checklist.
2. Start-up: The start-up plan shall consist of:
   a. The CA’s prefunctional checklist.
   b. The manufacturer’s standard start-up procedure
   c. The manufacturer’s standard field check-out sheets.

B. Execution of Pre-functional Checklists and Startup.

1. The CA shall observe, at minimum, the procedures for each piece of primary equipment, unless there are multiple units. In no case will the number of units witnessed be less than 50% of the total number of identical or very similar units.
2. For lower-level components of equipment, (e.g., unit heaters, sensors, controllers), the CA shall observe a sampling of the pre-functional and start-up procedures. The sampling procedures are identified in the commissioning plan.
3. The Prime Contractors and vendors shall execute startup and provide the CA with a signed and dated copy of the completed start-up and pre-functional tests and checklists.

C. Deficiencies, Non-Conformance and Approval in Checklists and Startup.

1. The Prime Contractors shall clearly list any outstanding items of the initial start-up and pre-functional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures and any outstanding deficiencies are provided to the CA within two days of test completion.
2. The CA reviews the report and submits either a non-compliance report or an approval to the CM. The CA shall work with the Prime Contractors and vendors to correct and retest deficiencies or uncompleted items. The installing Prime Contractors or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CA as soon as outstanding items have been corrected and resubmit an updated start-up report. When satisfactorily completed, the CA recommends approval of the execution of the checklists and startup of each system.

3.3. FUNCTIONAL PERFORMANCE TESTING

A. This sub-section applies to all commissioning functional testing for all divisions.

B. The general list of systems to be commissioned is found in Section 1.6 of this specification

C. Objectives and Scope. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems. In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required.

D. Development of Test Procedures. Before test procedures are written, the CA shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. The CA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each Prime Contractor or vendor responsible to execute a test shall provide assistance to the CA in developing the procedures review. Prior to execution, the CA shall provide a copy of the test procedures to the Prime Contractors who shall review the tests for feasibility, safety, equipment and warranty protection.

E. Coordination and Scheduling. The Prime Contractors shall provide sufficient notice to the CA regarding their completion schedule for the pre-functional checklists and startup of all equipment and systems. The CA will schedule functional tests through the CM. The CA shall direct, witness and document the functional testing of selected equipment and systems. The Prime Contractors shall execute the tests.

In general, functional testing is conducted after pre-functional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

3.4. DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation. The CA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided by the CA for review and approval and to the Prime Contractors for review.

B. Non-Conformance.

1. The CA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the CM.
2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CA.
3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the Owner.

C. Approval. The CA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CA.

3.5. OPERATION AND MAINTENANCE MANUALS

The CA reviews the O&M manuals, documentation and redlined as-builts for systems that were commissioned to verify compliance with the Specifications.

3.6 TRAINING OF OWNER PERSONNEL

A. The Prime Contractors shall be responsible for training coordination and scheduling, and ultimately for ensuring that training is completed.

B. The CA shall be responsible for approving the content and adequacy of the training of Owner personnel for commissioned equipment.

3.7 DEFERRED TESTING

A. Unforeseen Deferred Tests. If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the Owner. These tests will be conducted in the same manner as the seasonal tests as soon as possible.

B. Seasonal Testing. During the warranty period, seasonal testing shall be completed as part of this contract. The CA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate Prime Contractor, with facilities staff and the CA witnessing.

END OF SECTION 01650

SECTION 017300

EXECUTION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.
9. Correction of the Work.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting surveys.
2. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
   1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
   2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
   3. Products: List products to be used for patching and firms or entities that will perform patching work.
   4. Dates: Indicate when cutting and patching will be performed.
   5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
      a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

E. Certified Surveys: Submit two copies signed by land surveyor.

F. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

   1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
      a. Floor framing beams.
      b. Roof trusses.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
   a. Primary operational systems and equipment.
   b. Fire separation assemblies.
   c. Mechanical systems piping and ducts.
   d. Control systems.
   e. Communication systems.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
   a. Water, moisture, or vapor barriers.
   b. Membranes and flashings.
   c. Exterior curtain-wall construction.
   d. Sprayed fire-resistive material.
   e. Equipment supports.
   f. Piping, ductwork, vessels, and equipment.
   g. Noise- and vibration-control elements and systems.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit

to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Construction Manager promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect and Construction Manager when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Construction Manager.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect or Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Construction Manager before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements, and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching.

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Pre-installation Conferences: Include Owner's construction personnel at pre- installation conferences covering portions of the Work that are to receive Owner's work. Attend pre- installation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg. F (27 deg. C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
   a. Use containers intended for holding waste materials of type to be stored.
4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.11 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 01 74 19

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Implement practices and procedures to meet the Project's environmental performance goals, which include obtaining the LEED v4 credit Construction and Demolition Waste Management for 2 points. Ensure that the requirements related to these goals, as defined in this section and throughout the contract documents, are fully implemented. Substitutions or other changes to the work proposed by the Contractor or their subcontractors shall not be allowed if such changes compromise LEED Requirements.

C. Section includes administrative and procedural requirements for salvaging, recycling, and disposing nonhazardous demolition and construction waste generated during the project.

1.2 RELATED SECTIONS

A. Division One Sections.

B. Section 01 31 00 Project Management and Coordination

C. Section 01 50 00 Temporary Facilities and Controls

D. Section 01 81 13 Sustainable Design Requirements

E. Section 02 42 13 Deconstruction of Structures

F. Section 31 23 00 Excavation and Fill

G. Section 32 90 00 Plantings

1.3 DEFINITIONS

A. Alternative Daily Cover (ADC): Material other than earthen material placed on the surface of the active face of a municipal solid waste landfill at the end of each operating day to control vectors, fires, odors, blowing litter, and scavenging. Generally, these materials must be processed so they do not allow gaps in the exposed landfill face.

B. Clean Waste: Nonhazardous materials left over from construction and demolition. Clean waste excludes lead and asbestos.

C. Commingled Waste: Building waste streams that are combined on the project site and hauled away for sorting into recyclable streams. Also known as single-stream recycling.

D. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

E. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

F. Diverted Waste: Includes all recycled, salvaged, reused, and donated materials.

G. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

H. Green Business Certification Inc (GBCI): Third-party credentialing and verification body that administers the LEED certification program, performing third-party technical reviews and verification of registered projects to determine if they have met the standards set forth by the LEED rating system.

I. Land-Clearing Debris and Soil: Materials that are natural (e.g., rock, soil, stone, vegetation). Materials that are manmade (e.g., concrete, brick, cement) are considered construction waste even if they were on site.

J. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

K. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

L. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

A. Achieve end-of-Project rates approved by GBCI for diversion of 75 percent and four material streams, minimum, by weight or volume, of total non-hazardous solid waste generated by the Work.

B. Achieve end-of-Project rates approved by GBCI for diversion of 50 percent minimum, by weight or volume, of total non-hazardous solid waste generated by the Work and generate no more than 10 pounds of construction waste per square foot of the building's floor area.

1.5 SUBMITTALS

A. Construction Demolition and Waste Management (CWM) Plan: Submit CWM plan within 30 days of date established for Notice to Proceed. The Plan shall include, but not be limited to, the following:

1. Identify strategies to reduce the generation of waste during project design and construction.

2. Establish waste diversion goals for the project by identifying the materials (both structural and nonstructural) targeted for diversion.

3. Describe the diversion strategies planned for the project and where the materials will be taken including expected diversion rates for each material.

i. Provide the name and location of where the diverted materials will be taken and how the recycling facility will process the material. If on-site diversion strategies are not available, explain why.

ii. Provide the name and location of the landfill(s) and/or incinerator(s) where trash will be disposed.

4. Provide name, title, and responsibilities of on-site Waste Management Coordinator.

B. Final waste management report detailing all the waste generated, including disposal and diversion rates for the project.

1. Exclude excavated soil and land-clearing debris from calculations.

2. Include materials destined for ADC in the calculations as waste.

3. Any materials sent to a commingled recycling facility for processing must take the facility average recycling rate and must include any ADC as waste.

C. LEED Progress Reports: Submit a monthly waste management report for the project that includes the following information:

1. Total construction and demolition waste produced by the project (by weight or volume)

2. Types of waste material and quantity of each material (by weight or volume)

3. Total waste diverted and diversion rate (percentage). The report must address ADC and other materials that are included in the calculation even if they do not count toward diversion. If multiple haulers or diversion strategies are used, compile waste management information from all sources into a single report.

4. Include the following records, as applicable to the project and label them to correspond with the report:

i. Commingled waste: Provide documentation complying with one of the following requirements:

ii. The waste-sorting facility provides a waste diversion percentage specific to the project's waste based on measurement of each component waste material. Visual inspection is not an acceptable method of evaluation for documenting this percentage.

iii. The waste-sorting facility's average diversion rate, which must be regulated by the local or state authority and must exclude alternative daily cover (ADC).

a. This must be a closed system; shipping waste to another municipality to manage does not count as diverting the waste.

iv. Recycling and Processing Facility: Manifests, weight tickets, receipts, and/or invoices indicating receipt and acceptance of recyclable waste.

v. Landfill and Incinerator Disposal: Manifests, weight tickets, receipts, and/or invoices indicating receipt and acceptance landfills and/or incinerator bound waste.

vi. Reused materials: Record of estimated weight or volume of materials that are reused on-site or salvaged for reuse on other projects by subcontractors or vendors.

vii. Donated or sold materials: Receipts and estimated weight or volume for donated materials, materials sold to retailers, or other means of diversion.

D. See additional submittal requirements in Section 018113 Sustainable Design Requirements, Submittals: LEED Action Plan, LEED Progress Reports, and LEED Online Documentation.

1.6 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced employee of General Contractor/Construction Manager, with a record of successful waste management coordination of Projects with similar requirement.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Include the Construction Waste Management Plan Management Plan requirements in contract agreements with subcontractors.

D. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 Project Management and Coordination. Waste Management Service Company should conduct the meeting and Subcontractors must be present. Issue meeting minutes and copy Owner and Architect. Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of waste management coordinator.
2. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
3. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
4. Review waste management requirements for each trade.
5. Review recycling process and facilities involved in that recycling process.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CWM PLAN IMPLEMENTATION

A. General: Implement and maintain approved CWM plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with Section 01 50 00 Temporary Facilities and Controls for operation, termination, and removal requirements.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

2. Comply with Section 01 50 00 Temporary Facilities and Controls for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

General: Recycle paper and beverage containers used by on-site workers.

Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

Procedures: Separate recyclable waste from other waste materials, trash, and debris.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

2. Waste coordinator to regularly inspect containers and bins for contamination and remove contaminated materials if found.

3. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

4. Stockpile materials away from construction area. Do not store within drip line of trees.

5. Store absorptive components off the ground and protect from the weather.

6. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.3 RECYCLING DEMOLITION WASTE

A. Asphaltic Concrete Paving:

1. Grind asphalt to maximum 1-1/2-inch (38-mm) size.

2. Crush asphaltic concrete paving and screen to comply with requirements in Section 31 23 00 Excavation and Fill for use as general fill.

B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Pulverize concrete to maximum 1-1/2-inch (38-mm) size.

2. Crush concrete and screen to comply with requirements in Section 31 23 00 Excavation and Fill for use as satisfactory soil for fill or subbase.

C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Pulverize masonry to maximum 3/4-inch (19-mm) size.

i. Crush masonry and screen to comply with requirements in Section 31 23 00 Excavation and Fill for use as general fill.

ii. Crush masonry and screen to comply with requirements in Section 32 90 00 Plantings for use as mineral mulch.

2. Clean and stack undamaged, whole masonry units on wood pallets.

D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

E. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.

2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

F. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

G. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

H. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

I. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.

J. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

K. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

L. Conduit: Reduce conduit to straight lengths and store by type and size.

3.4 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For non-treated wood pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Site-Clearing Wastes: Chip brush, branches, and trees on-site.

1. Comply with requirements in Section 32 90 00 Plantings for use of chipped organic waste as organic mulch.

C. Wood Materials:

1. Clean Cut-Offs of Non-Treated Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
    i. Comply with requirements in Section 32 90 00 Plantings for use of clean sawdust as organic mulch.

D. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
    i. Comply with requirements in Section 32 90 00 Plantings for use of clean ground gypsum board as inorganic soil amendment.

3.5 DISPOSAL OF WASTE

A. Except as otherwise specified, do not allow waste materials that are to be disposed of to accumulate on-site.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

C. Burning: Do not burn waste materials.

D. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 01 74 19

SECTION 017700

CLOSEOUT PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Administrative and procedural requirements for contract closeout, including, but not limited to inspection procedures, warranties and final cleaning.

B. Related Sections include the following:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.
2. Section 013233 - Photographic Documentation: Submitting Final Completion construction photographs and negatives.
3. Section 017300 - Execution: Progress cleaning of Project site.
4. Section 017839 - Project Record Documents: Submitting Record Drawings, Record Specifications, and Record Product Data.
5. Section 017823 - Operation and Maintenance Data: Operation and maintenance manual requirements.
6. Section 017900 - Demonstration and Training: Requirements for instructing Owner's personnel.
7. Sections of Division 02 through 33: Specific closeout and special cleaning requirements for the Work in those sections.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Required submittals to regulatory agencies.
11. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
12. Advise Owner of changeover in heat and other utilities.
13. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
14. Complete final cleaning requirements, including touchup painting.
15. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

a. The Architect or his consultants will perform one re-inspection when requested and only when assured that the Work has been substantially completed. The cost of second or subsequent re-inspections will be $800.00 per diem. This cost will be back-charged by the Owner against the Contractor requiring a second or subsequent re-inspection.

2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy

of the list shall state that each item has been completed or otherwise resolved for acceptance.

2. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
3. Submit pest-control final inspection report and warranty.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.
5. All requirements for Final Completion as defined in the Owner/Contractor Contract.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
    a. The Architect or his consultants will perform one re-inspection when requested and only when assured that the remaining corrective work has been completed.
    b. The cost of second or subsequent re-inspections will be $1,280 per diem. This cost will be back-charged by the Owner against the Contractor requiring a second or subsequent re-inspection.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information on each page:
    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.

1.5 RECORD DRAWINGS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect’s reference during normal working hours.

B. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
2. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
5. Identify and date each Record Drawing; include the designation “PROJECT RECORD DRAWING” in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

1.6 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. Note related Change Orders and Record Drawings where applicable.

1.7 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.8 SYSTEMS START-UP

A. Starting Systems: Provide seven (7) days notification prior to start-up of each item.

1. Ensure that each piece of equipment or system is ready for operation.
2. Execute start-up under supervision of responsible persons in accordance with manufacturer’s instructions.

3. Submit a written report that equipment or system has been properly installed and is functioning correctly.

1.9 DEMONSTRATION AND TRAINING

A. Within two (2) weeks prior to the date of the Final Inspection, the Contractor shall demonstrate the operation and maintenance of all equipment and systems to Owner's designated management personnel. For equipment or systems requiring seasonal operations, perform demonstration for other season within six (6) months of Final Inspection.

B. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. If specific instructors such as the Installer or factory-authorized service representatives are required for demonstration as indicated in individual Specifications Sections, arrange to have those personnel in attendance for the required training sessions.
2. Provide instructors experienced in operation and maintenance procedures.

1.10 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

D. Warranties shall be notarized.

E. Warranties and Guarantees:

1. Prior to the issuance of the final Certificate of Occupancy, the General Contractor shall submit copies of all specified warranties and guarantees to the Architect and the Owner.
2. Execute and assemble all required documentation from subcontractors, suppliers, and manufacturers. Verify that all warranty provisions are as specified.
3. List of Required Warranties and Guarantees:

a. General Contractor: One (1) year guarantee for all labor and materials for the entire project.
b. Soil Poisoning: Contractor's five (5) year guarantee.
c. Termite Certification.
d. Other Warranties: As specified in each of the technical specifications, Divisions 2 – 33.

1.11 MISCELLANEOUS CLOSEOUT DOCUMENTATION

A. In addition to the warranties, bonds, and operations and maintenance manuals required above, the following documents shall be provided to the Architect and Owner prior to the Final Inspection:
   1. List of all subcontractors employed on the project with their contract responsibilities.
   2. Notarized Release of Liens for the General Contractor and all subcontractors.
   3. As-Built documentation for all trades.
   4. Certificate of Occupancy issued by the Philadelphia Department of Licenses and Inspections.
   5. Certificate of Sprinkler Installation Approval issued by the Philadelphia Department of Licenses and Inspections.
   6. Elevator Final Inspection from the Pennsylvania Department of Labor and Industry (if applicable).
   7. Application for Final Payment.

B. The Contractor shall provide all required information and documentation to the Owner/Project User for Rebuild's project close out form.

1.12 REINSPECTION FEE

A. Should Architect or his consultants perform reinspection due to failure of the Work to comply with claims of status of completion made by the Contractor:

   1. Owner will compensate Architect for such services,
   2. The Owner will deduct the amount of such compensation from the final payment to the Contractor.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use of cleaning materials during occupancy of adjacent facilities must be approved by Owner three days in advance of the work.

PART 3 - EXECUTION

3.1 EXECUTION

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Provide training at mutually agreed-on times. Schedule training with Owner with at least fourteen days' advance notice. For equipment that requires seasonal operation, provide similar instructions at the start of each season.
2. Coordinate instructors, including the provision of notification of dates, times, required length of instruction, and course content.

3.2 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Remove snow and ice to provide safe access to building.
    f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    h. Sweep concrete floors broom clean in unoccupied spaces.
    i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean carpet according to manufacturer's recommendations if visible soil or stains remain.
    j. Clean transparent materials, including mirrors and interior and exterior glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged

transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

k. Remove labels that are not permanent.

l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

a.) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

n. Replace parts subject to unusual operating conditions.

o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

q. Clean ducts, blowers, and coils if units were operated without filters during construction.

r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

s. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems or allow fumes to escape into mechanical systems. Remove waste materials from Project site and dispose of lawfully.

3.3 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.4 SPARE PARTS AND MAINTENANCE MANUALS

A. Materials: Provide attic stock products, spare parts and maintenance manuals in quantities specified in individual Specifications Sections.

B. Deliver to Project Site: Obtain receipt prior to Final Payment.

END OF SECTION 017419

SECTION 017823

OPERATIONS AND MAINTENANCE DATA

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.

    a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    b. Enable inserted reviewer comments on draft submittals.

2. Two paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect, through Construction Manager, will return all copies.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11- inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

    a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross- reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."

G. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839

PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Administrative and procedural requirements for Project Record Documents, including record drawings and record product data.

B. Related Requirements:
   1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.
   2. Section 013300 - Submittal Procedures: Retention requirements of product data for use as a record document.
   3. Section 017700 - Closeout Procedures: General closeout procedures.
   4. Section 017820 - Operation and Maintenance Data: Operation and maintenance manual requirements.
   5. Sections of Division 02 through 33: Specific requirements for Project Record Documents of the Work in those sections.

1.2 SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit copies of Record Drawings as follows:
      a. Initial Submittal: Submit one set of corrected record transparencies and one set of marked-up record prints. Architect will initial and date each transparency and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Architect will return transparencies and prints for organizing into sets, printing, binding, and final submittal.
      b. Final Submittal: Submit one set of marked-up record prints, one set of record transparencies, and one set of PDF electronic files. Print each drawing, whether or not changes and additional information were recorded.

B. Record Product Data: Submit one copy of each Architect reviewed product data submittal.
   1. Where record product data is required as part of operation and maintenance manuals, submit marked-up copy of product data as an insert in manual instead of original submittal as record product data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and shop drawings.
   1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is installer, subcontractor, or similar entity, to prepare the marked-up record prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information in an understandable drawing technique.
      c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

   2. Content: Types of items requiring marking include, but are not limited to, the following:
      a. Dimensional changes to Drawings.
      b. Revisions to details shown on Drawings.
      c. Depths of foundations below first floor.
      d. Locations and depths of underground utilities.
      e. Revisions to routing of piping and conduits.
      f. Revisions to electrical circuitry.
      g. Actual equipment locations.
      h. Duct size and routing.
      i. Locations of concealed internal utilities.
      j. Changes made by Change Order or Construction Change Directive.
      k. Changes made following Architect's written orders.
      l. Details not on the original Contract Drawings.
      m. Field records for variable and concealed conditions.
      n. Record information on the Work that is shown only schematically.
   3. Mark the Contract Drawings or shop drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If shop drawings are marked, show cross-reference on the Contract Drawings.
   4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
   5. Mark important additional information that was either shown schematically or omitted from original drawings.
   6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Transparencies: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected transparencies of the Contract Drawings and shop drawings.
   1. Incorporate changes and additional information previously marked on Record Prints. Erase, redraw, and add details and notations where applicable.
   2. Refer instances of uncertainty to Architect for resolution.
   3. Owner will furnish Contractor one set of transparencies of the Contract Drawings for use in recording information.

4. Print the Contract Drawings and Shop Drawings for use as record transparencies. Architect will make the Contract Drawings available to Contractor's print shop.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
   1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
   2. Format: Provide the following.
      a. Annotated PDF electronic file.
      b. Copies on mylar, bound into a set.

   3. Identification: As follows:
      a. Project name.
      b. Date.
      c. Designation "PROJECT RECORD DRAWINGS."
      d. Name of Architect.
      e. Name of Contractor.

2.2 RECORD PRODUCT DATA

A. Preparation: Mark product data to indicate the actual product installation where installation varies substantially from that indicated in product data submittal.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
   3. Note related Change Orders and record drawings where applicable.

B. Format: Submit record Product Data as one paper copy and scanned PDF electronic file(s) of marked up paper copy of Product Data.

   1. Include record Product Data directory organized by specification section number and title, electronically linked to each item of record Product Data.

2.3 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 01 81 13

SUSTAINABLE DESIGN REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Implement practices and procedures to meet the Project's environmental performance goals, which include obtaining a LEED® Silver certification based on LEED-BD+C: New Construction v4 rating system. Ensure that the requirements related to these goals, as defined in this section and throughout the contract documents, are fully implemented.

1. The aforementioned rating system document states the basic intent and requirements to achieve each prerequisite and credit. It is available here: http://www.usgbc.org/resources/grid/leed.

2. The LEED Reference Guide—the technical companion to the Rating System and LEED Online forms—provides further background, explanations, and instruction. It is available for purchase here: http://www.usgbc.org/store/

3. Projects earn one or more points toward certification by meeting or exceeding each credit's technical requirements. All prerequisites must be achieved in order to qualify for certification. Points add up to a final score that relates to one of four possible levels of certification.

i. See the attached LEED Project Checklist at the end of this Section for a summary of credit topics and point values. The LEED Project Checklist is provided for information only. Assume credits in the "?Y" and "?" column are being pursued.

C. Substitutions or other changes to the work proposed by the Contractor or their subcontractors shall not be allowed if such changes compromise LEED Requirements.

D. It is the responsibility of the Contractors to bring to the Architect's attention any conflicts between the sustainable design criteria listed in this section and any additional performance criteria or "acceptable products" listed in other sections of the contract documents (specifications or drawings). These conflicts shall be brought to the Architect's attention for resolution prior to the purchase or installation of the materials in question. LEED criteria will not be waived unless specifically approved, in writing by the Architect and the LEED Consultant.

E. Re:Vision Architecture has been hired to assist the team with the LEED process. They will be able to answer appropriate questions during the bidding and execution of the project. For more information, please visit or call:

Re:Vision Architecture
133 Grape Street
Philadelphia PA 19127
215 482 1133 // e-fax 208 441 4564

1.2 RELATED SECTIONS

A. Divisions 01 through 32 Sections for LEED requirements specific to the work of each of these Sections. Requirements may or may not include reference to LEED.

B. Section 01 74 19 Construction and Demolition Waste Management

C. Section 01 81 14 Low-Emitting Materials

D. Section 01 81 19 Indoor Air Quality Management

E. Section 01 91 00 General Commissioning Requirements

1.3 REFERENCE STANDARDS

A. ISO 14021–1999, Environmental labels and declarations—Self Declared Claims (Type II Environmental Labeling)

B. ISO 14025–2006, Environmental labels and declarations (Type III Environmental Declarations—Principles and Procedures)

C. ISO 21930–2007 Sustainability in Building Construction—Environmental Declaration of Building Products

D. Global Reporting Initiative (GRI) Sustainability Report

E. ISO 26000—2010 Guidance on Social Responsibility

F. Forest Stewardship Council

G. ISO 14021–1999, Environmental labels and declarations—Self Declared Claims (Type II Environmental Labeling)

H. Health Product Declaration

I. Cradle-to-Cradle® Certified Products Program

J. ANSI/BIFMA e3 Furniture Sustainability Standard

K. Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)

L. GreenScreen

M. United States Green Building Council (USGBC): Leadership in Energy and Environmental Design (LEED) Green Building Rating System for New Construction and Major Renovations, Version 4. http://www.usgbc.org/store

N. Other standards, as applicable. For further information, see the USGBC's LEED Reference Guide for Building Design and Construction.

1.4 DEFINITIONS

A. Bio-Based Material: Commercial or industrial products (other than food or feed) that are composed in whole, or in significant part, of biological products, renewable agricultural materials (including plant, animal, and marine materials), or forestry materials. For the purposes of LEED, this excludes leather and other animal hides.

B. Chain-of-Custody: Procedure that tracks a product from the point of harvest or extraction to its end use, including all successive stages of processing, transformation, manufacturing, and distribution.

C. Cradle-to-Gate Assessment: Analysis of a product's partial life cycle, from resource extraction (cradle) to the factory gate (before it is transported for distribution and sale). It omits the use and the disposal phases of the product. Environmental Product Declaration: statement that the item meets the environmental requirements of ISO 14021–1999, ISO 14025–2006 and EN 15804, or ISO 21930–2007.

D. Enclosure: The exterior plus semi-exterior portions of the building. Exterior consists of the elements of a building that separate conditioned spaces from the outside (i.e., the wall assembly). Semi-exterior consists of the elements of a building that separate conditioned space from unconditioned space or that encloses semi-heated space through which thermal energy may be transferred to or from the exterior or conditioned or unconditioned spaces (e.g., attic, crawl space, basement).

E. Environmental Product Declaration: A statement that the item meets the environmental requirements of ISO14021–1999, ISO 14025–2006 and EN 15804, or ISO 21930–2007

F. Extended Producer Responsibility: Measures undertaken by the maker of a product to accept its own and sometimes other manufacturers' products as postconsumer waste at the end of the products' useful life. Producers recover and recycle the materials for use in new products of the same type. To count toward credit compliance, a program must be widely available. For carpet, extended producer responsibility must be consistent with NSF/ANSI 140–2007. Also known as closed-loop program or product take-back.

G. Green Business Certification Inc (GBCI): Third-party credentialing and verification body that administers the LEED certification program, performing third-party technical reviews and verification of registered projects to determine if they have met the standards set forth by the LEED rating system.

H. LEED: Leadership in Energy & Environmental Design rating system developed by the United States Green Building Council (USGBC.).

I. Material Costs

1. LEED Total Material Cost: Is the total project construction cost for all products and materials included in the following MasterFormat 2012 specification sections (inclusive of taxes and transportation costs, but exclusive of labor and equipment costs incurred after the material is delivered to the site):

i. Divisions 3 (Concrete) through Division 10 (Specialties)

ii. Division 12 (Furniture) *Optional*

iii. Section 31.60.00 (Special Foundations and Load-Bearing Elements)

iv. Section 32.10.00 (Bases, Ballasts, and Paving)

v. Section 32.30.00 (Site Improvements)

vi. Section 32.90.00 (Planting)

LEED Total Material Cost does not include costs associated with mechanical, plumbing, and electrical components or equipment.

2. Product Material Cost: The cost for a given material (e.g. sheet of drywall), or an assembled product (e.g. casework), including taxes and delivery but excluding any cost for labor and equipment required for installation after the material is delivered to the site.

J. Product (permanently installed building product): An item that arrives on the project site either as a finished element ready for installation or as a component to another item assembled on-site. The product unit is defined by the functional requirement for use in the project; this includes the physical components and services needed to serve the intended function of the permanently installed building product. In addition, similar product within a specification, each contributes as a separate product.

K. Raw Material: The basic substance from which products are made, such as concrete, glass, gypsum, masonry, metals, recycled materials (e.g., plastics and metals), oil (petroleum polylactic acid), stone, agrifiber, bamboo, and wood.

L. Recycled Content: Is the proportion, by mass (weight), of pre-consumer or post-consumer recycled material in a product as defined by ISO 14021.

1. "Post-consumer" material is defined as waste generated by household, commercial, industrial, or institutional facilities in their role as end-users, that can no longer be used for its intended purpose.

2. "Pre-consumer" material is defined as matter diverted from the waste stream during the manufacturing process, determined as the percentage of material, by weight. Examples include planer shavings, sawdust, bagasse, walnut shells, culls, trimmed materials, over-issue publications, and obsolete inventories. Excluded is reutilization of materials such as rework, regrind, or scrap materials capable of being reclaimed within the same process that generated them.

M. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

1. Manufacturing Location: Refers to the location where final assembly of all components to produce a building product occurs. For example, the hardware for a pre-assembled truss

comes from Dallas, Texas, the lumber from Vancouver, British Columbia, and is assembled in Kent, Washington; then the location of the final assembly is Kent, Washington.

2. Extraction, Harvest or Recovery Location: Refers to the location of raw materials prior to manufacturing of the building material or product that is furnished and installed in the project building. For example, in a concrete mix, consider the location that all raw ingredients: sand, aggregates, fly ash, slag, or Portland cement come from. The extraction point for any recycled material (e.g. steel) is the location of the material prior to the manufacturing of the final product (e.g. recycling facility, scrap yard, depository, stock pile, or any other location for the material prior to the final manufacturing location)

N. Reuse: The reemployment of materials in the same or a related capacity as their original application, thus extending the lifetime of materials that would otherwise be discarded. Reuse includes the recovery and reemployment of materials recovered from existing building or construction sites. Also known as salvage.

O. Structure: Elements carrying either vertical or horizontal loads (e.g., walls, roofs, and floors) that are considered structurally sound and nonhazardous

P. Wood: Plant-based materials that are eligible for certification under the Forest Stewardship Council. Examples include bamboo and palm (monocots) as well as hardwoods (angiosperms) and softwoods (gymnosperms).

1. Wood must be certified by the Forest Stewardship Council (FSC) unless it is considered reused, salvaged, or recycled.

1.5 PERFORMANCE REQUIREMENTS

A. Construction and Demolition Waste Management: See Section 01 74 19 Construction and Demolition Waste Management.

B. Low-Emitting Materials: See Section 01 81 15 Low-Emitting Materials.

C. Indoor Air Quality Management: See Section 01 81 19 Indoor Air Quality Management.

D. Environmental Product Declarations:

1. At least 20 different permanently installed products sourced from at least five different manufacturers that meet one of the following disclosure criteria for Environmental Product Declarations (EPD):

i. Product-specific declaration.

a. Use products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope. Valued as one whole product for the purposes of credit achievement calculation.

ii. Environmental Product Declarations which conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

a. Industry-wide (generic) EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator. Valued as one whole product for purposes of credit achievement calculation.
b. Product-specific Type III EPD -- Products with an internally-reviewed LCA and have at least a cradle to grave scope. Valued as one whole product for the purposes of credit achievement calculation
c. Product-specific Type III EPD – Products with a third-party certification (Type III), including external verification, in which the manufacturer is explicitly listed as a participant by the program operator. Valued as 1.5 products for the purposes of credit achievement calculation.

iii. USGBC approved program – Products that comply with other USGBC approved environmental product declaration frameworks

iv. . Contractor is responsible for demonstrating compliance.

2. Use products that have a compliant embodied carbon optimization report or action plan separate from the LCA or EPD. Use at least five permanently installed products sourced from at least three different manufacturers. Products are values according to the list below:

i. Report Type: Embodied Carbon / LCA Action Plan

a. Reference Documents(s) for the Optimization Report: Product-specific LCA or product-specific Type III EPD.
b. Report Verification: Prepared by the manufacturer and signed by company executive.
c. Valuation: ½ product.

ii. Report Type: Reductions in Embodied Carbon less than 10% reduction in GWP relative to baseline

a. Baseline Reference Document(s) for the Optimization Report: Product-specific LCA, product-specific Type III EPD, or industry-wide Type III EPD.
b. Optimized Reference Document(s) for the Optimization Report: Product-specific LCA or product-specific Type III EPD.
c. Report Verification: Comparative analysis verified by an independent party.
d. Valuation: 1 product.

iii. Report Type: Reductions in Embodied Carbon 10% reduction in GWP relative to baseline.

a. Baseline Reference Document(s) for the Optimization Report: Product-specific LCA, product-specific Type III EPD, or industry-wide Type III EPD.
b. Optimized Reference Document(s) for the Optimization Report: Product-specific LCA or product-specific Type III EPD.
c. Report Verification: comparative analysis verified by an independent party.
d. Valuation: 1.5 products.

iv. Report Type: Reductions in Embodied Carbon 20%+ reduction in GWP and 5%+ reduction in two additional impact categories relative to baseline.

a. Baseline Reference Document(s): Product-specific LCA or product specific Type III EPD.

b. Optimized Reference Document(s) for the Optimization Report: Product-specific LCA or product-specific Type III EPD.
c. Report Verification: comparative analysis verified by an independent party.
d. Valuation: 2 products.
e. Impact Categories:
    a. Global Warming Potential; CO2e.
    b. Depletion of the Stratospheric Ozone Layer; kg CFC-11e.
    c. Acidification of Land and Water Sources; moles H+ or kg SO2e.
    d. Eutrophication; kg nitrogen equivalent or kg phosphate equivalent.
    e. Formation of Tropospheric Ozerne; kg NOx, kg O3 equivalent, or kg ethene.
    f. Depletion of Nonrenewable Energy Resources; MJ using CML / depletion of fossil fuels in TRACI.

v. USGBC Approved Program: Products that comply with other USGB approved Embodied Carbon / LCA Optimization frameworks. The contractor is responsible for demonstrating compliance.

vi. For credit achievement calculation, products sourced (extracted, manufactured, and purchased) within 100 miles (160 km) of the project site are valued at twice their base contributing number products, up to a maximum of 2 products.

E. Sourcing of Raw Materials:

i. USGBC approved program: Other USGBC approved programs meeting the CSR criteria. Contractor is responsible for demonstrating compliance.

2. Use products sourced from at least three different manufacturers that meet at least one of the responsible extraction criteria listed in the following Leadership Extraction Practices for at least 15%, by cost, of the total value of permanently installed building products in the project:

i. Extended producer responsibility. Products purchased from a manufacturer (producer) that participates in an extended producer responsibility program or is directly responsible for extended producer responsibility. Products meeting extended producer responsibility criteria are valued at 50% of their cost for the purposes of credit achievement calculation.

ii. Bio-based materials. Bio-based products and materials other than wood must be tested using ASTM Test Method D6866 or equivalent method ISO 16620-2 or be certified to the USDA BioPreferred Voluntary Labeling initiative that includes verification via ASTM 6866 testing. Exclude hide products, such as leather and other animal skin material.

    a. Bio-based products that meet the criteria above: value at 50% of cost multiplied by the biobased content of the product for the purposes of credit achievement calculation.
    b. Bio-based products that meet the Sustainable Agriculture Network's Sustainable Agriculture Standard in addition to the testing requirements above: value at 100% of their cost for the purposes of credit achievement calculation.

iii. Wood products. Wood products must be certified by the Forest Stewardship Council /or USGBC-approved equivalent. Products meeting wood products criteria are valued at 100% of their cost for the purposes of credit achievement calculation.

iv. Materials reuse. Reuse includes salvaged, refurbished, or reused products. Products meeting materials reuse criteria are valued at 200% of their cost for the purposes of credit achievement calculation.

v. Recycled content. Products meeting recycled content criteria are valued at 100% of their cost for the purposes of credit achievement calculation.

a. Recycled content is the sum of post-consumer recycled content plus one-half the pre-consumer recycled content, based on weight.
b. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

vi. USGBC approved program. Other USGBC approved programs meeting leadership extraction criteria. Contractor is responsible for demonstrating compliance.

3. For credit achievement calculation of Leadership Extraction Practices, products sourced (extracted, manufactured, and purchased) within 100 miles of the project site are valued at twice their base contributing cost, up to a maximum of 200% of cost.

F. Material Ingredients:

1. Use at least 20 different permanently installed products from at least five different manufacturers that use any of the following Material Ingredients Optimization programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm):

i. ANSI/BIFMA e3 Furniture Sustainability Standard. The documentation from the assessor or scorecard from BIFMA must demonstrate the product earned at least 3 points under 7.5.1.3 Advanced Level in e3-2014 or 3 points under 7.4.1.3 Advanced Level in e3-2012.

ii. Cradle to Cradle. Product has a Material Health Certificate of is Cradle to Cradle Certified under standard version 3 or later with a Material Health achievement level at the Bronze level or higher.

iii. Declare. The Declare product label must meet the following requirements:

a. Declare labels designated as Red List Free, LBC Red List Free, or Declared.
b. Declare labels designated as LBC Red List Approved or LBC Compliant that demonstrate content inventory to 0.1% (1000 ppm).

iv. Facts - NSF/ANSI 336: Sustainability Assessment for Commercial Furnishings Fabric at any certification level

v. Global Green TAG. Product Health Declaration (PHD) labels issued after January 1, 2020.

vi. Health Product Declaration. The end use product has a published and complete Health Product Declaration with full disclosure of known hazards in compliance with the Health Product Declaration open Standard.

vii. Living Product Challenge. The included Declare product label must demonstrate content inventory to 0.1% (1,000 ppm).

viii. Health Product Declaration. The end use product has a published, complete Health Product Declaration with full disclosure of known hazards in compliance with the Health Product Declaration open Standard.

ix. Manufacturer Inventory. The manufacturer has published complete content inventory for the product following these guidelines:

a. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number)

b. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose role, amount and hazard screen using either:

a. GreenScreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

b. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

i) The hazard screen must be applied to each trade secret ingredient and the inventory lists the hazard category for each of the health hazards included in Part 3 of GHS (e.g. "GHS Category 2 Carcinogen").

x. Product Lens Certification

xi. USGBC approved program. Other USGBC approved programs meeting the material ingredient reporting criteria. Contractor is responsible for demonstrating compliance.

2. Use products that have a compliant material ingredient report or action plan. Use at least 5 five permanently installed products sourced from at least three different manufacturers. Products are valued according to the list below:

i. Material Ingredient Screening and Optimization Action Plan.

a. Product Documentation: Action Plan based on publicly available material inventory to at least 1,000 ppm.
b. Report Verification: Prepared by the manufacturer and signed by company executive.
c. Valuation: ½ product.

ii. Advanced Inventory and Assessment.

a. Select one of the following Report Type and Criteria:
   a. Inventory to at least 100ppm by weight and no GreenScreen LT-1 hazards.
   b. GHS Category hazards are presents or inventory to at least 100ppm by weight and at least 75% of product is assessed using GreenScreen and the remaining 25% of product has been inventoried and the GreenSreen assessment is publicly available.
b. Select of the following Product Documentation:
   a. Cradle to Cradle Certified or Materials Health Certificate at Bronze Level or higher.
   b. Declare Labels designated as Red List Free or LBC Red List Free.
   c. Health Product Declaration that meets optimization and verification criteria.
   d. Living Product Challenge certified products that include a Red List Free or LBC Red List Free Declare Label.
   e. Manufacturer Inventory that meets optimization and verification criteria.
c. Report Verification: Third-party verified.
d. Valuation: 1 product.

iii. Material Ingredient Optimization.

a. Report Type and Criteria: Inventory to at least 100ppm by weight and at least 95% of product is assessed using GreenScreen. No BM-1 hazards are present and the remaining 5% not accesses has been inventoried and screen using GreenScreen List Translator and no GreenScreen LT-1 hazards are present.
b. Select of the following Product Documentation:
    a. Cradle to Cradle Certified or Materials Health Certificate at Silver Level or higher.
    b. Health Product Declaration that meets optimization and verification criteria.
    c. Living Product Challenge certified products that achieve Imperative 09: Transparent Material Health
    d. Manufacturer Inventory that meets optimization and verification criteria.
c. Report Verification: Third-party verified.
d. Valuation: 1.5 product.

iv. For credit achievement calculation of Leadership Extraction Practices, products sourced (extracted, manufactured, and purchased) within 100 miles of the project site are valued at twice their base contributing cost, up to a maximum of 200% of cost.

1.6 SUBMITTALS

A. General:

1. Submit LEED documentation as needed for submittals required by other Specification Sections, as requested by the LEED consultant during the process or by GBCI as part of the third party review.

2. In some cases, required LEED documentation is the same as standard submittals, for example, product data and MSDS documents will often contain LEED information like VOC content and testing standards. Highlight this information on the submittal and make a note of it with the submittal package. Do not duplicate the submittal and issue it separately as a LEED submittal.

3. For every product, submit a LEED Environmental Reporting form. A blank form is provided at the end of this specification section.

4. If pursuing a compliance path for USGBC approved programs, documentation demonstrating program is approved by USGBC.

B. Construction Activity Pollution Prevention [Prerequisite]

1. From the design team, obtain a copy of the Erosion and Sedimentation Control [ESC] plan conforming to the erosion and sedimentation requirements of the 2012 U.S. Environmental Protection Agency (EPA) Construction General Permit (CGP) or local equivalent, whichever is more stringent. Projects must apply the CGP regardless of size.

2. Monthly photo progress reports showing all areas of the site covered in the ESC Plan during the construction period. Report to include date-stamped photos showing the ESC measures taken, including any corrective action, to effectively implement the ESC plan and brief narratives describing the ESC measures in the photos. See LEED Progress Reports below.

3. For all deficiencies noted over the course of construction, provide a log or description of corrective action performed, regardless of selection pursued; photographs or inspection reports.

C. Construction and Demolition Waste Management

1. Provide submittals per Section 01 74 19 Construction and Demolition Waste Management

D. Environmental Product Declarations

1. Completed Building Products Calculator for all products that meet EPD and/or Multi-Attribute Optimization requirements.
2. Environmental Product Declaration: EPDs for 100% of products listed in the Calculator, with relevant sections highlighted.
3. Multi-Attribute Optimization: Documentation demonstrating products meet related credit Performance Requirements listed above for 100% of products listed in the Calculator and product data sheet or letter from product manufacturer indicating extraction and manufacturing location and letter from product vendor indicating purchasing location. Highlight relevant information.

E. Sourcing of Raw Materials

1. Completed Building Products Calculator for all products that meet Leadership Extraction Practices requirements. Ensure total materials cost is included.
2. Leadership Extraction Practices: Documentation demonstrating products meet at least one of the sustainable extraction criteria in listed in the related credit Performance Requirements above for 100% of products listed in the Calculator and product data sheet or letter from product manufacturer indicating extraction and manufacturing location and letter from product vendor indicating purchasing location. Highlight relevant information.
   i. For Extended Producer Responsibility (EPR), manufacturer and/or programs' documentation showing participation.
   ii. For bio-based and wood products, manufacturer's documentation for all products meeting the requirements.
   iii. For reused materials, receipts for salvaged and reclaimed materials indicating sources and cost (actual cost or replacement value, whichever is higher).
   iv. For recycled content products, manufacturer's documentation indicating percentages, by weight, of post-consumer and pre-consumer recycled content.

F. Material Ingredients

1. Completed Building Products Calculator for all products that meet Material Ingredient Reporting and/or Material Ingredient Optimization requirements. Ensure LEED total construction cost is included.
2. Material Ingredient Reporting: Documentation of chemical inventory from manufacturer, health product declaration (HPD), or verification of criteria compliance from approved third

party program for 100% of the products listed in the Calculator, with relevant sections highlighted.

3. Material Ingredient Optimization: Documentation of criteria compliance from the manufacturer or verification of criteria compliance from approved third-party program for 100% of the products listed in the Calculator, with relevant sections highlighted.

G. Construction Indoor Air Quality Management Plan

1. Provide submittals per Section 01 81 19 Construction Indoor Air Quality Requirements.

H. Indoor Air Quality Assessment

1. Provide submittals per Section 01 81 19 Construction Indoor Air Quality Requirements.

I. Low Emitting Materials

1. Provide submittals per Section 01 81 14 Low-Emitting Materials.

J. LEED Action Plan

1. Develop and submit an execution plan, referred to as the LEED Action Plan, within 30 days of Notice to Proceed. The plan should include a synopsis of the intent and requirements, as well as the contractor's procedures and parties responsible to successfully document and achieve each applicable LEED prerequisite and credit. The following prerequisites and credits are the contractor's responsibility, in part or in whole, and should be included in the LEED Action Plan:
   i. Construction Activity Pollution Prevention
   ii. Fundamental Commissioning and Verification
   iii. Enhanced Commissioning
   iv. Construction and Demolition Waste Management Planning
   v. Construction and Demolition Waste Management
   vi. Environmental Product Declarations
   vii. Sourcing of Raw Materials
   viii. Material Ingredients
   ix. Low-Emitting Materials
   x. Construction Indoor Air Quality Management Plan
   xi. Indoor Air Quality Assessment

K. LEED Progress Reports

1. Concurrent with each Application for Payment or monthly – whichever is most frequent – submit updates to the LEED Action Plan. Include reports comparing actual construction and purchasing activities, demonstrated via the above listed submittal requirements, for the prerequisites and credits identified in the Submittals, LEED Action Plan above.

i. See additional submittal requirements in related Sections for specific information on what is to be included in the LEED Progress Report:

a. Section 01 74 19 Construction and Demolition Waste Management

b. Section 01 81 13 Sustainable Design Requirements

c. Section 01 81 14 Low-Emitting Materials

d. Section 01 81 19 Indoor Air Quality Management

e. Section 01 91 00 General Commissioning Requirements

L. LEED Online Documentation

1. Within 30 days of Substantial Completion, complete LEED Online forms, calculators, and uploads for each credit and prerequisite identified in the Submittals, LEED Action Plan above.

1.7 QUALITY ASSURANCE

A. LEED Coordinator: The Construction Manager is responsible for engaging a LEED Green Associate or a LEED Accredited Professional with LEED experience in at least two projects of similar type and scale to coordinate LEED requirements and attend LEED specific meetings and calls. LEED Coordinator may also serve as ESC, Waste Management, or IAQ Management Coordinator and serve other project specific functions.

1.8 PROJECT CONDITIONS

A. No smoking will be permitted within 100 feet of the building, with no exceptions.

PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

A. Provide products and procedures necessary to obtain LEED credits required in this Section. Materials selected and procedures implemented by the Contractor shall support the LEED framework and goals for this project.

PART 3 – EXECUTION

3.1 GENERAL REQUIREMENTS

A. Respond to questions and requests from Architect and the USGBC regarding LEED credits that are the responsibility of the Contractor that depend on product selection, or product qualities, or that depend on Contractor's procedures until the USGBC has made its determination on the project's LEED certification application. Document responses as informational submittals.

B. Contractor shall be responsible for utilizing LEED Online to complete LEED forms for credits for which they are responsible and shall review all LEED Online forms prior to the start of construction.

3.2 CONSTRUCTION WASTE MANAGEMENT

A. Comply with Section 01 74 19 Construction and Demolition Waste Management.

3.3 CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT

A. Comply with Section 01 81 19 Indoor Air Quality Management.

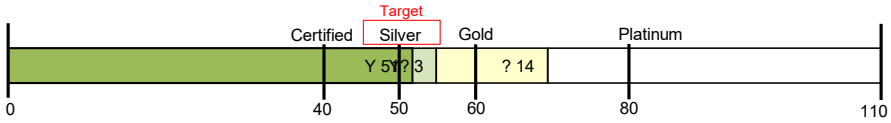
3.4 LOW-EMITTING MATERIALS

B. Comply with Section 01 81 14 Low-Emitting Materials

END OF SECTION 01 81 13

LEED SCORECARD
Lawncrest Recreation Center

BD+C New Construction v4
1/9/2024



Y	Y?	?	N		Pts
51	3	14	42	**TOTAL**	110 Pts

Y	Y?	?	N		Pts	D/C	EP	RP
1				**INTEGRATED PROCESS**	1 Pts			
1				IPc1: Integrated Process	1	D		
8			8	**LOCATION AND TRANSPORTATION**	16 Pts			
			16	LTc1: LEED For Neighborhood Development Location	16	D		
1				LTc2: Sensitive Land Protection	1	D		
1			1	LTc3: High-Priority Site	2	D	⚷	✓
4			1	LTc4: Surrounding Density and Diverse Uses	5	D		
1			4	LTc5: Access to Quality Transit	5	D	⚷	✓
			1	LTc6: Bicycle Facilities	1	D		
1				LTc7: Reduced Parking Footprint	1	D	⚷	
			1	LTc8: Green Vehicles	1	D		
5		4	1	**SUSTAINABLE SITES**	10 Pts			
Required				SSp1: Construction Activity Pollution Prevention		C		
1				SSc1: Site Assessment	1	D		
1			1	SSc2: Site Development - Protect or Restore Habitat (v4.1)	2	D	⚷	
1				SSc3: Open Space	1	D		
		3		SSc4: Rainwater Management	3	D	⚷	
2				SSc5: Heat Island Reduction	2	D	⚷	
		1		SSc6: Light Pollution Reduction	1	D		
4			7	**WATER EFFICIENCY**	11 Pts			
Required				WEp1: Outdoor Water Use Reduction		D		
Required				WEp2: Indoor Water Use Reduction		D		
Required				WEp3: Building-Level Water Metering		D		
2				WEc1: Outdoor Water Use Reduction	2	D		
1			5	WEc2: Indoor Water Use Reduction	6	D		✓
			2	WEc3: Cooling Tower Water Use	2	D		✓
1				WEc4: Water Metering	1	D		
9		9	15	**ENERGY AND ATMOSPHERE**	33 Pts			
Required				EAp1: Fundamental Commissioning & Verification		C		
Required				EAp2: Minimum Energy Performance		D		
Required				EAp3: Building-Level Energy Metering		D		
Required				EAp4: Fundamental Refrigerant Management		D		
3		1	2	EAc1: Enhanced Commissioning	6	D	⚷	
6		4	8	EAc2: Optimize Energy Performance	18	D	⚷	
		1		EAc3: Advanced Energy Metering	1	C	⚷	
			2	EAc4: Demand Response	2	D		
			3	EAc5: Renewable Energy Production	3	C	⚷	
		1		EAc6: Enhanced Refrigerant Management	1	C	⚷	
		2		EAc7: Green Power and Carbon Offsets	2	C	⚷	

Y	Y?	?	N		Pts	D/C	EP	RP
8	2		3	**MATERIALS AND RESOURCES**	13 Pts			
Required				MRp1: Storage and Collection of Recyclables		D		
Required				MRp2: Construction and Demolition Waste Management Planning		D		
3			2	MRc1: Building Life-Cycle Impact Reduction	5	C		✓
1	1			MRc2: Bldg Product Disclosure & Optimization - EPDs	2	C		
1			1	MRc3: Bldg Product Disclosure & Optimization - Sourcing of Raw Mat.	2	C	⚷	
1	1			MRc4: Bldg Product Disclosure & Optimization - Material Ingredients	2	C	⚷	
2				MRc5: Construction and Demolition Waste Management	2	C	⚷	
9	1		6	**INDOOR ENVIRONMENTAL QUALITY**	16 Pts			
Required				EQp1: Minimum Indoor Air Quality Performance		D		
Required				EQp2: Environmental Tobacco Smoke Control		D		
2				EQc1: Enhanced Indoor Air Quality Strategies	2	D		
3				EQc2: Low-Emitting Materials	3	D		
1				EQc3: Construction Indoor Air Quality Management Plan	1	C		
2				EQc4: Indoor Air Quality Assessment	2	C		
			1	EQc5: Thermal Comfort	1	C		
1			1	EQc6: Interior Lighting	2	C		
			3	EQc7: Daylight	3	C		
	1			EQc8: Quality Views (v4.1)	1	C		
			1	EQc9: Acoustic Performance	1	D		
6				**INNOVATION IN DESIGN**	6 Pts	D/C		
			1	IDc1.1: Pilot: CCP - Airborne Releases	1	D		
1				IDc1.2: Innovation: Green Building Education	1	C		
1				IDc1.3: Innovation: Purchasing - Lamps	1	C		
		1		IDc1.4: Innovation: Walkable Project Site	1	C		
		1		IDc1.5: Innovation: Occupant Comfort Survey	1	D		
1				IDc1.6: Pilot: Integrated Analysis of Building Materials	1	C		
		1		IDc1.7: Innovation: Well Features	1	C		
1				IDc1.8: TBD EP	1	C		
1				IDc1.9: TBD EP	1	C		
		1		IDc1.10: TBD	1	C		
1				IDc2: LEED® Accredited Professional	1	C		
1		1	2	**REGIONAL PRIORITY**	4 Pts			
			1	LTc3 High-Priority Site (min 2 pts)	1	D		
			1	LTc5 Access to Quality Transit (min 3 pts)	1	D		
		1		SSc4 Rainwater Management (min 2 pts)	1	D		
			1	WEc2 Indoor Water Use Reduction (min 4)	1	D		
			1	WEc3 cooling Tower Water Use (min 2 pts)	1	D		
1				MRc1 Building Life-Cycle Impact Reduction (min 3 pts)	1	C		

Please note, most projects lose 2-4 points during the review process.

SECTION 01 81 14

Low-Emitting Materials

PART 1 – GENERAL

1.1 SUMMARY

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Implement practices and procedures to meet the Project's environmental performance goals, which include obtaining 3 points for LEED v4 Indoor Environmental Quality, Low-Emitting Materials. Ensure that the requirements related to these goals, as defined in this section and throughout the contract documents, are implemented to the fullest extent.

C. Substitutions or other changes to the work proposed by the Contractor or their subcontractors shall not be allowed if such changes compromise LEED requirements.

1.2 RELATED SECTIONS

A. Divisions 03 through 33 Sections for LEED requirements specific to the work of each of these Sections. Requirements may or may not include reference to LEED.

B. Section 01 81 13 Sustainable Design Requirements

C. Section 01 81 19 Construction Indoor Air Quality Requirements

D. Section 06 05 23.10 Adhesives

E. Section 07 21 00 Thermal Insulation

F. Section 07 92 00 Joint Sealants

G. Section 09 29 00 Gypsum Board

H. Section 09 51 23 Acoustical Ceiling Tiles

I. Section 09 54 00 Specialty Ceilings

J. Section 09 60 00 Flooring

K. Section 09 90 00 Painting

1.3 DEFINITIONS

A. Building Exterior: A structure's primary and secondary weatherproofing system, including waterproofing membranes and air- and water-resistant barrier materials, and all building elements outside that system

B. Building Interior: Everything inside a structure's weatherproofing membrane

C. Interior Floor Finish: All the layers applied over a finished subfloor or stairs, including stair treads and risers, ramps, and other walking surfaces. Interior finish excludes building structural members, such as beams, trusses, studs, or subfloors, or similar items. Interior finish also excludes non full spread wet coatings or adhesives.

D. Interior Wall and Ceiling Finish: All the layers comprising the exposed interior surfaces of buildings, including fixed walls, fixed partitions, columns, exposed ceilings, and interior wainscoting, paneling, interior trim or other finish applied mechanically or for decoration, acoustical correction, surface fire resistance, or similar purposes

E. Volatile Organic Compounds (VOCs): Any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions. Compounds that have negligible photochemical reactivity, listed in EPA 40 CFR 51.100(s), are also excluded from this regulatory definition.

1.4 REFERENCE STANDARDS

A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.

1. California Department of Public Health (CDPH), "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers", v1.1-2010. Note that FloorScore certified products are tested to this standard.

2. California Air Resources Board (CARB) 93120 Airborne Toxic Control Measure (ATCM) for formaldehyde emissions from composite wood products

3. California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings

4. South Coast Air Quality Management District (SCAQMD), State of California, www.aqmd.gov/

   i. Rule 1168, "Adhesive and Sealant Applications", effective July 1, 2005

   ii. Rule 1113, "Architectural Coatings", effective date of June 3, 2011

1.5 PERFORMANCE REQUIREMENTS

A. Adhesives and Sealants Applied On-Site: Interior adhesives and sealants applied on site shall be tested using and comply with each of the following standards:

1. California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v. 1.1–2010

2. Wet applied on-site products, in addition to the above:

   i. SCAQMD Rule 1168, "Adhesive and Sealant Applications", effective July 1, 2005. This standard sets the maximum allowable VOC limits.

B. Paints and Coatings Applied On-Site: Interior paints and coatings applied on site shall be tested using and comply with the following standards:

0. California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v. 1.1–2010, when applied to walls, floors, and ceilings

i. Wet applied on-site products, one of the following in addition to the above, these standards sets the maximum allowable VOC limits:

ii. California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings

iii. SCAQMD Rule 1113, "Architectural Coatings", effective date of June 3, 2011, when wet-applied on-site.

C. Inherently non-emitting sources. Products that are inherently non-emitting sources of VOCs (stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood flooring) are considered fully compliant without any VOC emissions testing if they do not include integral organic based surface coatings, binders, or sealants.

D. Flooring: Flooring shall be tested using and comply with the California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v. 1.1–2010

E. Ceilings: Flooring shall be tested using and comply with the California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v. 1.1–2010

F. Thermal and Acoustic Insulation: Thermal and acoustic insulation be tested using and shall comply with the California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v. 1.1–2010.

1.6 SUBMITTALS

A. Product information in the form of product data sheets, MSDS, third-party certifications, or testing reports

1. Certificates must state the testing methodology and the model as appropriate

2. The units must be stated and be consistent with those as required

3. For wet-applied products, the manufacturer must state each product's classification and application according to the referenced standard definitions.

4. Manufacturer's or third-party documentation for building products tested in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010, must state the exposure scenario used to determine compliance.

i. Manufacturers' claims of compliance with the above requirements must also state the range of total VOCs after 14 days (336 hours), measured as specified in the CDPH Standard Method v1.1:

1. 0.5 mg/m3 or less;
2. between 0.5 and 5.0 mg/m3; or
3. 5.0 mg/m3 or more.

B. For all wet-applied products, provide the volume of product used in liters.

C. Information on any VOC compounds exempt from regulation is required for credit compliance. Cited regulatory limits do not include the VOC content of colorants added to coatings at the point of sale. Pre-tinted flat, nonflat, industrial maintenance coatings and stains include the VOC content of all ingredients, including colorants.

D. See additional submittal requirements in Section 018113 Sustainable Design Requirements, Submittals: LEED Action Plan, LEED Progress Reports, and LEED Online Documentation.

1.7 QUALITY ASSURANCE

A. LEED Coordinator: Refer to LEED Coordinator Quality Assurance requirements in Section 01 81 13 Sustainable Design Requirements.

B. Include the Low-Emitting Material requirements in contract agreements with subcontractors

C. As subcontractors are selected and deployed on site, familiarize them with the Low-Emitting Material requirements and how it will affect their submittals and daily activities. Hold a subcontractors' orientation meeting to review the requirements as a group.

D. Verify that low-emitting materials are being installed during job walks

PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated.

PART 3 – EXECUTION

3.1 DELIVERY AND STORAGE

A. Do not store adhesives, sealants, paints, and other Architectural coatings with materials that have a high capacity to absorb VOC emissions (i.e., materials which are woven, fibrous or porous in nature, such as acoustical ceilings, textiles, etc.). Do not store adhesives, sealants, paints, and other Architectural coatings in occupied spaces.

B. Do not store open containers of any adhesives, sealants, paints, or other coatings. Close and seal after each use.

3.2 INSTALLATION

A. Coordinate installation of all adhesives, sealants, paints, and coatings with the ventilation and sequencing criteria defined in Section 018119, "Indoor Air Quality Requirements."

END OF SECTION 01 81 14

SECTION 01 81 19

INDOOR AIR QUALITY MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Implement practices and procedures to meet the Project's environmental performance goals, which include obtaining the LEED v4 Indoor Environmental Quality Credit Construction Indoor Air Quality Management Plan for 1 point and credit Indoor Air Quality Assessment for 2 points. Ensure that the requirements related to these goals, as defined in this section and throughout the contract documents, are fully implemented. Substitutions or other changes to the work proposed by the Contractor or their subcontractors shall not be allowed if such changes compromise LEED Requirements.

C. This Section includes requirements for the development of a Construction Indoor Air Quality Management Plan to be implemented throughout the duration of the project construction in order to minimize the detrimental impacts on air quality resulting from construction activities. Factors that contaminate indoor air, such as dust entering HVAC systems and ductwork, improper storage of materials on-site and poor housekeeping, shall be minimized.

1.2 RELATED SECTIONS

A. Divisions 01 through 33 Sections for LEED requirements specific to the work of each of these Sections.

B. Section 01 81 13 Sustainable Design Requirements

C. Section 01 91 00 General Commissioning Requirements

1.3 DEFINITIONS:

A. A Construction IAQ Management Plan is a document specific to a building project that outlines measures to minimize contamination in the building during construction. It provides requirements to flush the building of contaminants prior to occupancy and/or testing to verify air contaminant level prior to occupancy.

B. (MERV) = Minimum Efficiency Reporting Value.

1.4 REFERENCE STANDARDS

A. ANSI/ASHRAE 52.2-2007, "Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size". www.ashrae.org.

B. Sheet Metal and Air-Conditioning National Contractor Association (SMACNA), "IAQ Guidelines for Occupied Buildings under Construction", 2nd Edition, 2007, ANSI/SMACNA 008-2008 (Chapter 3) www.smacna.org.

C. U.S. Environmental Protection Agency (EPA) "Compendium of Methods for the Determination of Air Pollutants in Indoor Air" http://nepis.epa.gov/Exe/ZyPDF.cgi/P1004G22.PDF?Dockey=P1004G22.PDF

D. CEN Standard EN 779: 2002, Particulate air filters for general ventilation, Determination of the Filtration Performance.

E. Green Seal, GS-37 "Cleaning Products for Industrial and Institutional Use" www.greenseal.org/.

1.5 SUBMITTALS

A. Indoor Air Quality Management Plan: Within thirty (30) days after receipt of Notice to Proceed, the Contractor shall develop and submit to the Owner for review an indoor air quality management plan. The Plan shall include, but not be limited to, the following:

1. Address each of the five categories (including subsections) covered by the SMACNA "IAQ Guidelines for Occupied Buildings under Construction" as follows:

i. HVAC Protection

a. Permanently installed HVAC equipment
b. Duct protection and cleaning
c. Filtration media
d. Material storage

ii. Source Control

a. Allowed products
b. Product substitution
c. High-toxicity material protocols
d. Local and temporary exhaust
e. Air cleaning
f. Smoking
g. Moisture protection
h. Sealing sources of pollution

iii. Pathway Interruption

a. Isolate work area
b. Depressurize work area, pressurize occupied or completed space
c. Relocate pollutant sources
d. Entryway walk-off mats
e. Dust guards and collectors on tools

iv. Housekeeping

a. Maintenance of site
b. Vacuum filters
c. Dust control for sweeping
d. Final cleaning of site

2. Scheduling
    a. Sequencing of trades and material installation
    b. If applicable, flush-out and/or perform IAQ testing
    c. Filtration media
3. Procedures for protecting stored on-site or installed absorptive materials from moisture damage.
4. Description of the smoking policy for the project site during construction. Refer to Section 01 81 13 Sustainable Design Requirements.
5. Indicate whether air handlers will be operated during construction and specify filtration procedures for permanent equipment that will be used.
6. Schedule for inspection and maintenance of IAQ measures.
7. Include provisions in the Plan for addressing conditions in the field that do not adhere to the Plan, including provisions to implement a stop work order or rectify non-compliant conditions.
8. Incorporate procedures for the flush-out and/or air quality testing into the IAQ Management Plan, as specified below.

B. If permanently installed HVAC systems are used for heating, cooling or ventilation during construction, provide the following:
    i. Product data sheet for temporary filtration media, including the filtration rating.
    ii. Log identifying installation date of temporary filtration media, dates that filtration media was inspected and dates for when permanent filters were installed.

C. Product data for permanent filtration media installed prior to occupancy.

D. Flush Out: Signed statement describing the building air flush-out procedures, including:
    1. Dates when flush-out was begun and completed
    2. Outdoor air delivery rates
    3. Internal temperature.
    4. Relative humidity
    5. Confirmation that all interior finishes, movable furnishings, and major VOC punch list items were installed and complete before beginning the flush-out
    6. Confirmation that new filtration media were installed before the flush-out began

E. Air Testing:
    1. Signed statement describing the building testing procedures, including:
        i. Test dates
        ii. Testing protocols
        iii. Scope
        iv. Sampling locations with respect to floor area, size, and ventilation system

v. Corrective measures implemented

vi. Confirmation that all interior finishes, movable furnishings, and major VOC punch list items were installed and complete before testing began.

vii. Report from testing and inspecting agency indicating results of IAQ testing and documentation showing compliance with IAQ testing procedures and requirements.

2. Air testing report, including:

i. Test date(s)

ii. Concentrations of formaldehyde, particulates (PM10 or PM 2.5, as applicable), ozone (as applicable), total volatile organic compounds (TVOC), target chemicals from CDPH Standard Method v1.1, and carbon monoxide (CO)

iii. Test methods.

F. Provide a copy or photograph of "No Smoking" signs posted around the job site.

G. LEED Progress Reports: Submit a monthly report containing photographs of each IAQ measure implemented. At minimum, include 6 photographs monthly.

1. By the end of construction, at least 3 photographs over the course of construction of each IAQ measure implemented must be included in the report.

2. Include photographs that demonstrate methods employed to protect absorptive materials from moisture damage during construction and pre-occupancy. Highlight materials stored or installed on-site.

3. Photographs should be annotated to indicate the IAQ measure depicted and the general location of the photograph.

H. See additional submittal requirements in Section 018113 Sustainable Design Requirements, Submittals: LEED Action Plan, LEED Progress Reports, and LEED Online Documentation.

1.6 QUALITY ASSURANCE

A. Construction IAQ Representative: The General Contractor/Construction Manager shall designate an individual as their Construction IAQ Representative, who will be responsible for communicating the progress of the Plan with the Owner, Architect and LEED Consultant on regular basis, and for assembling the required green building documentation.

B. Include the IAQ Management Plan requirements in contract agreements with subcontractors.

C. As subcontractors are selected and deployed on site, familiarize them with the plan and how it will affect their daily activities. Hold a subcontractors' orientation meeting to review the plan requirements as a group.

D. Include construction IAQ progress check-ins as a regular item in weekly subcontractor meetings and safety meetings.

E. Provide a copy of the plan on site, posted in an accessible area. Translate the plan into the languages spoken by subcontractors and their crews.

F. Verify that the IAQ management plan is being followed on job walks.

PART 2 - PRODUCTS

2.1 CLEANING

A. Using low-toxic cleaning supplies for cleaning of surfaces, equipment, and personal use complying with GS-37 or other equivalent standard.

1. GS-37 tested and approved cleaning products can be found on their website: http://www.greenseal.org/FindGreenSealProductsandServices.aspx?vid=ViewProductDetail&cid=0&sid=23

2.2 FILTRATION MEDIA

A. If permanently installed air handlers are used during construction, temporary filtration media must meet one of the following performance criteria:

1. MERV of at least 8, as determined by ASHRAE 52.2-2007 (with errata but without addenda)
2. Class F5 or higher, as defined by CEN Standard EN 779-2002, Particulate Air Filters For General Ventilation, Determination of the filtration performance

PART 3 - EXECUTION

3.1 GENERAL

A. The General Contractor/Construction Manager shall be responsible for implementation of the Construction IAQ Management Plan, and for the coordination of the Plan with all affected trades. Sub-contractors shall be responsible for the implementation of specific control measures, as impacted by their trade. Subcontractors shall coordinate their responsibilities through the Construction Manager and their designated Construction IAQ Representative.

B. Temporary filtration media must be used at each return air grille if permanently installed air handlers are used during construction.

1. After completion of construction and prior to occupancy, temporary filtration media must be replaced with new permanent filters as specified.

3.2 FLUSH OUT

A. After construction ends – including the installation of all interior finishes and movable furnishings, major VOC punch list items have been completed, and the building has been thoroughly cleaned – but prior to occupancy, install new filtration media and supply a total air volume of 14,000 cubic feet of outdoor air per sf of gross floor area. Maintain internally 60 degrees F and no higher than 80 degrees F and maximum 60% RH within the building during the flush out procedure.

1. Permanent filters used during the flush-out shall meet the requirements of the filtration media specified for this project.

B. If occupancy is desired prior to completion of the flush-out, the space may be occupied following delivery of a minimum of 3,500 cubic feet of outdoor air per square foot of gross floor area to the space. Maintain internally 60 degrees F and no higher than 80 degrees F and maximum 60% RH within the building. Once the space is occupied, it shall be ventilated at a minimum rate of 0.3 cfm/sf of outside air or the design minimum outside air rate determined in EQ Prerequisite Minimum Indoor Air Quality Performance, whichever is greater. Each day of the flush out,

ventilation shall begin a minimum of three hours prior to occupancy and continue during occupancy. These conditions shall be maintained until a total of 14,000 cubic feet per square foot of outside air has been delivered to the space.

3.3 AIR TESTING: PARTICULATE MATTER AND INORGANIC GASES

A. After construction ends – including the installation of all interior finishes and movable furnishings, major VOC punch list items have been completed, and the building has been thoroughly cleaned – but prior to occupancy and under ventilation conditions typical for occupancy, conduct baseline IAQ testing in occupied spaces for the contaminants listed in Table 1. Retail projects may conduct the testing within 14 days of occupancy.

B. Test for the particulate matter (PM) and inorganic gases listed in Table 1, using an allowed test method, and demonstrate the contaminants do not exceed the concentration limits listed in the table.

Table 1

Contaminant	Concentration Limit (µg/m³)	Allowed Test Methods
Carbon Monoxide (CO)	9 ppm; no more than 2 ppm above outdoor levels	ISO 4224 EPA Compendium Method IP-3 GB/T 18883-2002 for projects in China Direct calibrated electrochemical instrument with accuracy of +/- 3% of reading and resolution of 0.1 ppm NDIR CO Sensors with accuracy of 1% of 10 ppm full scale and display resolution of less than 0.1ppm
PM 10	ISO 14644-1:2015, cleanroom class of 8 or lower 50 µg/m³ Healthcare only: 20 µg/m³	Particulate monitoring device with accuracy greater of 5 micrograms/m³ or 20% of reading and resolution (5 min average data) +/- 5 µg/m³
PM 2.5	12 µg/m³ For projects in areas with high ambient levels of PM2.5 (known as EPA nonattainment areas for PM2.5, or local equivalent), 35 µg/m³	
Ozone	0.07 ppm	Monitoring device with accuracy greater of 5 ppb or 20% of reading and resolution (5 min average data) +/- 5 ppb ISO 13964 ASTM D5149 -– 02 EPA designated methods for Ozone

3.4 AIR TESTING: VOLATILE ORGANIC COMPOUNDS

A. After construction ends – including the installation of all interior finishes and movable furnishings, major VOC punch list items have been completed, and the building has been thoroughly cleaned – but prior to occupancy and under ventilation conditions typical for occupancy, conduct baseline IAQ testing in occupied spaces for the contaminants listed in Table 2. Retail projects may conduct the testing within 14 days of occupancy.

B. Perform a screening test for Total Volatile Organic Compounds (TVOC). Use ISO 16000-6, EPA TO-17, or EPA TO-15 to collect and analyze the air sample. Calculate the TVOC value per EN 16516:2017, CDPH Standard Method v1.2 2017 section 3.9.4, or alternative calculation method

as long as full method description is included in test report. If the TVOC levels exceed 500 µg/m3, investigate for potential issues by comparing the individual VOC levels from the GC/MS results to associated cognizant authority health-based limits. Correct any identified issues and re-test if necessary.

C. Test for the individual volatile organic compounds listed in Table 2 using an allowed test method and demonstrate the contaminants do not exceed the concentration limits listed in the table. Laboratories that conduct the tests must be accredited under ISO/IEC 17025 for the test methods they use.

Table 2

Contaminant	Concentration Limit (µg/m³)	Allowed Test Methods
Formaldehyde 50-00-0	20 µg/m³ (16 ppb)	ISO 16000-3, 4; EPA TO-11a, EPA comp. IP-6A ASTM D5197-16
Acetaldehyde 75-07-0	140 µg/m³	
Benzene 71-43-2	3 µg/m³	ISO 16000-6 EPA IP-1, EPA TO-17, EPA TO-15 ISO 16017-1, 2; ASTM D6196-15
Hexane (n-) 110-54-3	7000 µg/m³	
Naphthalene 91-20-3	9 µg/m³	
Phenol 108-95-2	200 µg/m³	
Styrene 100-42-5	900 µg/m³	
Tetrachloroethylene 127-18-4	35 µg/m³	
Toluene 108-88-3	300 µg/m³	
Vinyl acetate 108-05-4	200 µg/m³	
Dichlorobenzene (1,4-) 106-46-7	800 µg/m³	
Xylenes-total 108-38-3, 95-47-6, and 106-42-3	700 µg/m³	

3.5 INSPECTIONS & PROCEDURES

A. Conduct regular inspection and maintenance of indoor air quality measures.

B. Implement policies and procedures outlined in the Indoor Air Quality Management Plan.

C. Use safety meetings, signage, and subcontractor agreements to communicate the goals of the Indoor Air Quality Management Plan.

END OF SECTION 01 81 19

SECTION 024119

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Demolishing existing construction and finishes for installation of new work.

B. Principal Products:
   1. Removal of items indicated on Drawings.

C. Related Requirements:
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.

1.2 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Predemolition Conference: Conduct conference at Project site.
   1. Inspect and discuss condition of construction to be selectively demolished.
   2. Review structural load limitations of existing structure.
   3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
   5. Review areas where existing construction is to remain and requires protection.

B. Coordinate utility and building service interruptions with Owner.
   1. Notify Owner seven days, minimum, before disrupting building fire protection and life safety systems.
   2. Schedule tie ins to existing systems to minimize disruption.
   3. Coordinate Work so fire protection and life safety systems remain continuously operational in occupied areas.

C. Owner will conduct salvage operations before demolition begins to remove materials Owner chooses to retain.

D. Cooperate with Owner in scheduling noisy operations and waste removal that may impact Owner operation and work in adjoining spaces.

1.4 ACTION SUBMITTALS

A. Shop Drawings:
   1. Indicate demolition and removal sequence.
   2. Indicate location of items designated for reuse and Owner retention.
   3. Indicate location and construction of temporary partitions.

B. Demolition Schedule: Indicate overall schedule and interruptions required for utility and building services.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Accurately record actual locations of capped utilities, concealed utilities discovered during demolition, and subsurface obstructions.

1.6 FIELD CONDITIONS

A. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work. Cease demolition and notify Owner and Architect if hazardous materials are encountered.

B. Conduct demolition to minimize interference with adjacentbuilding areas.

C. Cease operations immediately if structure appears to be in danger and notify Owner and Architect. Do not resume operations until directed.

D. Storage or sale of removed items or materials on-site is not permitted.

E. Remove demolition waste from site as Work progresses.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Follow the following reference standards:
   1. ANSI/ASSP A10.6.
   2. NFPA 241.

B. Follow code for demolition Work, dust control, and for products requiring utility disconnection and reconnection.

C. Notify Owner and Architect if suspected hazardous or contaminated materials are discovered.

D. Obtain required permits from authorities having jurisdiction.

E. Perform Work in accordance with Municipality of Philadelphia standard.

3.2 EXAMINATION

A. Survey of Existing Conditions: Record existing conditions with photographs of conditions that might be misconstrued as damage caused by demolition operations.

3.3 PREPARATION

A. Notify affected utility companies before starting Work; follow their requirements.

B. Review demolition with Owner to catalog items to be salvaged.

C. Protection of In-Place Conditions:
   1. Provide life safety measures including:
      a. Lighting.
      b. Fence.
      c. Barricades.
   2. Provide temporary bracing and shoring to prevent damage and movement of structure.

D. Mark location and termination of utilities.

E. Erect, and maintain temporary barriers and security devices, including warning signs and lights, and similar measures, for protection of the public, the Owner, and existing improvements indicated to remain.

F. Erect and maintain weatherproof closures for exterior openings.

G. Erect and maintain temporary partitions to prevent spread of dust, odors, and noise to permit continued Owner occupancy.

H. Prevent movement of structure; provide temporary bracing and shoring required to ensure safety of existing structure.

I. Provide appropriate temporary signage including signage for exit or building egress.

J. Do not close or obstruct building egress paths.

K. Do not disable or disrupt building fire or life safety systems without 5 days prior written notice to Owner.

3.4 SALVAGE REQUIREMENTS

A. Coordinate with Owner to identify building components and equipment required to be removed and delivered to Owner.

B. Tag components and equipment Owner designates for salvage.

C. Protect designated salvage items from demolition operations until items can be removed.

D. Carefully remove building components and equipment indicated to be salvaged.

E. Disassemble as required to permit removal from building.

F. Package small and loose parts to avoid loss.

G. Mark equipment and packaged parts to permit identification and consolidation of components of each salvaged item.

H. Prepare assembly instructions consistent with disassembled parts. Package assembly instructions in protective envelope and securely attach to each disassembled salvaged item.

I. Deliver salvaged items to Owner. Obtain signed receipt from Owner.

3.5 DEMOLITION

A. Conduct demolition to minimize interference with adjacent unaffected building areas.

B. Maintain protected egress from and access to adjacent existing buildings at all times.

C. Do not close or obstruct roadways and sidewalks without permits.

D. Cease operations immediately when structure appears to be in danger and notify Architect.

E. Disconnect and remove designated utilities within demolition areas.

F. Cap and identify abandoned utilities at termination points when utility is not completely removed. Annotate Record Drawings indicating location and type of service for capped utilities remaining after demolition.

G. Demolish in orderly and careful manner. Protect existing improvements.

H. Carefully remove building components indicated to be reused.
   1. Disassemble components as required to permit removal.
   2. Package small and loose parts to avoid loss.
   3. Mark components and packaged parts to permit reinstallation.
   4. Store components, protected from construction operations, until reinstalled.

I. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.

J. Transport friable and dusty demolished materials through building in enclosed containers.

K. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.

L. Remove temporary partitions.

END OF SECTION

SECTION 030130

MAINTENANCE OF CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Removal of deteriorated concrete and subsequent replacement and patching.
2. Floor joint repair.
3. Epoxy crack injection.
4. Corrosion-inhibiting treatment.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1. Unit prices apply to authorized work covered by estimated quantities.
2. Unit prices apply to authorized additions to and deletions from the Work as authorized by Change Orders.

B. General: Unit prices include the cost of preparing existing construction to receive the work indicated and costs of field quality control required for units of work completed.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to concrete maintenance including, but not limited to, the following:

a. Verify concrete-maintenance specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
b. Materials, material application, sequencing, tolerances, and required clearances.
c. Quality-control program.

d. Coordination with building occupants.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, chemical composition, physical properties, test data, and mixing, preparation, and application instructions.

B. Samples: Cured Samples for each exposed product and for each color and texture specified, in manufacturer's standard size appropriate for each type of work.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturers.

B. Product Test Reports: For each manufactured bonding agent, cementitious patching mortar, joint-filler, and crack-injection adhesive, for tests performed by manufacturer and witnessed by a qualified testing agency.

C. Field quality-control reports.

D. Quality-Control Program: Submit before work begins.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Each manufactured bonding-agent, packaged patching-mortar, joint-filler, crack-injection-adhesive, and corrosion-inhibiting-treatment manufacturer shall employ factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.

B. Concrete-Maintenance Specialist Qualifications: Engage an experienced concrete-maintenance firm that employs installers and supervisors who are trained and approved by manufacturer to apply packaged patching-mortar, crack-injection adhesive, and corrosion-inhibiting treatments to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing or patching new concrete is insufficient experience for concrete-maintenance work.

1. Field Supervision: Concrete-maintenance specialist firm shall maintain experienced full-time supervisors on Project site during times that concrete-maintenance work is in progress.

C. Quality-Control Program: Prepare a written plan for concrete maintenance to systematically demonstrate the ability of personnel to properly perform maintenance work, including each

phase or process, protection of surrounding materials during operations, and control of debris and runoff during the Work. Describe in detail materials, methods, equipment, and sequence of operations to be used for each phase of the Work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's written instructions for minimum and maximum temperature requirements and other conditions for storage.

B. Store cementitious materials off the ground, under cover, and in a dry location.

C. Store aggregates covered and in a dry location; maintain grading and other required characteristics and prevent contamination.

1.9 FIELD CONDITIONS

A. Environmental Limitations for Epoxies: Do not apply when air and substrate temperatures are outside limits permitted by manufacturer. During hot weather, cool epoxy components before mixing, store mixed products in shade, and cool unused mixed products to retard setting. Do not apply to wet substrates unless approved by manufacturer.

1. Use only Class A epoxies when substrate temperatures are below or are expected to go below 40 deg F within eight hours.
2. Use only Class A or B epoxies when substrate temperatures are below or are expected to go below 60 deg F within eight hours.
3. Use only Class C epoxies when substrate temperatures are above and are expected to stay above 60 deg F for eight hours.

B. Cold-Weather Requirements for Cementitious Materials: Do not apply unless concrete-surface and air temperatures are above 40 deg F and will remain so for at least 48 hours after completion of Work.

C. Cold-Weather Requirements for Cementitious Materials: Comply with the following procedures:

1. When air temperature is below 40 deg F, heat patching-material ingredients and existing concrete to produce temperatures between 40 and 90 deg F.
2. When mean daily air temperature is between 25 and 40 deg F, cover completed Work with weather-resistant insulating blankets for 48 hours after repair or provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 48 hours after repair.
3. When mean daily air temperature is below 25 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 48 hours after repair.

D. Hot-Weather Requirements for Cementitious Materials: Protect repair work when temperature and humidity conditions produce excessive evaporation of water from patching

materials. Provide artificial shade and wind breaks, and use cooled materials as required. Do not apply to substrates with temperatures of 90 deg F and above.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: For repair products, obtain each color, grade, finish, type, and variety of product from single source and from single manufacturer with resources to provide products of consistent quality in appearance and physical properties.

2.2 BONDING AGENTS

A. Epoxy-Modified, Cementitious Bonding and Anticorrosion Agent: Manufactured product that consists of water-insensitive epoxy adhesive, portland cement, and water-based solution of corrosion-inhibiting chemicals that forms a protective film on steel reinforcement.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Dayton Superior Corporation.
    b. Euclid Chemical Company (The); an RPM company.
    c. Sika Corporation.

B. Epoxy Bonding Agent: ASTM C881/C881M, bonding system Type V and free of VOCs.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Dayton Superior Corporation.
    b. Euclid Chemical Company (The); an RPM company.
    c. Sika Corporation.

2.3 PATCHING MORTAR

A. Patching Mortar Requirements:

1. Only use patching mortars that are recommended by manufacturer for each applicable horizontal, vertical, or overhead use orientation.
2. Color and Aggregate Texture: Provide patching mortar and aggregates of colors and sizes necessary to produce patching mortar that matches existing, adjacent, exposed concrete. Blend several aggregates if necessary to achieve suitable matches.

3. Coarse Aggregate for Patching Mortar: ASTM C33/C33M, washed aggregate, Size No. 8, Class 5S. Add to patching-mortar mix only as permitted by patching-mortar manufacturer.

B. Polymer-Modified, Cementitious Patching Mortar: Packaged, dry mix for repair of concrete and that contains a non-redispersible latex additive as either a dry powder or a separate liquid that is added during mixing.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Dayton Superior Corporation.
b. Euclid Chemical Company (The); an RPM company.
c. Sika Corporation.

2. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C109/C109M.

2.4 JOINT FILLER

A. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A Shore durometer hardness of at least 80 according to ASTM D2240.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Dayton Superior Corporation.
b. Euclid Chemical Company (The); an RPM company.
c. Sika Corporation.

B. Polyurea Joint Filler: Two-component, semirigid, 100 percent solids, polyurea resin with a Type A Shore durometer hardness of at least 80 according to ASTM D2240.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Euclid Chemical Company (The); an RPM company.
b. Kaufman Products, Inc.
c. Master Builders Solutions.

C. Color: Matching existing joint filler.

2.5 EPOXY CRACK-INJECTION MATERIALS

A. Epoxy Crack-Injection Adhesive: ASTM C881/C881M, bonding system Type IV at structural locations and where indicated, Type I at other locations; free of VOCs.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Dayton Superior Corporation.
b. Euclid Chemical Company (The); an RPM company.
c. Sika Corporation.

2. Capping Adhesive: Product manufactured for use with crack-injection adhesive by same manufacturer.
3. Color: Provide epoxy crack-injection adhesive and capping adhesive that blend with existing, adjacent concrete and do not stain concrete surface.

2.6 CORROSION-INHIBITING MATERIALS

A. Corrosion-Inhibiting Treatment: Waterborne solution of alkaline corrosion-inhibiting chemicals for concrete-surface application that penetrates concrete by diffusion and forms a protective film on steel reinforcement.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Euclid Chemical Company (The); an RPM company.
b. Master Builders Solutions.
c. Sika Corporation.

2.7 MISCELLANEOUS MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I, II, or III unless otherwise indicated.

B. Water: Potable.

2.8 MIXES

A. General: Mix products, in clean containers, according to manufacturer's written instructions.

1. Do not add water, thinners, or additives unless recommended by manufacturer.
2. When practical, use manufacturer's premeasured packages to ensure that materials are mixed in proper proportions. When premeasured packages are not used, measure

ingredients using graduated measuring containers; do not estimate quantities or use shovel or trowel as unit of measure.

3. Do not mix more materials than can be used within time limits recommended by manufacturer. Discard materials that have begun to set.

B. Mortar Scrub Coat: Mix dry ingredients with enough water to provide consistency of thick cream.

C. Dry-Pack Mortar: Mix required type(s) of patching-mortar dry ingredients with just enough liquid to form damp cohesive mixture that can be squeezed by hand into a ball but is not plastic.

D. Concrete: Comply with Section 033000 "Cast-in-Place Concrete."

E. Grout for Use with Preplaced Aggregate: Proportion according to ASTM C938. Add grout fluidifier to mixing water followed by portland cement, pozzolan, and fine aggregate.

PART 3 - EXECUTION

3.1 CONCRETE MAINTENANCE

A. Have concrete-maintenance work performed only by qualified concrete-maintenance specialist.

B. Comply with manufacturers' written instructions for surface preparation and product application.

3.2 EXAMINATION

A. Notify Architect seven days in advance of dates when areas of deteriorated or delaminated concrete and deteriorated reinforcing bars will be located.

B. Locate areas of deteriorated or delaminated concrete using hammer or chain-drag sounding and mark boundaries. Mark areas for removal by simplifying and squaring off boundaries. At columns and walls make boundaries level and plumb unless otherwise indicated.

C. Pachometer Testing: Locate at least three reinforcing bars using a pachometer, and drill test holes to determine depth of cover. Calibrate pachometer using depth of cover measurements, and verify depth of cover in removal areas using pachometer.

D. Perform surveys as the Work progresses to detect hazards resulting from concrete-maintenance work.

3.3 PREPARATION

A. Ensure that supervisory personnel are on-site and on duty when concrete maintenance work begins and during its progress.

B. Protect persons, motor vehicles, surrounding surfaces of building being repaired, building site, plants, and surrounding buildings from harm resulting from concrete maintenance work.

1. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
2. Use only proven protection methods appropriate to each area and surface being protected.
3. Provide temporary barricades, barriers, and directional signage to exclude public from areas where concrete maintenance work is being performed.
4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of concrete maintenance work.
5. Contain dust and debris generated by concrete maintenance work and prevent it from reaching the public or adjacent surfaces.
6. Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment that ensure that such water will not create a hazard or adversely affect other building areas or materials.
7. Protect floors and other surfaces along haul routes from damage, wear, and staining.
8. Provide supplemental sound-control treatment to isolate removal and dismantling work from other areas of the building.
9. Protect adjacent surfaces and equipment by covering them with heavy polyethylene film and waterproof masking tape. If practical, remove items, store, and reinstall after potentially damaging operations are complete.
10. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
11. Dispose of debris and runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

C. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is in working order.

1. Prevent solids such as aggregate or mortar residue from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from concrete maintenance work.
2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

D. Preparation for Concrete Removal: Examine construction to be repaired to determine best methods to safely and effectively perform concrete maintenance work. Examine adjacent work to determine what protective measures will be necessary. Make explorations, probes, and

inquiries as necessary to determine condition of construction to be removed in the course of repair.

1. Verify that affected utilities have been disconnected and capped.
2. Inventory and record the condition of items to be removed for reinstallation or salvage.
3. Provide and maintain shoring, bracing, and temporary structural supports as required to preserve stability and prevent unexpected or uncontrolled movement, settlement, or collapse of construction being demolished and construction and finishes to remain. Strengthen or add new supports when required during progress of removal work.

E. Reinforcing-Bar Preparation: Remove loose and flaking rust from exposed reinforcing bars by wire brushing until only tightly adhered light rust remains.

1. Where section loss of reinforcing bar is more than 25 percent, or 20 percent in two or more adjacent bars, cut bars and remove and replace as indicated on Drawings.
2. Remove additional concrete as necessary to provide at least 1-inch clearance at existing and replacement bars.
3. Splice replacement bars to existing bars according to ACI 318 by lapping, welding, or using mechanical couplings.

F. Surface Preparation for Corrosion-Inhibiting Treatment: Clean concrete to remove dirt, oils, films, and other materials detrimental to treatment application.

1. Use low-pressure water cleaning.
2. Allow surface to dry before applying corrosion-inhibiting treatment.

3.4 REMOVAL OF CONCRETE

A. Do not overload structural elements with debris.

B. Saw-cut perimeter of areas indicated for removal to a depth of at least 1/2 inch. Make cuts perpendicular to concrete surfaces and no deeper than cover on reinforcement.

C. Remove deteriorated and delaminated concrete by breaking up and dislodging from reinforcement.

D. Remove additional concrete if necessary to provide a depth of removal of at least 1/2 inch over entire removal area.

E. Where half or more of the perimeter of reinforcing bar is exposed, bond between reinforcing bar and surrounding concrete is broken, or reinforcing bar is corroded, remove concrete from entire perimeter of bar and to provide at least 1-inch clearance around bar.

F. Test areas where concrete has been removed by tapping with hammer, and remove additional concrete until unsound and disbonded concrete is completely removed.

G. Provide surfaces with a fractured profile of at least 1/8 inch that are approximately perpendicular or parallel to original concrete surfaces. At columns and walls, make top and bottom surfaces level unless otherwise directed.

H. Thoroughly clean removal areas of loose concrete, dust, and debris.

3.5 APPLICATION OF BONDING AGENT

A. Epoxy-Modified, Cementitious Bonding and Anticorrosion Agent: Apply to reinforcing bars and concrete by stiff brush or hopper spray according to manufacturer's written instructions. Apply to reinforcing bars in two coats, allowing first coat to dry two to three hours before applying second coat. Allow to dry before placing patching mortar or concrete.

B. Epoxy Bonding Agent: Apply to reinforcing bars and concrete by brush, roller, or spray according to manufacturer's written instructions, leaving no pinholes or other uncoated areas. Apply to reinforcing bars in at least two coats, allowing first coat to dry before applying second coat. Place patching mortar or concrete while epoxy is still tacky. If epoxy dries, recoat before placing patching mortar or concrete.

3.6 INSTALLATION OF PATCHING MORTAR

A. Place patching mortar as specified in this article unless otherwise recommended in writing by manufacturer.

1. Provide forms where necessary to confine patch to required shape.
2. Wet substrate and forms thoroughly and then remove standing water.

B. Pretreatment: Apply specified bonding agent or as required by manufacturer.

C. General Placement: Place patching mortar by troweling toward edges of patch to force intimate contact with edge surfaces. For large patches, fill edges first and then work toward center, always troweling toward edges of patch. At fully exposed reinforcing bars, force patching mortar to fill space behind bars by compacting with trowel from sides of bars.

D. Vertical Patching: Place material in lifts of not more than 1 inch or less than 1/4 inch. Do not feather edge.

E. Overhead Patching: Place material in lifts of not more than 1 inch or less than 1/4 inch. Do not feather edge.

F. Consolidation: After each lift is placed, consolidate material and screed surface.

G. Multiple Lifts: Where multiple lifts are used, score surface of lifts to provide a rough surface for placing subsequent lifts. Allow each lift to reach final set before placing subsequent lifts.

H. Finishing: Allow surfaces of lifts that are to remain exposed to become firm and then finish to a surface matching adjacent concrete.

I. Curing: Wet-cure cementitious patching materials, including polymer-modified cementitious patching materials, for not less than seven days by water-fog spray or water-saturated absorptive cover.

3.7 INSTALLATION OF DRY-PACK-MORTAR

A. Use dry-pack mortar for deep cavities. Place as specified in this article unless otherwise recommended in writing by manufacturer.

1. Provide forms where necessary to confine patch to required shape.
2. Wet substrate and forms thoroughly and then remove standing water.

B. Pretreatment: Apply specified bonding agent.

C. Place dry-pack mortar into cavity by hand, and compact tightly into place. Do not place more material at a time than can be properly compacted. Continue placing and compacting until patch is approximately level with surrounding surface.

D. After cavity is filled and patch is compacted, trowel surface to match profile and finish of surrounding concrete. A thin coat of patching mortar may be troweled into the surface of patch to help obtain required finish.

E. Wet-cure patch for not less than seven days by water-fog spray or water-saturated absorptive cover.

3.8 CONCRETE PLACEMENT

A. Place concrete according to Section 033000 "Cast-in-Place Concrete" and as specified in this article.

3.9 FLOOR-JOINT REPAIR

A. Cut out deteriorated concrete and reconstruct sides of joint with patching mortar as indicated on Drawings. Install joint filler in nonmoving floor joints where indicated and as specified in this article.

B. Depth: Install joint filler to a depth of at least 3/4 inch. Use fine silica sand no more than 1/4 inch deep to close base of joint. Do not use sealant backer rods or compressible fillers below joint filler.

C. Top Surface: Install joint filler so that when cured, it is flush at top surface of adjacent concrete. If necessary, overfill joint and remove excess when filler has cured.

3.10 EPOXY CRACK INJECTION

A. Clean cracks with oil-free compressed air or low-pressure water to remove loose particles.

B. Clean areas to receive capping adhesive of oil, dirt, and other substances that would interfere with bond.

C. Place injection ports as recommended by epoxy manufacturer, spacing no farther apart than thickness of member being injected. Seal injection ports in place with capping adhesive.

D. Seal cracks at exposed surfaces with a ribbon of capping adhesive at least 1/4 inch thick by 1 inch wider than crack.

E. Inject cracks wider than 0.003 inch to a depth of 8 inches.

F. Inject epoxy adhesive, beginning at widest part of crack and working toward narrower parts. Inject adhesive into ports to refusal, capping adjacent ports when they extrude epoxy. Cap injected ports and inject through adjacent ports until crack is filled.

G. After epoxy adhesive has set, remove injection ports and grind surfaces smooth.

3.11 APPLICATION OF CORROSION-INHIBITING-TREATMENT

A. Apply corrosion-inhibiting treatment to surfaces indicated on Drawings, from wall-to-wall or curb-to-curb and from joint-to-joint in the perpendicular direction.

B. Apply by brush, roller, or airless spray in two coats at manufacturer's recommended application rate. Remove film of excess treatment by high-pressure washing before patching treated concrete or applying a sealer or overlay.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:

1. Packaged, Cementitious Patching Mortar: Two randomly selected sets of samples for each type of mortar required, tested according to ASTM C928/C928M.
2. Concrete: As specified in Section 033000 "Cast-in-Place Concrete."
3. Joint Filler: Core-drilled samples to verify proper installation.

    a. Testing Frequency: One sample for each 100 feet of joint filled.
    b. Where samples are taken, refill holes with joint filler.

4. Epoxy Crack Injection: Core-drilled samples to verify proper installation.

a. Testing Frequency: Three samples from mockup and one sample for each 100 feet of crack injected.
b. Where samples are taken, refill holes with epoxy mortar.

C. Product will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Manufacturers Field Service: Engage manufacturers' factory-authorized service representatives for consultation and Project-site inspection and to provide on-site assistance when requested by Architect.

1. Have manufacturers' factory-authorized service representatives perform the following number of Project-site inspections to observe progress and quality of the Work, distributed over the period of product installation, regardless of on-site assistance requested by Architect:

a. Bonding-Agent and Packaged Patching-Mortar Installation: Three inspections.
b. Joint-Filler Installation: Two inspections.
c. Crack-Injection-Adhesive Preparation and Installation: Four inspections.
d. Corrosion-Inhibiting Treatment: Two inspections.

END OF SECTION 030130

SECTION 031000

CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Form-facing material for cast-in-place concrete.
2. Shoring, bracing, and anchoring.

B. Related Requirements:

1. Section 321313 "Concrete Paving" for formwork related to concrete pavement and walks.
2. Section 321316 "Decorative Concrete Paving" for formwork related to decorative concrete pavement and walks.

1.3 DEFINITIONS

A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.

B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.

b. Construction, movement, contraction, and isolation joints
c. Forms and form-removal limitations.
d. Shoring and reshoring procedures.
e. Anchor rod and anchorage device installation tolerances.

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following:

1. Exposed surface form-facing material.
2. Concealed surface form-facing material.
3. Forms for cylindrical columns.
4. Pan-type forms.
5. Void forms.
6. Form ties.
7. Form-release agent.

B. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.

1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
2. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301.

a. Location of construction joints is subject to approval of the Architect.

3. Indicate proposed schedule and sequence of stripping of forms, shoring removal, and reshoring installation and removal.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing and inspection agency.

B. Research Reports: For insulating concrete forms indicating compliance with International Code Council Acceptance Criteria AC353.

C. Field quality-control reports.

D. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

2.2 FORM-FACING MATERIALS

A. As-Cast Surface Form-Facing Material:

1. Provide continuous, true, and smooth concrete surfaces.
2. Furnish in largest practicable sizes to minimize number of joints.
3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete, and as follows:

    a. Plywood, metal, or other approved panel materials.
    b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

        1) APA HDO (high-density overlay).
        2) APA MDO (medium-density overlay); mill-release agent treated and edge sealed.
        3) APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.
        4) APA Plyform Class I, B-B or better; mill oiled and edge sealed.

B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.

1. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces without spiral or vertical seams not exceeding specified formwork surface class.

1. Provide forms with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation, with straight or tapered end forms.

E. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

2.3 RELATED MATERIALS

A. Reglets: Fabricate reglets of not less than 0.022-inch-thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

B. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
2. Form release agent for form liners shall be acceptable to form liner manufacturer.

F. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

A. Comply with ACI 301.

B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes.

C. Limit concrete surface irregularities as follows:

1. Surface Finish-1.0: ACI 117 Class D, 1 inch.
2. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
3. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.

D. Construct forms tight enough to prevent loss of concrete mortar.

1. Minimize joints.
2. Exposed Concrete: Symmetrically align joints in forms.

E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.

1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
3. Install keyways, reglets, recesses, and other accessories, for easy removal.

F. Do not use rust-stained, steel, form-facing material.

G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.

1. Provide and secure units to support screed strips
2. Use strike-off templates or compacting-type screeds.

H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.

1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
2. Locate temporary openings in forms at inconspicuous locations.

I. Chamfer exterior corners and edges of permanently exposed concrete.

J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.

K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

1. Determine sizes and locations from trades providing such items.
2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.

L. Construction and Movement Joints:

1. Construct joints true to line with faces perpendicular to surface plane of concrete.
2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
3. Place joints perpendicular to main reinforcement.

4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.

    a. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls as indicated on Drawings.

    a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
4. Install dovetail anchor slots in concrete structures, as indicated on Drawings.
5. Clean embedded items immediately prior to concrete placement.

3.3 REMOVING AND REUSING FORMS

A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work.

1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
2. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.

1. Align and secure joints to avoid offsets.
2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.

END OF SECTION 031000

SECTION 032000

CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction contraction and isolation joints.
c. Steel-reinforcement installation.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Bar supports.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of Architect.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For testing and inspection agency.

B. Delegated Design Engineer Qualifications: Include the following:

1. Experience providing delegated design engineering services of the type indicated.
2. Documentation that delegated design engineer is licensed in the jurisdiction in which Project is located.

C. Welding certificates.

1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M.

D. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement.

E. Field quality-control reports.

F. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Store reinforcement to avoid contact with earth.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

B. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.

2.2 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Epoxy-Coated Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, ASTM A775/A775M epoxy coated.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

D. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.

1. Finish: Plain.

2.3 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:

1. Do not cut or puncture vapor retarder.
2. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

B. Accurately position, support, and secure reinforcement against displacement.

1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Splices: Lap splices as indicated on Drawings.

1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
2. Stagger splices in accordance with ACI 318.

G. Install welded-wire reinforcement in longest practicable lengths.

1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."

    a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.

2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
4. Lace overlaps with wire.

3.3 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement.
2. Continue reinforcement across construction joints unless otherwise indicated.
3. Do not continue reinforcement through sides of strip placements of floors and slabs.

B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel-reinforcement placement.

END OF SECTION 032000

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 031000 "Concrete Forming and Accessories" for form-facing materials.
2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
3. Section 033300 "Architectural Concrete" for general building applications of specially finished formed concrete.
4. Section 312000 "Earth Moving" for drainage fill under slabs-on-ground.
5. Section 321313 "Concrete Paving" for concrete pavement and walks.
6. Section 321316 "Decorative Concrete Paving" for decorative concrete pavement and walks.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.

c. Ready-mix concrete manufacturer.
d. Concrete Subcontractor.
e. Special concrete finish Subcontractor.

2. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction joints, control joints, isolation joints, and joint-filler strips.
c. Semirigid joint fillers.
d. Vapor-retarder installation.
e. Anchor rod and anchorage device installation tolerances.
f. Cold and hot weather concreting procedures.
g. Concrete finishes and finishing.
h. Curing procedures.
i. Forms and form-removal limitations.
j. Shoring and reshoring procedures.
k. Methods for achieving specified floor and slab flatness and levelness.
l. Floor and slab flatness and levelness measurements.
m. Concrete repair procedures.
n. Concrete protection.
o. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
p. Protection of field cured field test cylinders.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Aggregates.
5. Admixtures:

a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.

6. Fiber reinforcement.
7. Vapor retarders.
8. Floor and slab treatments.
9. Liquid floor treatments.
10. Curing materials.

a. Include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.

11. Joint fillers.
12. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Steel-fiber reinforcement content.
10. Synthetic micro-fiber content.
11. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
12. Include manufacturer's certification that permeability-reducing admixture is compatible with mix design.
13. Include certification that dosage rate for permeability-reducing admixture matches dosage rate used in performance compliance test.
14. Intended placement method.
15. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

a. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.
3. Testing agency: Include copies of applicable ACI certificates.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Fiber reinforcement.
4. Curing compounds.
5. Floor and slab treatments.

6. Bonding agents.
7. Adhesives.
8. Vapor retarders.
9. Semirigid joint filler.
10. Joint-filler strips.
11. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Aggregates.
5. Admixtures.

D. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

E. Research Reports:

1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
2. For sheet vapor retarder/termite barrier, showing compliance with ICC AC380.

F. Preconstruction Test Reports: For each mix design.

G. Field quality-control reports.

H. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician.

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.

1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor to be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Field Quality-Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests to be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.

1. Include the following information in each test report:

a. Admixture dosage rates.
b. Slump.
c. Air content.
d. Seven-day compressive strength.
e. 28-day compressive strength.
f. Permeability.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.9 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I/II, gray.
2. Fly Ash: ASTM C618, Class C or F.
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.

C. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Alkali-Silica Reaction: Comply with one of the following:

a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.

b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.

c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.

2. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C260/C260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

F. Water and Water Used to Make Ice: ASTM C94/C94M, potable

2.3 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A, not less than 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Raven Industries, Inc.
b. Stego Industries, LLC.
c. W. R. Meadows, Inc.

2.4 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Dayton Superior Corporation.
    b. Kaufman Products, Inc.
    c. W. R. Meadows, Inc.

2.5 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Dayton Superior Corporation.
    b. Sika Corporation.
    c. W. R. Meadows, Inc.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

1. Color:

    a. Ambient Temperature Below 50 deg F: Black.
    b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
    c. Ambient Temperature Above 85 deg F: White.

D. Curing Paper: 8-feet-wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.

E. Water: Potable or complying with ASTM C1602/C1602M.

F. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Dayton Superior Corporation.
    b. Euclid Chemical Company (The); an RPM company.
    c. W. R. Meadows, Inc.

2.6 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1752, cork or self-expanding cork.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 in accordance with ASTM D2240.

C. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Floor Slab Protective Covering: 8-feet-wide cellulose fabric.

2.7 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand, as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested in accordance with ASTM C109/C109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.8 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash or Other Pozzolans: 25 percent by mass.
2. Slag Cement: 50 percent by mass.
3. Silica Fume: 10 percent by mass.
4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, and concrete with a w/cm below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
5. Use permeability-reducing admixture in concrete mixtures where indicated.

2.9 CONCRETE MIXTURES

A. Normal-weight concrete used for footings, foundation walls and piers.

1. Exposure Class: ACI 318 F1.
2. Minimum Compressive Strength: 4500 psi at 28 days.
3. Maximum w/cm: 0.45.
4. Slump Limit: 8 inches, plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.
5. Air Content:

a. Exposure Class F1: 5.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size and 4.5 percent,

plus or minus 1.5 percent at point of delivery for concrete containing 1-1/2-inch nominal maximum aggregate size.

6. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

B. Normal-weight concrete used for interior slabs-on-ground.

1. Minimum Compressive Strength: 4500 psi at 28 days.
2. Maximum w/cm: 0.45.
3. Minimum Cementitious Materials Content: 540 lb/cu. yd..
4. Slump Limit: 8 inches, plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.
5. Air Content:

    a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.

6. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

C. Normal-weight concrete used for interior suspended slabs.

1. Minimum Compressive Strength: 4500 psi at 28 days.
2. Maximum w/cm: 0.45.
3. Minimum Cementitious Materials Content: 520 lb/cu. yd..
4. Slump Limit: 8 inches, plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.
5. Air Content:

    a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.

6. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.4 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
2. Face laps away from exposed direction of concrete pour.
3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
4. Lap joints 6 inches and seal with manufacturer's recommended tape.
5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
7. Protect vapor retarder during placement of reinforcement and concrete.

    a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder in accordance with manufacturer's written instructions.

3.5 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
2. Place joints perpendicular to main reinforcement.

    a. Continue reinforcement across construction joints unless otherwise indicated.
    b. Do not continue reinforcement through sides of strip placements of floors and slabs.

3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
8. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated on Drawings.
2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

F. Dowel Plates: Install dowel plates at joints where indicated on Drawings.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.

    a. Do not use vibrators to transport concrete inside forms.
    b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
    c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
    d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.7 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.

    a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
    b. Remove projections larger than 1 inch.
    c. Tie holes do not require patching.
    d. Surface Tolerance: ACI 117 Class D.
    e. Apply to concrete surfaces not exposed to public view.

2. ACI 301 Surface Finish SF-3.0:

    a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
    b. Remove projections larger than 1/8 inch.
    c. Patch tie holes.
    d. Surface Tolerance: ACI 117 Class A.
    e. Locations: Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

B. Rubbed Finish: Apply the following to as cast surface finishes where indicated on Drawings:

1. Smooth-Rubbed Finish:

    a. Perform no later than one day after form removal.
    b. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture.
    c. If sufficient cement paste cannot be drawn from the concrete by the rubbing process, use a grout made from the same cementitious materials used in the in-place concrete.

2. Grout-Cleaned Rubbed Finish:

    a. Clean concrete surfaces after contiguous surfaces are completed and accessible.
    b. Do not clean concrete surfaces as Work progresses.
    c. Mix 1 part portland cement to 1-1/2 parts fine sand, complying with ASTM C144 or ASTM C404, by volume, with sufficient water to produce a mixture with the consistency of thick paint. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces.
    d. Wet concrete surfaces.
    e. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap, and keep surface damp by fog spray for at least 36 hours.

3. Cork-Floated Finish:

a. Mix 1 part portland cement to 1 part fine sand, complying with ASTM C144 or ASTM C404, by volume, with sufficient water to produce a mixture with the consistency of thick paint.
b. Mix 1 part portland cement and 1 part fine sand with sufficient water to produce a mixture of stiff grout. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces.
c. Wet concrete surfaces.
d. Compress grout into voids by grinding surface.
e. In a swirling motion, finish surface with a cork float.

4. Scrubbed Finish: After concrete has achieved a compressive strength of from 1000 to 1500 psi, apply scrubbed finish.

a. Wet concrete surfaces thoroughly and scrub with stiff fiber or wire brushes, using water freely, until top mortar surface is removed and aggregate is uniformly exposed.
b. Rinse scrubbed surfaces with clean water.
c. Maintain continuity of finish on each surface or area of Work.

C. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish:

1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.
3. Apply scratch finish to surfaces to receive concrete floor toppings and to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.

2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:

    a. Slabs on Ground:

        1) Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.
        2) Specified overall values of flatness, F_F 35; and of levelness, F_L 25; with minimum local values of flatness, F_F 24; and of levelness, F_L 17.

    b. Suspended Slabs:

        1) Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.
        2) Specified overall values of flatness, F_F 35; and of levelness, F_L 20; with minimum local values of flatness, F_F 24; and of levelness, F_L 15.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.

1. Coordinate required final finish with Architect before application.
2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

3.9 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 6 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4500 psi at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices.

    a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    b. Cast anchor-bolt insert into bases.
    c. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.10 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.

3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305.1, before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
3. If forms remain during curing period, moist cure after loosening forms.
4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

    a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
    b. Continuous Sprinkling: Maintain concrete surface continuously wet.
    c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
    d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
    e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

        1) Recoat areas subject to heavy rainfall within three hours after initial application.
        2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:

1. Begin curing immediately after finishing concrete.
2. Interior Concrete Floors:

    a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:

        1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

            a) Lap edges and ends of absorptive cover not less than 12 inches.
            b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

        2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
b) Cure for not less than seven days.

3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.
b) Continuous water-fog spray.

b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:

1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

a) Lap edges and ends of absorptive cover not less than 12 inches.
b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
b) Cure for not less than seven days.

3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.
b) Continuous water-fog spray.

c. Floors to Receive Curing Compound:

1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Maintain continuity of coating, and repair damage during curing period.
4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing

compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

d. Floors to Receive Curing and Sealing Compound:

1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.11 TOLERANCES

A. Conform to ACI 117.

3.12 APPLICATION OF LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than 14 days' old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.
4. Rinse with water; remove excess material until surface is dry.
5. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller in accordance with manufacturer's written instructions.

3.13 JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least six month(s).
2. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.

D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.

    a. Limit cut depth to 3/4 inch.
    b. Make edges of cuts perpendicular to concrete surface.
    c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
    d. Fill and compact with patching mortar before bonding agent has dried.
    e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.

    a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
    b. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.

    a. Correct low and high areas.

b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.

    a. Finish repaired areas to blend into adjacent concrete.

5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.

    a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
    b. Feather edges to match adjacent floor elevations.

6. Correct other low areas scheduled to remain exposed with repair topping.

    a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
    b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.

    a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
    b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
    c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
    d. Place, compact, and finish to blend with adjacent finished concrete.
    e. Cure in same manner as adjacent concrete.

8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.

    a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
    b. Dampen cleaned concrete surfaces and apply bonding agent.
    c. Place patching mortar before bonding agent has dried.
    d. Compact patching mortar and finish to match adjacent concrete.

e. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:

1) Project name.
2) Name of testing agency.
3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
4) Name of concrete manufacturer.
5) Date and time of inspection, sampling, and field testing.
6) Date and time of concrete placement.
7) Location in Work of concrete represented by samples.
8) Date and time sample was obtained.
9) Truck and batch ticket numbers.
10) Design compressive strength at 28 days.
11) Concrete mixture designation, proportions, and materials.
12) Field test results.
13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
14) Type of fracture and compressive break strengths at seven days and 28 days.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

D. Inspections:

1. Headed bolts and studs.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.
5. Verification of concrete strength before removal of shores and forms from beams and slabs.
6. Batch Plant Inspections: On a random basis, as determined by Architect.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

    a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C143/C143M:

    a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
    b. Perform additional tests when concrete consistency appears to change.

3. Slump Flow: ASTM C1611/C1611M:

    a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
    b. Perform additional tests when concrete consistency appears to change.

4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;.

    a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

5. Concrete Temperature: ASTM C1064/C1064M:

    a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.

6. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.

    a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

7. Compression Test Specimens: ASTM C31/C31M:

    a. Cast, initial cure, and field cure two sets of three standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C39/C39M.

    a. Test one set of two field-cured specimens at seven days and one set of three specimens at 28 days and one specimen at 56 days as required.
    b. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
12. Additional Tests:

    a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
    b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.

        1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.6.6.3.

13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 48 hours of completion of floor finishing and promptly report test results to Architect.

3.16 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 033000

SECTION 033543

POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Polished concrete surfaces at interior concrete stairs and ramps.

B. Principal Products:
   1. Concrete densifier.
   2. Concrete stain.
   3. Finish sealer.
   4. Concrete joint sealants.

C. Related Requirements.
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 033000: Cast in place concrete.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
   1. Coordinate polished concrete finishing with installation of concrete slabs and final selection of concrete mix designs.

B. Preinstallation Meeting Attendees and Procedures:
   1. Conduct meeting one week, minimum, before pouring concrete.
   2. Additional Attendees:
      a. Cast-in-place concrete subcontractor.
   3. Additional Agenda Items:
      a. Concrete curing and finishing.
      b. Concrete flatness tolerance.
      c. Protection of concrete slabs during construction.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Liquid floor treatments.
   2. Stain materials.
   3. Repair materials.

4. Initial selection color charts and samples.

B. Shop Drawings: Plan showing polished concrete surfaces and schedule of polishing operations. Include locations of construction joints and cold joints.

1.4 INFORMATIONAL SUBMITTALS

A. Field Quality Control Submittals: Field test reports.

B. Qualification Statements: Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommendations for cleaning and maintaining stained and polished concrete finishes.

1.6 QUALITY ASSURANCE

A. Qualifications:
1. Installers: Contractor crew, polishing equipment and liquid floor treatment manufacturers recently certified.

B. Field Samples: Polish concrete floor in Architect selected room to receive other finish floor or inconspicuous area, 100 square feet minimum size. Demonstrate aggregate, sheen, color, and construction joint treatment. Include polished edge and corner.

C. Mockups: Construct three (3) panels 48 x 48 inches minimum size. Demonstrate product interfaces, intersections, and terminations.
1. Mockup Locations: Coordinate with Architect.
2. Approved mockups establish work results standard.

PART 2 - PRODUCTS

2.1 FLOOR TREATMENTS - GENERAL

A. Source Control: Provide stains and floor treatments from one manufacturer.

2.2 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Waterborne silicate or siliconate penetrating hardener.
1. Manufacturers and Products:
a. Curecrete Retro Plate 99.
b. Euclid Chemical Company Ultrasil Li.
c. Laticrete L & M FGS Hardener Plus.
d. PROSOCO, Inc. Consolideck LS.
e. Solomon Colors Lythic Densifier.

B. Accessory Materials: Penetrating floor treatment manufacturers recommended joint fillers, sealers, and cleaning solutions.

2.3 CONCRETE STAINS

A. Penetrating Stain: Water based, acrylic latex, penetrating stain with colorfast pigments.
   1. Manufacturers and Products:
      a. Curecrete Retro Plate Dye.
      b. Euclid Chemical Company VIBRA-STAIN.
      c. Laticrete L & M FGS VIVID DYE WB PLUS.
      d. PROSOCO, Inc. GemTone Stain.
      e. Solomon Colors Pro Dye Plus.
   2. Color: Architect selected.

2.4 PERFORMANCE

A. Dynamic Coefficient of Friction: Tested per ANSI/NFSI B101.3 or ANSI A137.1 DCOF AcuTest.
   1. Level Floor Surfaces: 0.42 minimum.
   2. Stair Treads: 0.60 minimum.
   3. Ramp Surfaces: 0.80 minimum.

B. Physical Characteristics: Provide plant-mixed concrete per Section 033000 and the following:
   1. Coordinate mix of concrete with installer and manufacturer of polished concrete finishing systems to produce performance and aesthetic criteria indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Concrete Slabs: Verify substrates are acceptable for polishing.
   1. Verify concrete is fully cured and meets flatness specified in Section 033000.

3.2 PREPARATION

A. Clean concrete surfaces of dirt and other foreign matter harmful to concrete finishing material performance.

B. Fill surface imperfections using manufacturer recommended materials. Grind smooth and level.

C. Protect adjacent areas from overspray.

3.3 POLISHING

A. Final Polishing Work Results:
   1. Gloss: Architect selected.
   2. Aggregate Appearance: Architect selected.

B. Floor Polishing and Staining:
   1. Machine grind floor and vertical surfaces level and smooth. and to depth required to reveal aggregate matching approved field sample.
   2. Apply liquid floor treatments. Allow recommend drying time between coats.
   3. Apply penetrating stain; achieve specified color.
   4. Polish floor with progressively finer grit diamond pads; achieve specified gloss level.
   5. Neutralize, seal, and and clean polished floor surfaces.

C. Remove defects and repolish defective areas.

D. Finish edges of floor finish adjoining other materials in clean and sharp manner.

3.4 FIELD QUALITY CONTROL

A. Field Tests and Inspections: Engage inspectors to perform tests and inspections and prepare reports. Allow inspectors access to Work areas.
   1. Failed Test Retest Cost: Contractor responsibility.

B. Dynamic Coefficient of Friction: ANSI/NFSI B101.3 or ANSI A137.1 DCOF AcuTest.
   1. Test Location: Architect selected.
   2. Test Quantity: Three per 1000 square feet.

C. Finish Quality: ASTM D5767 for image clarity and ASTM D4039 for haze.
   1. Test Location: Architect selected.
   2. Test Quantity: Three per 1000 square feet.

D. Non-Conforming Work: Re-polish and retest.

3.5 CLEANING

A. Mechanically scrub treated floors with soft to medium pads and manufacturer approved cleaning solution.

3.6 PROTECTION

A. Protect polished concrete floor from damage during subsequent construction operations and placement of equipment and fixtures.

END OF SECTION

SECTION 035400

CAST UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Self-leveling underlayment below finish flooring.

B. Principal Products:
1. Portland cement underlayment.

C. Related Requirements.
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 090561: Common work results for flooring preparation.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting Attendees and Procedures:
1. Conduct meeting one week, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data:
1. Submit physical characteristics and product limitations.

B. Shop Drawings:
1. Plans showing locations and average depths of underlayment.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates:
1. Manufacturer Certificate: Certify underlayment and floor covering systems are compatible.

1.5 QUALITY ASSURANCE

A. Qualifications:
1. Installers: Manufacturer approved and trained.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
   1. Store products indoors, protected from elements, in manufacturer unopened packaging.

1.7 FIELD CONDITIONS

A. Ambient Conditions: Perform Work within following limitations.
   1. Building enclosed and environmental systems maintaining design conditions for Owner occupancy.
   2. Temperature: 50 degrees F, minimum and rising; 80 degrees, maximum.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT UNDERLAYMENT

A. Self-leveling Portland Cement Based Underlayment:
   1. Manufacturers and Products:
      a. ARDEX V 1200 or K 15.
      b. Comparable product, submitted and accepted prior to bidding.
   2. 28 Day Compressive Strength: ASTM C109/C109M, 4,500 psi, minimum.
   3. Components:
      a. Binding Agents: Portland, hydraulic or blended cement, ASTM C150 or ASTM C219.
      b. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch, or coarse sand.
      c. Water: Potable.
   4. Primer: Manufacturer recommended type.
   5. Sealant: Manufacturer recommended type.

2.2 PERFORMANCE

A. Fire Resistance: ASTM E119.
   1. Follow tested assembly requirements.

2.3 MIXES

A. Mix cementitious materials with water.
   1. Mix in aggregate for installations over 2 inches deep.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Verify substrate surfaces are clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate.

3.2 PREPARATION

A. Surface Preparation:
   1. Fill cracks with sealant or cementitious material.
   2. Seal joints and edges to prevent underlayment leaking to floors below.

3.3 APPLICATION

A. Prime substrates.

B. Apply underlayment. Produce a uniform, smooth, level surface; align with adjacent floor.

C. Cure underlayment.

3.4 PROTECTION

A. Protection: Protect underlayment until covered with finished flooring.

END OF SECTION

SECTION 040100

MAINTENANCE OF MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Cleaning of masonry.
   2. Brick masonry repair.
   3. Tuckpointing.

B. Principal Products:
   1. Masonry materials.
   2. Cleaning materials.

C. Related Requirements:
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 042000: Unit masonry.
   5. Section 079200: Joint sealants in existing masonry.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting Attendees and Procedures:
   1. Conduct meeting one week, minimum, before starting Work of this Section.

B. Sequencing Procedures:
   1. Complete cleaning before installation of new unit masonry and stone.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. For each type of product to include material description and installation instructions.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturers' Instructions.

B. Manufacturer Reports: Field test reports.

C. Qualification Statements: Manufacturer of paint-remover and chemical cleaner.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturers: Minimum 10 years documented experience manufacturing products for restoration and cleaning masonry.
   2. Installers: Minimum 10 years documented experience manufacturing products for restoration and cleaning masonry.

B. Certifications: From Contractor for specified performance.

C. Preconstruction Testing: Test each product. Complete testing 30 days, minimum, before scheduled field cleaning.

D. Mockups: Clean wall panel 40 sq. ft. minimum size. Demonstrate cleaning methods and cleaning products.
   1. Mockups Location: Field, Architect selected, 4 locations minimum.
   2. Approved mockups establish work results standard.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
   1. Store cleaning materials indoors, protected from elements.
   2. Handle cleaning materials to prevent contamination by foreign materials.

1.7 FIELD CONDITIONS

A. Ambient Conditions: Perform work within following limitations.
   1. Building enclosed and environmental systems maintaining design conditions for Owner occupancy.
   2. Temperature: 45 degrees F, minimum, 80 degrees F, maximum.

B. Existing Conditions: Verify field measurements before fabrication. Show field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MASONRY MATERIALS

A. Mortar and Grout Materials: See Section 042000.

B. Concrete Masonry Units: See Section 042000.

C. Brick: See Section 042000.

2.2 CLEANING MATERIALS

A. General:
   1. Products selected for use shall be recommended in writing by Manufacturer for substrates present at project site.

B. Manufacturers:
   1. Diedrich Technologies, Inc.
   2. Hydrochemical Techniques, Inc.
   3. ProSoCo, Inc.
   4. Cathedral Stone.

C. Nonacidic Gel Cleaner: Gel containing detergents and chelating agents; pH between 6 and 9.
   1. Sure Klean 942 Masonry Cleaner; ProSoCo, Inc.

D. Nonacidic Liquid Cleaner: For removing mold, mildew, and other organic soiling from stone and brick.
   1. Sure Klean Biowash; ProSoCo, Inc.

E. Alkaline Prewash Cleaner: For prewash applications used only where followed by an acidic cleaner of type indicated for afterwash.
   1. Sure Klean 766 Prewash; ProSoCo, Inc.
   2. Diedrich Technologies, Inc.; 707X/808X.

F. Mild Acidic Cleaner: Containing no hydrochloric, hydrofluoric, or sulfuric acid; chlorine bleaches; or caustic soda.
   1. Sure Klean EK Restoration Cleaner; ProSoCo, Inc.
   2. Diedrich Technologies, Inc.; ENVIRESTORE 100.

G. Acidic Cleaner: Masonry restoration cleaner composed of hydrofluoric acid blended with other acids and wetting agents.
   1. Diedrich 101G Granite, Terra Cotta, and Brick Cleaner; Diedrich Technologies, Inc.
   2. Hydroclean Brick, Granite, Sandstone and Terra Cotta Cleaner (HT-626); Hydrochemical Techniques, Inc.
   3. Sure Klean Heavy-Duty Restoration Cleaner; ProSoCo, Inc.
   4. Sure Klean Restoration Cleaner; ProSoCo, Inc.

H. One-Part Limestone Cleaner: One-part acidic formulation for cleaning limestone.
   1. Hydroclean Limestone and Marble Cleaner and Brightener (HT-907); Hydrochemical Techniques, Inc.
   2. Sure Klean Limestone Restorer; ProSoCo, Inc.
   3. Diedrich Technologies, Inc.; 202 Vana-Stop.

I. Two-Part Limestone Cleaner: Two part system consisting of an alkaline cleaner for prewash and an acid neutralizer for afterwash.
   1. Diedrich Limestone Cleaner Prerinse (707) and Neutralizer After-Rinse (707N); Diedrich Technologies, Inc.
   2. Hydroclean Limestone and Marble Precleaner (HT-704) and Hydroclean Limestone and Marble Cleaner and Brightener (HT-907); Hydrochemical Techniques, Inc.
   3. Sure Klean Limestone Prewash and Afterwash; ProSoCo, Inc.

J. Alkaline Paint Remover: Paste formulation for removing paint coatings from masonry.
   1. Diedrich 606/606X Paint Remover; Diedrich Technologies, Inc.
   2. Hydroclean Heavy Duty Paint Remover (HT-716); Hydrochemical Techniques, Inc.
   3. Enviro Klean Safety Peel 2; ProSoCo, Inc.
   4. Sure Klean Heavy-Duty Paint Stripper; ProSoCo, Inc.

K. Solvent-Type Paint Remover: Thixotropic, water-rinsable solvent formulation for removing paint coatings from masonry.
   1. Diedrich 505 Special Coatings Stripper; Diedrich Technologies, Inc.
   2. Hydroclean Solvent Paint Remover (HT-300); Hydrochemical Techniques, Inc.
   3. Enviro Klean Safety Peel 1; ProSoCo, Inc.
   4. Enviro Klean Safety Peel 3; ProSoCo, Inc.
   5. Sure Klean - Fast Acting Stripper; ProSoCo, Inc.

L. Water for Cleaning: Potable.

2.3 CHEMICAL CLEANING SOLUTIONS

A. Dilute chemical cleaners with water to produce solutions of concentration recommended by chemical cleaner manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Verify surfaces to be cleaned restored are ready for work of this section.

3.2 PREPARATION

A. Protection of In-Place Conditions: Protect elements surrounding work of this section from damage or disfiguration.

3.3 REPAIR OF EXISTING MASONRY

A. Rebuilding:
   1. Cut out damaged and deteriorated masonry and stone with care in manner to prevent damage to adjacent remaining materials.

2. Support structure in advance of cutting out units to maintain stability of remaining materials.
3. Cut away loose or unsound adjoining masonry, stone, mortar, as directed by Architect/Engineer, and to provide firm and solid bearing for new work.
4. Build in new, masonry, or stone units following procedures for new work specified in Section 042000.
5. Mortar Mix: Colored and proportioned to match existing work.
6. Ensure anchors, ties, reinforcing, and flashings are correctly located and built in.
7. Install built in masonry and stone work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in openings, accessories and fittings.

B. Repointing.
1. Cut out loose or disintegrated mortar in joints to minimum 1/2 inch depth or until sound mortar is reached.
2. Utilize hand tools.
3. Do not use power tools.
4. Do not damage masonry units.
5. When cutting is complete, remove dust and loose material by brushing.
6. Premoisten joint and apply mortar specified in Section Section 042000. Pack tightly in maximum 1/4 inch6 layers. Form smooth, compact concave joint to match existing.
7. Moist cure for 72 hours.

3.4 CLEANING MASONRY - GENERAL

A. Clean masonry from top to bottom from one end of each elevation to opposite end.

B. Use only cleaning methods for each masonry material and location identical to methods used for approved mockup.
1. Use natural-fiber brushes only.
2. Use spray equipment that provides controlled volume and pressure at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.
3. Apply chemical cleaner with low-pressure spray, equipped with a cone-shaped spray tip.
4. For water spray application, use a fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
5. For steam application, use a steam generator capable of delivering live steam at nozzle.

C. Perform each cleaning method in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces.

D. Completely remove plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing to dry as long as possible before removal. Remove loose soil and debris from open masonry joints.
1. Apply root-killing material to plant roots according to manufacturer's written instructions. Do not apply materials to plants that are to remain.

E. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting.

3.5 CLEANING EXISTING MASONRY

A. Clean existing masonry by one or more of the following methods, listed from least to most aggressive, as indicated in approved cleaning plan. Select least aggressive cleaning method available to effectively clean each type of masonry for existing conditions. Demonstrate effectiveness of selected cleaning methods with mockup. Adjust cleaning plan and selected cleaning methods based on mockup cleaning. Use application pressures determined during mockup cleaning.
   1. Cold-water wash.
   2. Warm-Water Wash.
   3. Detergent Cleaning.
   4. Nonacidic Liquid Chemical Cleaning.
   5. Nonacidic Gel Chemical Cleaning.
   6. Mild Acidic Chemical Cleaning.
   7. Acidic Chemical Cleaning.

B. Remove paint from existing masonry by one or more of the following methods, listed from least to most aggressive, as indicated in approved cleaning plan. Select least aggressive cleaning method available to effectively remove existing paint from each type of masonry. Demonstrate effectiveness of selected cleaning methods with mockup. Adjust cleaning plan and selected cleaning methods based on mockup cleaning.
   1. Alkaline Paint Remover.
   2. Solvent-Type Paint Remover.

C. Apply cleaning solutions and paint removers in accordance with manufacturer's instructions and approved cleaning plan.

D. Clean surfaces and remove large particles with wood scrapers or non-ferrous wire brush.

E. Spray or brush coat masonry with cleaning solution.

F. Provide second application when required by approved mockup.

G. Allow sufficient time for solution to remain on masonry and agitate with soft fiber brush.

H. Rinse from bottom up with potable water applied at 400 to 600 psi and at rate of 4 to 6 gal/min.

END OF SECTION

SECTION 042000

UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Load bearing CMU with masonry veneer.
2. Masonry veneer at exterior and interior walls.
3. Interior single wythe CMU partitions.

B. Principal Products:
1. Concrete masonry units, CMU-2.
2. Decorative concrete masonry units, CMU-1.
3. Brick masonry veneer, MV-B1A, MV-B1B, MV-B2A, MV-B2B.
4. Mortar and grout.
5. Reinforcement.
6. Masonry veneer anchors.
7. Through wall masonry flashing.
8. Cavity drainage and ventilation accessories.

C. Related Requirements.
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 040100: Maintenance of masonry.
5. Section 072100: Cavity wall insulation.
6. Section 079200: Joint sealants.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting:
1. Conduct meeting one month, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data.
1. Initial selection color charts and samples.

B. Shop Drawings.
1. Masonry Units: Shapes, sizes, profiles, and coursing.
2. Stone Trim: Shapes, sizes, profiles, and coursing.

3. Reinforcing Steel: ACI 315, show placement of bars in masonry, including wall elevations.

C. Samples:
1. Decorative CMUs: Full sized Samples. Approved Samples may not be incorporated into Work.
2. Brick: Straps of five or more full sized units.
3. Colored Mortar.
4. Accessories: Vents, flashing, and control joints.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates: Data substantiation compliance with requirements for the following:
1. Brick: Size tolerance, efflorescence, and freeze thaw durability.
2. Structural Masonry: Net-area compressive strength.
3. Mortar and Grout: Mix designs for compressive strength, water retention, and air content.

B. Installer Qualification Statements: Evidence of passing International Masonry Institute upgrade training.

1.5 QUALITY ASSURANCE

A. Qualifications:
1. Flashing Installers: Workers who have completed International Masonry Institute flashing upgrade course.
2. Grout and Reinforcing Installers: Workers who have completed International Masonry Institute grouting and reinforced masonry upgrade course.

B. Preconstruction Testing: Test each product. Complete testing 30 days, minimum, before scheduled field installation.
1. Brick: Compressive strength, ASTM C67.
2. CMU: Compressive strength, ASTM C140.
3. Mortar: Compressive strength, ASTM C109/C109M, Property Specification.
4. Grout: Compressive strength, ASTM C1019.
5. Wall Assembly: Compressive strength, prism test ASTM C1314.

C. Mockup - Stand-Alone: Construct full thickness masonry wall containing all components required for finished construction.
1. Mockup Size: See drawings.
2. Demonstrate the following:
a. Supporting structure, including backup wythe, studs, sheathing, and air barrier.
b. Face wythe, including color, texture, coursing, and blending of masonry unis.
c. Tooled mortar joints.
d. Sealant-filled joints.
e. Flashing, weep vents, mortar trap, and drainage material.
f. Sills and Wall Caps.

g. Inside corner and Outside corner.

3. Utilize stepped back technique, exposing each layer of construction.
4. Approved mockup establishes work results standard.
5. Remove mock up when Architect directs.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
1. Masonry Units: Store elevated above grade, protected from precipitation and stormwater runoff. Do not use wet units.
2. Mortar and Grout: Store elevated above grade, protected from moisture. Do not use materials that have become damp.

1.7 FIELD CONDITIONS

A. Cold Weather: TMS 602.
1. Do not use frozen or frost damaged materials.

B. Hot Weather: TMS 602.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. CMUs, CMU-2: ASTM C90.
1. Manufacturer and Product:
a. Nitterhouse Masonry Products; Recycled Concrete Brick.
b. Comparable product submitted and accepted prior to bidding.
2. Net Area CMU Compressive Strength: 2000 psi, minimum.
3. Density Classification: Normal weight.
4. Nominal Size: 8 inches high by 16 inches long; widths shown on Drawings.

B. Shapes: See Drawings.
1. Special Shapes: For lintels, corners, jambs, sashes, movement joints, headers, and bonding conditions.
2. Outside Corners: See Drawings.

2.2 DECORATIVE CONCRETE MASONRY UNITS

A. Decorative CMUs, CMU-1: ASTM C90.
1. Manufacturers and Products:
a. Nitterhouse Masonry Products; Polished Face Block, Color A-13.
b. Comparable product submitted and accepted prior to bidding.
2. Net Area CMU Compressive Strength: 2000 psi, minimum.
3. Density Classification: Normal weight.
4. Nominal Size: 8 inches high by 16 inches long, widths shown on Drawings.

5. Textures and Patterns: Polished face.
6. Colors: Architect selected.

2.3 CONCRETE AND MASONRY LINTELS

A. Masonry Lintels:
1. Masonry Lintels: Field-built or prefabricated reinforced, grouted, bond beam CMUs.
2. Compressive Strength: Same as CMUs, minimum.

2.4 BRICK

A. Solid Face Brick: ASTM C216.
1. Manufacturers and Products:
a. MV-B1A and MV-B1B: Belden Brick; 470-479 Light Range Smooth, Buff.
b. MV-B2A and MV-B2B: Belden Brick; Cloud Crimson Ironspot Smooth.
2. Grade: SW.
3. Type: FBS.
4. Actual Brick Size: 3-5/8 inch width by 1-5/8 inch height by 11-5/8 inch length, Roman Size.
5. Special Shapes: Exposed surfaces matching faces; shapes shown on Drawings.
6. Color: Architect selected.

2.5 MORTAR AND GROUT

A. Portland Cement: ASTM C150/C150M, Type I or Type II.
1. Cold Weather Applications: Type III.
2. Color: White.

B. Hydrated Lime: ASTM C207, Type S.

C. Packaged Mortar Mix: Factory blend of portland cement and hydrated lime.

D. Masonry Cement: ASTM C91.
1. Manufacturers:
a. Holcim, Inc.
b. Lafarge North America.
c. Lehigh Cement Company.
d. National Cement Company, Inc.

E. Mortar Cement: ASTM C1329.
1. Manufacturers:
a. Lafarge North America.
b. Or approved equal.

F. Colored Mortar: Provide packaged colored mortar blend.
1. Mortar Pigments: ASTM C979, products formulated for masonry mortar.

2. Colored Mortar Blend: Packaged pre-colored blend of portland cement and hydrated lime with blended aggregate.
3. Colored Mortar Blend Manufacturers and Products:
   a. Amerimix AMX 405C.
   b. Glen-Gery Color Mortar Blend.
   c. Spec Mix Colored Mortar.
   d. WORKRITE Colored Portland Cement & Lime.
4. Color: Architect selected.

G. Grout Aggregate: ASTM C404, fine.

H. Cold Weather Admixture: Accelerating. ASTM C1384, Type C, nonchloride, noncorrosive.
1. Manufacturers and Products:
   a. Euclid Chemical ACCELGUARD 80.
   b. Master Builders Solutions MasterSet AC534.
   c. GCP Applied Technologies MORSET.

I. Water: Potable, free of substances that cause discoloration or adversely affect mortar setting or strength.

J. Mortar Mixes:
1. Mortar: Portland cement-lime mortar, ASTM C270, Proportion Specification.
2. Mortar Compressive Strength:
   a. Structural Masonry: Mortar type required to provide masonry compressive strength shown on Drawings.
   b. Below Grade Masonry: Type S.
   c. Reinforced Masonry: Type S.
   d. Non-Load-Bearing Walls: Type N.
   e. Non-Load-Bearing Partitions: Type N.
3. Admixtures: Containing no calcium chloride.

K. Grout Mixes:
1. Masonry Grout: ASTM C476 and TMS 602, Table 1.15.1 for grout space and pour height dimensions.
2. Grout Compressive Strength: Match wall F'm compressive strength.
3. Slump: 10 to 11 inches per ASTM C143/C143M.

2.6 STEEL MATERIALS

A. Steel Wire: ASTM A1064/A1064M, hot-dip galvanized per ASTM A153/A153M.

B. Steel Sheet: ASTM A1008/A1008M, Commercial Steel, hot-dip galvanized per ASTM A153/A153M.

C. Steel Plates, Shapes, and Bars: ASTM A36/A36M, hot-dip galvanized per ASTM A153/A153M.

D. Steel Anchors: ASTM B633 Class Fe/Zn 5 minimum, zinc-plated steel.

E. Stainless Steel Wire: ASTM A580/A580M, Type 304 or Type 316.

F. Stainless Steel Sheet: ASTM A666, Type 304 or Type 316.

G. Stainless Steel Anchors: ASTM F593 and ASTM F594, Alloy Group 1.

2.7 REINFORCING STEEL

A. Reinforcing Steel: ASTM A615/A615M, 60 ksi, deformed billet bars, galvanized finish.

B. Rebar Positioners: Preformed galvanized or stainless steel wire positioned in mortar beds to support reinforcing steel.
   1. Manufacturers and Products:
      a. Heckmann Building Products 376.
      b. Hohman & Barnard RB Series.
      c. Wire-Bond O-Ring Series.

2.8 JOINT REINFORCEMENT

A. Joint Reinforcement: ASTM A951/A951M.
   1. Interior Walls: Hot-dip galvanized, carbon steel.
   2. Exterior Walls: Hot-dip galvanized or Stainless steel.
   3. Side Rod Wires: 0.187 inch diameter.
   4. Cross Rod Wires: 0.187 inch diameter.
   5. Length: 10 feet, minimum.
   6. Corners and Tees: Prefabricated.

B. Single Wythe Masonry Joint Reinforcement: Ladder type.
   1. Manufacturers and Products:
      a. Heckmann Building Products #1100.
      b. Hohmann & Barnard 220 Ladder Mesh.
      c. Wire-Bond Ladder 2 Wire.

C. Cavity Wall Joint Reinforcement:
   1. Ladder type, with adjustable height ties projecting into face wythe, pintle and eye connection to backup wythe.
   2. Manufacturers and Products:
      a. Hohmann & Barnard 270 Ladder Eye-Wire.
      b. Wire-Bond Ladder Hook & Eye.

2.9 VENEER ANCHORS

A. Veneer Anchors - General: Resist tension and compression forces perpendicular to wall plane.
   1. Performance: Withstand 100-lbf tension and compression loads without deforming.

2. Veneer Tie Size: Extend to outer half of veneer, over 5/8 inch from outside face.
3. Seismic Support: Continuous steel wires clipped to each veneer tie.
    a. Clip: Reinforcing manufacturer standard product.

B. Steel Studs and Sheathing Attachment: Mounted behind insulation.
1. Screw-Attached Anchors: Vertically oriented L shaped anchors and trapezoidal wire ties, stainless steel.
    a. Manufacturers and Products:
        1) Hohmann & Barnard BL 407.
        2) PROSOCO Veneer-Tie.
        3) Wire-Bond 2407.
    b. Insulation Washers: Anchor manufacturer plastic wedge shaped insulation anchors.
        1) Hohmann & Barnard Blok-Lok Wedge-Lok.

2.10 WALL ANCHORS

A. Structural Steel Attachment: Hot-dip galvanized steel Wire weld on anchors and wire ties.
1. Crimped Wire Anchors: 1/4 inch diameter continuous wires.
2. Ties: Wires fabricated to size of masonry being anchored.

B. Concrete Attachment: Cast in slot and dovetail anchor ties.
1. Slot: Hot-dip galvanized steel sheet, 0.034 inch thickness; with flexible foam filler.
2. Ties: Hot-dip galvanized steel trapezoidal wires with dovetail triangle tabs.
    a. Manufacturers and Products:
        1) Heckmann Building Products #103 Dovetail Triangular Anchor.
        2) Hohmann & Barnard 315 - Flexible Dovetail Brick Tie.
        3) Wire-Bond Dovetail Triangular Tie 2102.

C. Wall-Top Anchors: Steel bracing, see structural drawings.

D. Anchor Bolts: ASTM A307 Grade A, L-shaped hot-dip galvanized steel bolts with hex nuts and flat washers.

E. Anchorage Devices: Expansion anchors or chemical anchors.
1. Interior Locations: Stainless steel.
2. Exterior Locations: Stainless Steel.

2.11 SHEET METAL FLASHING

A. Stainless Steel Flashing:
1. Stainless Steel Sheet: ASTM A240, Type 304, 0.016 inch thick.
2. Solder: ASTM B32, Grade Sn60, flashing manufacturer recommended type.

B. Flashing Fabrication: Cut and form flashing as shown on Drawings. and as follows:
   1. End Dams: Extend flashing 6 inches minimum beyond lintels and turn up 2 inches minimum.
   2. Drip Edges: Extend flashing through veneer, turn down 45 degrees and hem edge.
   3. Cavity Wall Flashing: Extend flashing through outer wythe, across cavity, and turn up 8 inches minimum onto inner wythe.

2.12 FLEXIBLE FLASHING

A. Self Adhering Stainless Steel Laminated Flashing: Stainless steel sheet, factory applied adhesive with release sheet.
   1. Manufacturers and Products:
      a. Hohmann & Barnard Mighty-Flash SA.
      b. STS Coatings Wall Guardian Self Adhering Stainless Steel Flashing.
      c. TK Products, Inc TK-SS FLASHING.
      d. York Manufacturing York 304.
   2. Stainless Steel: ASTM A240, Type 304.

B. Self-Adhering Stainless Steel Drainage Flashing: Stainless steel sheet laminated to drainage fabric on one side and factory applied adhesive with release sheet on the other side.
   1. Manufacturers and Products:
      a. York Manufacturing York Flash Vent SA.

C. Flashing Accessories: Flashing manufacturer products required for complete installation:
   1. Termination Bars: Stainless Steel.
   2. Preformed corners, end dams, special shapes, and seaming materials.
   3. Adhesives and primers.

2.13 CAVITY WALL ACCESSORIES

A. Cellular Plastic Weep Vents: Flexible plastic extrusions.
   1. Manufacturers and Products:
      a. Advanced Building Products Mortar Maze Weep Vent.
      b. Heckmann Building Products No 85 Cell Vent.
      c. Hohmann & Barnard Quadro-Vent.
      d. Wire-Bond Cell Vent.
   2. Size: Full head joint height and depth.
   3. Color: Architect selected.

B. Cavity Drainage Material: Mesh panels, base of wall system to catch mortar droppings.
   1. Manufacturers and Products:
      a. Advanced Building Products Mortar Break.
      b. Hohmann & Barnard Mortar Trap.
      c. Mortar Net USA MortarNet.
      d. York Weep Net.
   2. Depth: Full cavity depth.

2.14 PERFORMANCE

A. Structural Design Criteria: See See Drawings.

B. Structural Loads: See Drawings.

C. Fire Resistance:
1. Masonry assemblies part of fire rated walls tested per ASTM E119.
2. Masonry assemblies part of exterior walls tested per NFPA 285.

2.15 ACCESSORIES

A. Control Joint Gaskets: Rubber or Neoprene material. Furnish with corner and tee accessories, heat and cement fused joints.

B. Compressible Filler: Closed cell polyurethane and rubber; oversized 50 percent to joint width; self expanding.

C. Masonry Cleaners:
1. Non-acidic, not harmful to masonry work or adjacent materials, recommended by masonry unit manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify field conditions are acceptable and are ready to receive Work.
1. Verify foundations are within specified tolerances.
2. Verify reinforcing is properly placed.
3. Verify rough-in for piping and electrical systems are properly placed.

3.2 PREPARATION

A. Coordinate placement of anchors provided under other Sections.

3.3 INSTALLATION - GENERAL

A. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

B. Use full size units unless cutting is unavoidable. Cut units to provide clean, sharp, unchipped edges. Conceal cut edges wherever possible.

C. Blending Exposed Masonry: Mix units to produce uniform blend of colors and textures.

D. Protection During Installation: Cover open masonry walls, projections, and sills when Work is not in progress, utilize waterproof membrane.
   1. Extend protection 24 inches, minimum, on both sides of wall.

E. Stain Prevention: Immediately remove mortar and soil.
   1. Protect in place construction from mortar droppings.
   2. Protect walls from rain water splashing up from ground or scaffold.

3.4 CONCRETE MASONRY UNITS

A. Coursing:
   1. Bond: See Drawings.
   2. Mortar Joints: Concave except cut joints flush where shown on Drawings and resilient base is scheduled.

B. Joint Reinforcement Placement:
   1. 16 inch intervals.
   2. First and second course below top of walls.
   3. Above and Below Openings: Installed in first and second courses, 16 inches minimum each side of opening.
   4. Interrupt joint reinforcement at control and expansion joints.
   5. Corners and Intersections: Reinforced with prefabricated units.

C. Reinforcement and Grouting: Follow TMS 602.
   1. Grouted Components: See Drawings.
      a. Support and secure reinforcing bars from displacement.
      b. Place and consolidate grout fill without displacing reinforcing.
      c. At bearing locations, fill masonry cores with grout for minimum 12 inches both sides of opening.
   2. Grout Pour Height: 60 inches, maximum.

D. Isolation from Structure:
   1. Isolate masonry partitions from vertical structural framing members with movement joint shown on Drawings.
   2. Isolate top of masonry from horizontal structural framing members and slabs or decks with compressible joint filler.

3.5 CAVITY WALLS

A. Concrete Masonry Facing Units:
   1. Bond: See Drawings.
   2. Mortar Joints: Concave except cut joints flush where shown on Drawings and resilient base is scheduled.

B. Brick Units:
   1. Bond: Lay exposed units in bond shown on Drawings.

2. Mortar Joints: Tool to concave profile shown on Drawings.

C. Cavity Wall Bonding System: Method shown on Drawings.
1. Provide adjustable two-piece reinforcement spaced 16 inches horizontally and 16 inches vertically.

D. Air Barrier: Apply to backup wythe per Section 072700.

E. Cavity Wall Insulation: Section 072100; fit insulation between wall ties and other obstructions.

3.6 MASONRY VENEER

A. Facing Units:
1. Bond: Lay exposed units in bond shown on Drawings.
2. Mortar Joints: Tool to concave profile shown on Drawings.

B. Anchoring: Anchor masonry veneers to wall framing and backup construction.
1. Anchor Spacing:
a. Space anchors 16 inches horizontally and 16 inches vertically.

3.7 CONTROL AND EXPANSION JOINTS

A. Control Joints in CMU: One of the following methods:
1. Preformed control joint gaskets designed to fit standard block.
2. Interlocking units designed for control joints with bond-breaker strips at joint. Rake out head joints for application of sealant.
a. Apply sealant to open joints.

B. Expansion Joints in Brick: One of the following methods:
1. Preformed factory fabricated fillers built into masonry.
2. Compressible joint fillers built into masonry.
a. Apply sealant to open joints.

3.8 FLASHING, WEEPS, AND DRAINAGE

A. Install flashing in the following locations to effectively drain water from wall cavities.
1. Where shown on Drawings.
2. At obstructions to downward flow of water in wall.

B. Rigid Sheet Metal Flashing:
1. Extend flashing horizontally through outer wythe, extend out beyond face and turn down and hem to form continuous drip edge.
2. Turn flashing up inner wythe or backup construction, 8 inches minimum and secure in termination bar.

C. Flexible Flashing:
1. Install metal drip edges at exterior face of wall.

2. Install flexible flashing 1/2 inch back from outside face of exterior wall.
3. Turn flashing up inner wythe or backup construction, 8 inches minimum and fully adhere to substrate.

D. Weep Vents: Full depth of head joints. Install where shown on Drawings and above flashing and below obstructions to upward flow of air in wall.
1. Weep Vent Spacing: 24 inch centers.

E. Cavity Drainage Material: Place in cavities to maximize drainage.

3.9 LINTELS

A. Install loose steel and bond beam masonry lintels over openings.

B. Bearing: 8 inches each side, minimum.

3.10 FIELD QUALITY CONTROL

A. Testing and Inspecting: Engage inspectors to perform tests and inspections and prepare reports. Allow inspectors access to Work areas.
1. Failed Test Retest Cost: Contractor responsibility.
2. Do not begin construction until inspectors have verified compliance of materials.
3. Do not use materials that fail tests and inspections.

B. Testing Frequency: One test for each 5000 sq ft of wall area.

C. Special Inspections: TMS 402, Level C.

D. Clay Masonry Compressive Strength Test: ASTM C67.

E. CMU Compressive Strength Test: ASTM C140.

F. Mortar Tests: Test each mix provided per ASTM C780 to determine the following:
1. Mortar Aggregate Ratio.
2. Air Content.
3. Consistency.
4. Board life.

G. Grout Compressive Strength Test: ASTM C1019.

H. Non-Conforming Work: Make corrections or replace, and re-test.

3.11 REPAIRING AND POINTING

A. Repairing and Replacing:
1. Remove and replace chipped, broken, or stained units.
2. Remove and replace units that do not match adjacent units.

3. Set replacement units in fresh mortar; point to eliminate evidence of replacement.

B. Pointing: Enlarge voids and holes and fill with mortar. Point joints to provide neat, uniform appearance.

3.12 CLEANING

A. In Progress Cleaning: Dry brush to remove excess mortar before tooling joints.

B. Final Cleaning: Clean exposed masonry as follows:
1. Allow mortar to set and cure.
2. Scrape to remove excess mortar.
3. Clean brick by bucket-and-brush hand-cleaning method per BIA Technical Note 20.

C. Stone Cleaning: Clean according to Building Stone Institute "Dimensional Stone Design Manual."

END OF SECTION

SECTION 051200

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural-steel materials.
2. Shrinkage-resistant grout.

B. Related Requirements:

1. Section 053100 "Steel Decking" for field installation of shear stud connectors through deck.
2. Section 055000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications and other steel items not defined as structural steel.
3. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" and Section 099600 "High-Performance Coatings" for painting requirements.

1.2 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.

C. Demand-Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the seismic-load-resisting system and which are indicated as "demand critical" or "seismic critical" on Drawings.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Anchor rods.
4. Threaded rods.
5. Shop primer.
6. Galvanized-steel primer.
7. Etching cleaner.
8. Galvanized repair paint.
9. Shrinkage-resistant grout.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
5. Identify members and connections of the seismic-load-resisting system.
6. Indicate locations and dimensions of protected zones.
7. Identify demand-critical welds.
8. Identify members not to be shop primed.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide in accordance with AWS D1.1/D1.1M for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand-critical welds.

D. Delegated Design Submittal: For structural-steel connections indicated on Drawings to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installer, fabricator, shop-painting applicators, professional engineer and testing agency.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural-steel materials, including chemical and physical properties.

E. Product Test Reports: For the following:

1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength, bolt-nut-washer assemblies.

F. Survey of existing conditions.

G. Source quality-control reports.

H. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).

B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

C. Shop-Painting Applicator Qualifications: Qualified in accordance with AISC's Sophisticated Paint Endorsement P3 or to SSPC-QP 3.

D. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

1. Welders and welding operators performing work on bottom-flange, demand-critical welds are to pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G are to be considered separate processes for welding personnel qualification.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303.
2. ANSI/AISC 341.
3. ANSI/AISC 360.
4. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

B. Connection Design Information:

1. Option 3 and 3B: Design connections and final configuration of member reinforcement at connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer.

a. Use Allowable Stress Design; data are given at service-load level.

C. Moment Connections: Type FR, fully restrained.

D. Construction: Moment frame.

2.2 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A992/A992M.

B. Channels and Angles: ASTM A36/A36M.

C. Plate and Bar: ASTM A36/A36M.

D. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade C structural tubing.

E. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with plain finish.

B. Zinc-Coated High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating.
2. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with mechanically deposited zinc coating finish.

C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, heavy-hex head assemblies, consisting of steel structural bolts with splined ends; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

1. Finish: Plain or Mechanically deposited zinc coating.

2.4 RODS

A. Headed Anchor Rods: ASTM F1554, Grade 55, weldable, straight.

1. Nuts: ASTM A563 heavy-hex carbon steel.
2. Plate Washers: ASTM A36/A36M carbon steel.
3. Washers: ASTM F436, Type 1, hardened carbon steel.
4. Finish: Plain or Hot-dip zinc coating, ASTM A153/A153M, Class C.

B. Threaded Rods: ASTM A193/A193M, Grade B7.

1. Nuts: ASTM A63 heavy-hex carbon steel.
2. Washers: ASTM F436, Type 1, hardened carbon steel.
3. Finish: Plain or Hot-dip zinc coating, ASTM A153/A153M, Class C.

2.5 PRIMER

A. Steel Primer:
   1. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

B. Galvanized-Steel Primer: MPI#26.

   1. Etching Cleaner: MPI#25, for galvanized steel.
   2. Galvanizing Repair Paint: ASTM A780/A780M.

2.6 SHRINKAGE-RESISTANT GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.7 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

   1. Camber structural-steel members where indicated.
   2. Fabricate beams with rolling camber up.
   3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
   4. Mark and match-mark materials for field assembly.
   5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

   1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill,or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 3.

F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

   1. Cut, drill, or punch holes perpendicular to steel surfaces.

2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.8 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

2.9 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.

1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.10 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces unless indicated to be painted.
6. Corrosion-resisting (weathering) steel surfaces.
7. Surfaces enclosed in interior construction.

B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:

1. SSPC-SP 2.
2. SSPC-SP 3.
3. SSPC-SP 7 (WAB)/NACE WAB-4.
4. SSPC-SP 14 (WAB)/NACE WAB-8.
5. SSPC-SP 11.
6. SSPC-SP 6 (WAB)/NACE WAB-3.
7. SSPC-SP 10 (WAB)/NACE WAB-2.
8. SSPC-SP 5 (WAB)/NACE WAB-1.
9. SSPC-SP 8.

C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner or in accordance with SSPC-SP 16.

D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.11 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.

1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
2. Bolted Connections: Inspect and test shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

    a. Liquid Penetrant Inspection: ASTM E165/E165M.
    b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
    c. Ultrasonic Inspection: ASTM E164.
    d. Radiographic Inspection: ASTM E94/E94M.

4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:

    a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear stud connector.

b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear stud connectors if weld fracture occurs on shear stud connectors already tested.

5. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.

1. Do not remove temporary shoring supporting composite deck construction and structural-steel framing until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Baseplates, Bearing Plates, and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.

4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

3.5 REPAIR

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.

B. Touchup Painting:

1. Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

    a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

2. Cleaning and touchup painting are specified in Section 099113 "Exterior Painting," Section 099123 "Interior Painting," or Section 099600 "High-Performance Coatings."

C. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

3.6 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

1. Bolted Connections: Inspect and test bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.

    a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

        1) Liquid Penetrant Inspection: ASTM E165/E165M.
        2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
        3) Ultrasonic Inspection: ASTM E164.
        4) Radiographic Inspection: ASTM E94/E94M.

END OF SECTION 051200

SECTION 053100

STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof deck.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
3. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Roof deck.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Test and Evaluation Reports:

1. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

a. Power-actuated mechanical fasteners.

2. Research Reports: For steel deck, from ICC-ES showing compliance with the building code.

D. Field Quality-Control Submittals:

1. Field quality-control reports.

E. Qualification Statements: For welding personnel and testing agency.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with SDI QA/QC and the following welding codes:

1. AWS D1.1/D1.1M.
2. AWS D1.3/D1.3M.

B. Electrical Raceway Units: Provide UL-labeled cellular floor-deck units complying with UL 209 and listed in UL's "Electrical Construction Equipment Directory" for use with standard header ducts and outlets for electrical distribution systems.

C. FM Approvals' RoofNav Listing: Provide steel roof deck evaluated by FM Approvals and listed in its "RoofNav" for Class 1 fire rating and Class 1-90 windstorm ratings. Identify materials with FM Approvals Certification markings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store products in accordance with SDI MOC3. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck in accordance with AISI S100.

B. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from listings of another qualified testing agency.

2.2 ROOF DECK

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Canam Buildings US Inc.; Canam Group Inc.
2. Epic Metals Corporation.
3. Vulcraft Group; Division of Nucor Corp.

B. Fabrication of Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with SDI RD and with the following:

1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, G90 zinc coating.
2. Deck Profile: As indicated.
3. Profile Depth: As indicated.
4. Design Uncoated-Steel Thickness: As indicated.
5. Span Condition: Triple span or more.
6. Side Laps: Overlapped.

2.3 ACCESSORIES

A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI standards for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0747 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

J. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

K. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

L. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch-wide flanges and level recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.

M. Galvanizing Repair Paint: ASTM A780/A780M.

N. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories in accordance with SDI C, SDI NC, and SDI RD, as applicable; manufacturer's written instructions; and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install in accordance with deck manufacturer's written instructions.

J. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

3.3 INSTALLATION OF ROOF DECK

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: 3/4 inch, nominal.
2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches apart in Zone 1 and 6 inches apart in Zones 2 and 3, based on roof-area definitions in FM Global Loss Prevention Data Sheet 1-28.
3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 18 inches, and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1-1/2-inch-long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld or mechanically fasten flanges to top of deck. Space welds or mechanical fasteners not more than 12 inches apart with at least one weld or fastener at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels in accordance with deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive in accordance with manufacturer's written instructions to ensure complete closure.

G. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified.

3.4 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint in accordance with ASTM A780/A780M and manufacturer's written instructions.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Special inspections and qualification of welding special inspectors for cold-formed steel floor and roof deck in accordance with quality-assurance inspection requirements of SDI QA/QC.

a. Field welds will be subject to inspection.

2. Steel decking will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 053100

SECTION 055000

METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Miscellaneous steel fabrications.

B. Principal Products:
1. Steel Lintels.
2. Ledge Angles.
3. Miscellaneous steel supports and framing.
4. Supports for operable partitions.
5. Supports for gymnasium equipment and scoreboards.
6. Metal ladders.
7. Metal ships ladders.
8. Metal stair nosings for concrete stairs.
9. Roof screening assembly.

C. Related Requirements.
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 042000: Steel lintel and shelf angle installation.
5. Section 076200: Sheet metal flashing and trim.
6. Section 077200: Roof hatches.
7. Section 116623: Gymnasium equipment.
8. Section 116643: Interior scoreboards.
9. Section 323100: Chain link fencing infill.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting Attendees and Procedures:
1. Conduct meeting one week and one month, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data:
1. Metal nosings for stairs.
2. Manufactured ladders.

3. Ladder safety devices.
4. Manufactured bollards.

B. Shop Drawings: Layouts, details, connections, anchorages.
1. Supports for operable partitions.
2. Supports for overhead doors.
3. Miscellaneous steel supports and framing.
4. Slotted channel framing assemblies.
5. Ladders.
6. Steel lintels.
7. Steel ledge angles.
8. Roof screening assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Delegated Design Submittals: Provide sealed calculations and shop drawings.

B. Research Evaluation Reports: ICC-ES reports for post-installed anchors.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Provide copies of welder certificates as informational submittals if requested by Architect.
1. Steel Fabrications: AWS D1.1.
2. Aluminum Fabrications: AWS D1.2.
3. Stainless Steel Fabrications: AWS D1.6.

B. Mockups and Field Samples: Provide metal fabrications for mockup and field samples assemblies specified in other Sections.

1.6 FIELD CONDITIONS

A. Existing Conditions: Verify field measurements before fabrication. Show field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE

A. Delegate design to fabricator licensed Professional Engineer.
1. Operable partition support framing.
2. Overhead door support framing.
3. Beam and plate lintels.
4. Guard rails.
5. Ladders.
6. Roof screening assembly.

B. Structural Design Criteria: See Structural Drawings.

C. Structural Loads: See Structural Drawings.

D. Handrail and Guard Structural Loads:
   1. Top Rail and Top of Guard: 50 psf, uniform and 200 lbf concentrated, both omnidirectional and non-simultaneous.
   2. Guard Infill: 50 psf, uniform and 200 lbf concentrated, both horizontal and non-simultaneous.

E. Allowable Deflection:
   1. Metal Fabrications: 1/360 of span, maximum.

F. Accessibility Requirements: Applicable provisions in Department of Justice publication 2010 ADA Standards for Accessible Design, ICC/ANSI A117.1, and state accessibility code.

2.2 MATERIALS - STEEL

A. Steel Structural Wide Flange Shapes: ASTM A992.

B. Steel Hollow Structural Sections: ASTM A500, Grade B.

C. Other Steel Structural Shapes: ASTM A36.

D. Steel Plates: ASTM A36 or A572, Grade 50.

E. Steel Pipe: ASTM A53, Grade B.

F. Steel Sheet: ASTM A653, Grade 33 Structural Quality, G90 galvanizing.

G. Steel Bolts: ASTM A307, Grade A or B or ASTM F3125, Type 1, Grade A325, heavy hex style.
   1. Finish: Hot-dip galvanized.

H. Steel Nuts: ASTM A563, types appropriate for bolts.
   1. Finish: Hot-dip galvanized.

I. Welding Materials: AWS D1.1, types as required for materials being welded.

2.3 MATERIALS - STAINLESS STEEL

A. Stainless Steel Bars and Shapes: ASTM A276, Type 304 or 316.

B. Stainless Steel Tubing: ASTM A269 or ASTM A554, Type 304 or 316.

C. Stainless Steel Pipe: ASTM A312, seamless, Type 304 or 316.

D. Stainless Steel Plate, Sheet, and Strip: ASTM A240 or A666, Type 304 or 316.

E. Stainless Steel Bolts, Nuts, and Washers: ASTM A354.

F. Welding Materials: ASW D1.6, types as required for materials being welded.

2.4 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B221, Alloy 6063, Temper T6.

B. Aluminum Sheet: ASTM B209, Alloy 6063, Temper T6.

C. Aluminum Drawn Seamless Tubes: ASTM B210, Alloy 6063, Temper T6.

D. Aluminum Bars: ASTM B211, Alloy 6063, Temper T6.

E. Bolts, Nuts, and Washers for Aluminum Components: Stainless steel, Type 304 or 316.

F. Welding Materials: AWS D1.2, types as required for materials being welded.

2.5 MISCELLANEOUS MATERIALS

A. Post-Installed Anchors: Torque-controlled expansion or chemical anchors.
   1. Material: Stainless steel.

B. Concrete Embedment Anchors: Wedge type for adjustable bolt location; malleable iron or cast steel. Supply bolts, washers, and shims with ASTM F2329 hot-dip galvanized finish.

C. Shop Primer: primer specified in Section 099000.

D. Zinc Rich Primer: SSPC Paint 20, Type I Inorganic.

E. Separation Coating: Bituminous paint; SSPC-Paint 12.

F. Stair Nosings: Cast iron.
   1. Manufacturers:
      a. Balco.
      b. Wooster Products.
      c. Nystrom.
   2. Length: Tread width minus 4 inches.
   3. Configuration: Recessed strips.
   4. Color: Architect selected.

2.6 FABRICATION - GENERAL

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Seal joined members by continuous welds.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to uniform small radius.

E. Exposed Welded Joints: NOMMA Guideline 1 Joint Finish 1.

F. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

G. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

H. Tolerances:
   1. Squareness: 1/8 inch maximum difference in diagonal measurements.
   2. Face Offset: 1/16 inch, maximum.
   3. Misalignment of Adjacent Members: 1/16 inch, maximum.
   4. Bow: 1/8 inch in 48 inches, maximum.
   5. Plane: 1/8 inch deviation in 48 inches, maximum.

2.7 FABRICATION - LINTELS AND LEDGE ANGLES

A. Loose Steel Lintels: Steel sections, size and configuration shown on Drawings, length for minimum 8 inch bearing on both sides of opening.

B. Ledge Angles: Steel sections, size and configuration shown on Drawings; shop-drilled fastener holes. Fabricate for 1/4 inch gap between units.

C. Built-Up Lintel Assemblies: Steel structural sections and plate shown on Drawings.

D. Finishes:
   1. Exterior Walls: Galvanized.
   2. Interior Walls: Shop primer.

2.8 FABRICATION - LADDERS

A. Contractor Option: Provide manufactured or shop-fabricated ladders.

B. Manufactured Ladders: Steel OSHA 1926.1053.
   1. Manufacturers:
      a. O'Keefe's, Inc.
      b. Alaco Ladder Company.
      c. Cotterman.
      d. EGA Products, Inc.
      e. McMaster-Carr.
      f. Platforms & Ladders.

2. Side Rails: Steel plates.
3. Rungs: 1 inch steel bars spaced 12 inches on center.
4. Steel Finish: Hot-dip galvanized.
5. Fall Protection: OSHA-compliant self-retracting lifeline system.

C. Fabricated Vertical Ladders: ANSI ASC A14.3, steel welded construction. Provide bottom and wall attachment angles spaced maximum 5 ft o/c.
1. Side Rails: 3/8 by 2 inches spaced 16 inches.
2. Rungs: One inch steel bars let into side rails and spaced 12 inches on center.
3. Exterior Ladders: Hot-dip galvanized.
4. Interior Ladders: Shop primer.
5. Fall Protection: OSHA-compliant self-retracting lifeline system for ladders with 24 foot or greater climb length.

D. Ladder Security Enclosures: Steel frame with expanded metal panel, and with continuous steel hinge and steel hasp for padlocking in closed and open positions. Size panel to prevent unauthorized ladder access.
1. Finish: Match ladders.

2.9 FABRICATION - DOWNSPOUT BOOTS

A. Downspout Boots: Contoured interior flow design with no boxed corners, weld seams or choke points; include integral lug slots and stainless steel fasteners.
1. Manufacturers:
a. J. R. Hoe.
b. Neenah Enterprises, Inc.
c. Zurn.
2. Configuration: 90 degree.
3. Size: See Drawings.
4. Material: Cast iron.
5. Finish: Factory powder coat.
a. Color: Architect selected.
6. Accessories:
a. Manufacturers standard stainless steel fasteners for mounting onto building wall.
b. Flexible rubber adapter for connection to drainage pipe.

2.10 FABRICATION - MISCELLANEOUS STRUCTURAL SUPPORTS

A. Delegated Design: Provide supports fabricated from structural steel shapes coordinated with supported item manufacturer anchorage requirements and building structure.

B. Operable Partition Supports: Continuous steel beam supported and braced by angles; shop primer finish.

C. Other Supports: Structural steel sections shown on Drawings and to support applied loads; shop primer finish.

2.11 FABRICATION - ROOF SCREENING ASSEMBLY

A. Roof Screening Assembly:
   1. Description: Primary structural steel framing and secondary chain link fencing infill.
   2. Structural Steel Framing: See Structural Notes and Drawings.
      a. Galvanize all exterior structural steel framing.
      b. Provide and design attachments to building structure.
   3. Chain Link Fencing Infill: See Section 323100.
      a. Provide horizontal infill fencing designed for exterior loads indicated on Structural Drawings for roofing and exterior horizontal panels.
      b. Provide and design attachments to structural steel supports.

2.12 STEEL FINISHES

A. Prepare surfaces to be primed per SSPC SP 2.

B. Clean surfaces of rust, scale, grease, and foreign matter before finishing.

C. Do not prime surfaces in direct contact with concrete or where field welding is required.

D. Prime paint items in fabrication shop with two coats except where galvanizing is specified.

E. Galvanizing: ASTM A123; hot-dip galvanize after fabrication.

F. Galvanizing for Fasteners, Connectors, and Anchors:
   1. Hot-Dip Galvanizing: ASTM A153.
   2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

2.13 STAINLESS STEEL FINISHES

A. Stainless Steel: NAAMM AMP 503, Number 4 satin directional polish.

2.14 ALUMINUM FINISHES

A. Anodizing: AAMA 611 Class I or AAMA 612 with electrodeposition organic seal.
   1. Color: Clear.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates for items required to be cast into concrete and embedded in masonry.

C. Apply separation coating to aluminum surfaces contacting dissimilar metals, concrete, and masonry.

3.2 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Separate dissimilar exterior metals with non-absorptive gaskets.

C. Make provisions for erection stresses. Install temporary bracing to maintain alignment, until permanent bracing and attachments are installed.

D. Fasten Work rigidly and securely to supports.

E. Field weld components shown on Drawings and shown on Shop Drawings per AWS D1.1.

F. Obtain Architect approval before site cutting or making unanticipated adjustments.

G. After erection, touch up welds, abrasions, and damaged finishes with prime paint or zinc-rich paint to match shop finishes.

H. Miscellaneous Framing and Supports:
   1. Attach supports rigidly and securely to building structural elements.
   2. Brace overhead support framing to prevent movement of supported items.

3.3 INSTALLATION TOLERANCES

A. Plumb: 1/4 inch deviation maximum, either per story or every 12 ft in height, whichever is greater; non-cumulative.

B. Alignment: 1/8 inch offset deviation, maximum.

C. Position: 1/4 inch deviation, maximum.

3.4 FIELD QUALITY CONTROL

A. Field Tests and Inspections: Engage inspectors to perform tests and inspections and prepare reports. Allow inspectors access to Work areas.
   1. Failed Test Retest Cost: Contractor responsibility.

B. Field Weld Inspection: AWS D1.1.

C. Non-Conforming Work: Make corrections or replace, and retest.

3.5 ADJUSTING

A. Clean and touch up damaged primer paint with same product applied in shop.

END OF SECTION

SECTION 055213

PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Painted steel railings.
2. Stainless steel railings.

B. Principal Products:
1. Painted steel railings.
2. Stainless steel railings.

C. Related Requirements.
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 055100: Metal stairs.
5. Section 099000: Painting and coatings.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting Attendees and Procedures:
1. Conduct meeting one week, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data:
1. Railing system componenets.
2. Handrail brackets.
3. Shop primer.
4. Prefinished Components: Initial selection color charts and samples.

B. Shop Drawings:
1. Railing layout, profiles and sizes, and anchorage details.
2. Railing connections.
3. Anchorage accessories and fasteners.

C. Samples:
1. Railings: 12 inch long shop-finished Sample. Demonstrate bending radius.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates:
   1. Welding qualifications.
   2. Mill certificates, for Type 316 stainless steel.

B. Delegated Design Submittals: Sealed calculations and Shop Drawings.
   1. Guards and infill.
   2. Handrails.

C. Test and Evaluation Reports: Independent testing agency test results showing:
   1. Code compliance of post-installed anchors.

D. Field Quality Control Submittals: Field test and inspection reports.

E. Manufacturer Reports: Field instruction, test, and inspection reports.

F. Qualification Statements: Licensed professionals, Manufacturer, fabricator, installer, and testing agency.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Installer: Fabricator of railings.
   2. Welding: Welders qualified as follows.
      a. Steel Members: AWS D1.1/D1.1M.
      b. Aluminum: AWS D1.2/D1.2M.
      c. Steel Sheet: AWS D1.3/D1.3M.
   3. Licensed Professionals: Engineer experienced in designing railings, licensed in State of Pennsylvania.

1.6 FIELD CONDITIONS

A. Existing Conditions: Verify field measurements before fabricating. Show field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 STEEL RAILINGS

A. Steel Railings:
   1. Rails and Posts: Match existing profiles, See Drawings and field verify.
   2. Guard Infill: See Drawings.
   3. Splice Connectors: Hot-dip galvanized steel, concealed spigots.
   4. Exposed Fasteners: Stainless steel, flush countersunk screws or bolts; consistent with railing design.

5. Anchors: Stainless steel; selected to meet structural performance requirements and substrate conditions.

B. Wall Brackets:
   1. Wall Mounted Brackets: Concealed fastener design.
      a. Material and Finish: Same as railing.
      b. Clearance: 1-1/2 inch gap between handrail and wall surface.

C. Materials:
   1. Tubing: ASTM A513.
   2. Bars, Plates, and Shapes: ASTM A36/A36M.

D. Galvanizing: ASTM A123/A123M; hot-dip after fabrication.

E. Galvanized Steel Finishes: Shop primed.

2.2 STAINLESS STEEL RAILINGS

A. Stainless Steel Railings:
   1. Rails and Posts: Rectangular profiles, See Drawings.
   2. Guard Infill: See Drawings.
   3. Splice Connectors: Stainless steel, fully welded.
   4. Exposed Fasteners: Stainless steel, flush countersunk screws or bolts; consistent with railing design.
   5. Anchors: Stainless steel; selected to meet structural performance requirements and substrate conditions.

B. Wall Brackets:
   1. Wall Mounted Brackets: Concealed fastener design.
      a. Material and Finish: Same as railing.
      b. Clearance: 1-1/2 inch gap between handrail and wall surface.

C. Materials:
   1. Tubing: ASTM A554, Grade MT 304 or MT 316L.
   2. Bars, Plates, Sheets, and Shapes: ASTM A240/A240M or ASTM A666, Type 304 or 316.

D. Stainless Steel Finish: No. 4.

2.3 PERFORMANCE AND DESIGN

A. Delegate railing design to fabricator licensed Professional Engineer.

B. Handrail Structural Design:
   1. Live Loads: 50 plf uniform, 300 lbf concentrated, non-simultaneous.

C. Guard Structural Design:
   1. Top Rail and Top of Guard: 50 plf, uniform and 200 lbf concentrated, both omnidirectional and non-simultaneous.
   2. Guard Infill: 50 psf uniform and 200 lbf concentrated, both horizontal and non-simultaneous.

D. Structural Design Criteria: See Structural Drawings.

E. Allowable Deflection: 1/360, maximum.

F. Accessibility Requirements: Applicable provisions in Department of Justice publication 2010 ADA Standards for Accessible Design, ICC/ANSI A117.1, and state accessibility code.

G. Handrail Continuity: Gripping surfaces uninterrupted by newel posts, structural elements, or obstructions.

H. Guard Infill Design: Openings will not allow 4 inch diameter sphere passage.

2.4 INSTALLATION MATERIALS

A. Welding Rods and Bare Electrodes: Selected per AWS for metal being welded and structural requirements.

B. Bituminous Paint: ASTM D1187 asphalt emulsion.

C. Grout: ASTM C1107, factory-packaged nonmetallic, shrinkage resistant interior and exterior use grout.

D. Embedded Sleeves: Stainless steel tubes; sized to fit posts, 6 inches long, minimum, with closed bottom.

2.5 FABRICATION

A. Factory Assembly: Fit and shop assemble components in largest practical sizes for delivery to site.

B. Fabricate components with joints tightly fitted and secured. Furnish spigots and sleeves to accommodate site assembly and installation.

C. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as railing assembly.

E. Steel Railing Joints and Connections:
   1. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations not encouraging water intrusion.
   2. Interior Components: Continuously seal joined pieces by continuous welds.
   3. Exposed Welded Joints: NOMMA Guideline 1 Joint Finish # 1.

F. Accurately form components to suit stairs and landings, to each other, and to building structure.

G. Accommodate for expansion and contraction of members and building movement without damage to connections or members.

H. Railing Ends: Closed, except when railing returns to within 1/4 inch of wall face.

I. Changes in Direction:
   1. Uniform, without buckling, twisting, deforming or cracking surfaces.
   2. Formed by flush bending or with prefabricated elbow fittings.
   3. Radii: See Drawings.

2.6 STEEL AND IRON FINISHES

A. Shop-Primed, Field-Painted Railings:
   1. Primer Materials: Section 099000.
   2. Galvanized Railings: Fill drain and vent holes not intended as weeps and file smooth.
   3. Galvanizing Repair Paint: Zinc-rich paint; ASTM A780.
   4. Preparation for Priming:
      a. Uncoated Steel: SSPC SP-6/NACE No. 3, Commercial Blast Cleaning.
      b. Galvanized Steel: Thoroughly clean and treat railings with etching cleaner.
   5. Primer Application: SSPC PA-1. Apply primer to all surfaces except those to be field welded or embedded in concrete and masonry.
      a. Apply second coat to surfaces that will be concealed when installed, and to bolts and welds.

B. Shop-Finished Railings:
   1. Primer and Finish Materials: Section 099000.
   2. High-Performance Coating: Section 099000.

2.7 STAINLESS STEEL FINISHES

A. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify concealed blocking and reinforcement is installed and correctly located to receive wall mounted handrails.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates for items required to be cast into concrete, embedded in masonry, and placed in partitions.

3.3 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortions or defects.

B. Anchor posts to structure.
   1. Posts: Preset sleeves in concrete; set posts in sleeves and fill space around posts with grout.
   2. Posts: Core drill concrete; set posts in cored holes and fill space around posts with grout.
   3. Posts: Weld directly to stringers and Weld flanges to posts and anchor flanges to stringers.

C. Attach Railings:
   1. Wall Mounting: Mount with wall brackets and end flanges.
   2. Guardrail Mounting: Weld railing brackets to posts.

D. Field weld anchors as shown on Drawings or Shop Drawings. Grind welds smooth. Touch up welds with primer.

E. Assemble with spigots and sleeves to accommodate tight joints and secure installation.

3.4 FIELD QUALITY CONTROL

A. Field Tests and Inspections: Engage inspectors to perform tests and inspections and prepare reports. Allow inspectors access to Work areas.
   1. Failed Test Retest Cost: Contractor responsibility.
   2. Do not begin construction until inspectors have verified compliance of materials.
   3. Do not use materials that fail tests and inspections.

B. Test Method: ASTM E894 and ASTM E935 on randomly selected representative railing assemblies.

C. Non-Conforming Work: Remove and replace, and retest.

3.5 CLEANING

A. Clean stainless steel with soap and clean water.

B. Primed Steel: Remove substances that may impair finish paint bond.

3.6 REPAIR

A. Apply primer to field welds, bolted connections, and damaged areas of factory applied primer.

B. Apply galvanizing repair paint per ASTM A780 to field welds, bolted connections, and damaged areas of hot-dip galvanized members.

C. Remove scratches and abrasions from stainless steel surfaces by polishing to match factory finish.

3.7 PROTECTION

A. Protect railings during construction period against soiling and damage.

END OF SECTION

SECTION 061053

MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Concealed blocking and nailers.
2. Utility backboards.

B. Principal Products:
1. Fire retardant treated lumber and panels.
2. Preservative treated lumber.

C. Related Requirements.
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 092116: Interior non-structural metal framing.

1.2 REFERENCES

A. Abbreviations and Acronyms:
1. FRTW: Fire retardant treated wood.
2. PTW: Preservative treated wood.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting Attendees and Procedures:
1. Conduct meeting one week, minimum, before starting Work of this Section.

1.4 ACTION SUBMITTALS

A. Product Data:
1. Wood preservative treatment.
2. Fire retardant treatment.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
1. Store lumber indoors, protected from elements.
2. Store lumber elevated above grade, protected from moisture.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lumber: DOC PS 20. Grading rules certified by ALSC Board of Review.
   1. Maximum Moisture Content: 19 percent.

B. Plywood: DOC PS 1, Exterior A-C, fire retardant treated.
   1. Thickness: See Drawings.

C. Fire Retardant by Pressure Process:
   1. Exterior Type: ASTM C2898.
   2. Interior Type A: ASTM D3201, 28 percent maximum moisture content at 92 percent relative humidity.
   3. Surface Burning Characteristics per ASTM E84.
      a. Flame Spread: 25.
      b. Smoke Developed: 50.
   4. Labeling: Testing agency classification.
   5. Kiln dry after treatment.
      a. Lumber: 19 percent maximum moisture content.
      b. Plywood: 15 percent maximum moisture content.
   6. Applications:
      a. Concealed blocking.
      b. Plywood utility backing panels.
      c. Roof blocking.
      d. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.
      e. Items shown on Drawings.

D. Wood Preservative, Pressure Treatment: AWPA U1 Category UC2 and Category UC3b.
   1. ACQ Preservative: Waterborne ammoniacal copper quat preservative.
   2. Applications:
      a. Concrete and Masonry Adjacent: Wood plates, sills, blocking, and furring; Category UC3b.
      b. Items shown on Drawings.
   3. Kiln dry after treatment.
      a. Lumber: 19 percent maximum moisture content.
      b. Plywood: 15 percent maximum moisture content.

2.2 INSTALLATION ACCESSORIES

A. Fasteners and Anchors:
   1. General: Follow requirements for wood member size and type.
      a. All Applications: Type 304 stainless steel.
   2. Nails, Brads, and Staples: ASTM F1667.
   3. Power-Driven Fasteners: NES NER-272.

4. Wood Screws: ASME B18.6.1.
5. Screws for Fastening to Metal Framing:
    a. Cold-Formed Metal Framing: ASTM C954.
    b. Other Metal Framing: ASTM C1002.
6. Anchors:
    a. Toggle bolt type for anchorage to hollow masonry.
    b. Expansion shield and lag bolt type for anchorage to solid masonry or concrete.
    c. Bolt or ballistic fastener for anchorages to steel.

B. Separation Layer: Butyl Rubber flashing sheet membrane.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set members level and plumb, in correct position.

B. Place horizontal members crown side up.

C. Construct curb members of solid wood sections.

D. Space framing and furring 16 inches on center.

E. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.

F. Coordinate curb installation with installation of decking and support of deck openings, roofing vapor retarder, and parapet construction.

G. Fasten plywood backing panels to substrate with fire retardant classification marking exposed to view; coordinate locations with equipment requiring backing panels.

H. Install continuous flexible flashing separator as follows:
    1. ACQ Wood Preservative Treated Lumber: Between wood and metal decking.
    2. Without Preservative Treatment: Between wood and concrete or masonry.

I. Follow AWPA M4 for site applied preservative treatment to cut surfaces of SBX preservative treated lumber.

END OF SECTION

SECTION 061600

SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Gypsum wall sheathing.
   2. Plywood wall sheathing.

B. Principal Products:
   1. Glass-mat gypsum wall sheathing.
   2. Plywood wall sheathing.

C. Related Requirements.
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 054000: Cold formed metal framing.
   5. Section 061053: Miscellaneous rough carpentry.
   6. Section 072700: Air barriers.
   7. Section 074113: Roofing underlayment at metal roofs.
   8. Section 075200: Substrate boards.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting Attendees and Procedures:
   1. Conduct meeting one week, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data: Submit for each product.

1.4 INFORMATIONAL SUBMITTALS

A. Test and Evaluation Reports: Manufacturer and Independent testing agency test results showing:
   1. Fire treated plywood performance.
   2. Preservative treated plywood performance.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
   1. Store sheathing elevated above grade, protected from precipitation and stormwater runoff.

PART 2 - PRODUCTS

2.1 WALL SHEATHING

A. Plywood Wall Sheathing: APA rated Exterior, Structural I.
   1. Span Rating: See Structural Drawings.
   2. Thickness: See Drawings.

B. Glass Mat Faced Gypsum Sheathing: ASTM C1177.
   1. Manufacturers and Products:
      a. CertainTeed Corporation GlasRoc.
      b. G-P Gypsum Dens-Glass Sheathing.
      c. National Gypsum Gold Bond eXP.
      d. USG Corporation Securock.
   2. Thickness: 5/8 inch Type X.

C. Glass Mat Faced Parapet Sheathing: ASTM C1177.
   1. Manufacturers and Products:
      a. G-P Gypsum Dens Deck Prime.
      b. National Gypsum DEXcell FA Glass Mat Roof Board.
      c. USG Corporation Securock Ultra-Light Coated Glass Mat Roof Board.

2.2 SUBFLOORING

A. Plywood Subflooring or Underlayment: DOC PS 1, Exposure I, Structural I, Underlayment panels.
   1. Exposed Face: Fully sanded.
   2. Span Rating: See Structural Drawings.
   3. Thickness: See Drawings.
   4. Edges: Tongue and groove.

B. Underlayment: DOC PS 1, Exterior A-C plywood panels.
   1. Exposed Face: Fully sanded.
   2. Thickness: 3/8 inch.

2.3 PERFORMANCE

A. Structural Design Criteria: See Structural Drawings.

B. Structural Loads: See Structural Drawings.

C. Fire Resistance: ASTM E119 tested assemblies.
   1. See Drawings for fire assembly designs.

2.4 WOOD PRODUCT TREATMENTS

A. Fire Retardant Treated Wood Sheathing:
   1. Surface Burning Characteristics per ASTM E84.
      a. Flame Spread: 25.
      b. Smoke Developed: 50.
   2. Labeling: Testing agency classification.

B. Preservative Treatment: AWPA U1 pressure process.
   1. Indoor: Category UC2.
   2. Exterior: Category UC3b.
   3. Ground Contact: Category UC4a.

2.5 FASTENERS

A. Fasteners, General: Type 304 stainless steel.

B. Screws:
   1. Fastening Sheathing to Cold-Formed Metal Framing: ASTM C954.
      a. Include wafer heads and reamer wings.
   2. Fastening Sheathing to Steel Studs Under 33 Mils: ASTM C1002.

C. Adhesives: Approved for use by sheathing and adhesive manufacturers, per APA AFG 01 or ASTM D3498.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Install sound, undamaged materials.

B. Spacing: Leave expansion space at panel joints and adjacent assemblies as recommended by manufacturer.

3.2 INSTALLATION - WOOD SHEATHING

A. Wall And Roof Sheathing:
   1. Screw panels to wood framing.
      a. Apply glue to framing before fastening sheathing.
   2. Screw panels to metal framing.

B. Subflooring and Underlayment:
   1. Screw panels to wood framing.
   2. Screw panels to metal framing.

3. Finish Floor Underlayment: Fasten in pattern recommended by finish flooring manufacturer.

3.3 INSTALLATION - GYPSUM SHEATHING

A. Install per GA-253.

B. Screw gypsum sheathing to wood framing.

C. Screw gypsum sheathing to metal framing.

D. Install fasteners to bear against panel face. Do not install fasteners through panel face.

3.4 PROTECTION

A. Do not leave panels exposed to moisture. Replace wet panels or allow to dry completely before installing sealants, tape, weather barrier and siding and veneer.

END OF SECTION

SECTION 064000

ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Wood cabinetry, WO-1.
2. Wood cabinet door and drawer faces, WS-1.
3. Display cases.

B. Principal Products:
1. Cabinetry, solid wood, transparent finished.
2. Cabinet hardware.
3. Shop finishing of wood trim and other interior architectural woodwork.
4. Display cases and accessories.

C. Related Requirements.
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 099000: Painting and coating.
5. Section 101100: Visual display surfaces.
6. Section 123600: Countertops and sills.

1.2 REFERENCES

A. Abbreviations and Acronyms:
1. HPDL: High Pressure Decorative Laminate.
2. ABS: Acrylonitrile butadiene styrene.

B. Definitions:
1. Sheen Levels: ASTM D523.
a. Flat: Five gloss units at 60 degrees and 10 gloss units at 85 degrees, maximum.
b. Satin: 20 to 35 gloss units at 60 degrees and 35 gloss units minimum at 85 degrees.
c. Semigloss: 35 to 70 gloss units at 60 degrees.
d. Gloss: 70 gloss units at 60 degrees, minimum.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting Attendees and Procedures:
1. Conduct meeting one month, minimum, before starting Work of this Section.

1.4 ACTION SUBMITTALS

A. Submittals - General: AWI 100.

B. Product Data:
1. Panel products.
2. Adhesives.
3. Manufactured trim profiles and ornamental components.
4. Hardware.
5. Finish materials.
6. Shop primers.
7. Fire retardant treatment.
8. Initial selection color charts and Samples.

C. Shop Drawings:
1. Dimensioned plans and elevations showing architectural woodwork elements locations.
2. Show materials, profiles, assembly methods, joint details, fastening methods, hardware locations and sizes and locations of cutouts and finishes.

D. Samples:
1. Hardware: Each type and finish.
2. Solid wood cabinet panel: Each type and finish.

1.5 INFORMATIONAL SUBMITTALS

A. Woodworker Quality Certificates: AWI Quality Certification Program.

B. Test and Evaluation Reports: Independent testing agency test results showing:
1. Fire-retardant-treated wood performance.

1.6 CLOSEOUT SUBMITTALS

A. AWI Quality Certification Program certificates confirming woodwork, including installation, follows duty level and specified grade requirements.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Spare Parts: Manufacturer recommended parts and quantities.

B. Tools: Manufacturer recommended special tools required to maintain architectural woodwork.

1.8 QUALITY ASSURANCE

A. Qualifications:
1. Fabricator: AWI Quality Certification Program participant.
2. Installer: AWI Quality Certification Program participant.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements: AWI 200.

1.10 FIELD CONDITIONS

A. Ambient Conditions: Perform Work within following limitations.
   1. Building enclosed and environmental systems maintaining design conditions for Owner occupancy.

B. Existing Conditions: Verify field measurements before fabrication. Show field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 WOODWORK GENERAL REQUIREMENTS

A. Quality Standard: Follow AWI Standards for aesthetic and performance grades.

B. Woodwork Grade: Custom.

2.2 WOOD CABINETS - TRANSPARENT FINISH

A. Wood Cabinets General Requirements: ANSI/AWI 0641, Duty Level 3.

B. Aesthetic Grade: Custom.

C. Cabinet Construction: Frameless.

D. Panel Cores: MDF or Solid wood.

E. Door and Drawer Configuration: Flush overlay.
   1. Reveal Dimension: See Drawings.

F. Exposed Wood - Cabinetry Panels, WO-1: HPVA HP-1, Grade A-1.
   1. Species: Hard Maple
   2. Slice: Rotary and Architect selected.
   3. Veneer Matching: Architect selected.
   4. Panel Veneer Matching: Center balance.

G. Exposed Wood - Cabinet Door and Drawer Faces, WS-1:
   1. Species: Hard Maple
   2. Slice: Rift and Architect selected.

H. Semi-Exposed Surfaces Other Than Drawer Bodies: Same as exposed wood.
   1. Edge Banding at WO-1: Wood veneer matching exposed wood.
   2. Edges at WS-1: Solid wood panel edges.

I. Drawer Semi-Exposed Surfaces: Same as exposed wood.
   1. Edge Banding at WO-1: Wood veneer matching exposed wood.
   2. Edges at WS-1: Solid wood panel edges.

J. Drawer Construction: Match cabinet duty level.
   1. Box Material: Solid maple and Veneer core.
      a. Thickness: 3/4 inch, minimum.
   2. Joinery: Join drawer sides, backs, and subfronts with glued dovetail joints.

2.3 CLOSET AND UTILITY SHELVING

A. Grade: Custom.

B. Shelf Material:
   1. Transparent Finish Solid Lumber:
      a. Species: Hard Maple
      b. Slice: Rift and Architect selected.
      c. Exposed Panel Edges: Hardwood.

C. Clothes Rods: Metal, 1-3/8 inch diameter.

D. Mounting Flanges:
   1. Formed satin stainless steel.

2.4 CABINET HARDWARE AND ACCESSORIES

A. General: BHMA A156.9 and ANSI/AWI 0641.

B. Cabinet Hinges: Concealed European self-closing type.
   1. Opening Angle: 110 to 130 degrees.

C. Door Pulls: Manufacturer recommended tab pull type. Architect selected profile.

D. Cabinet Shelf Supports:
   1. Shelf Standards and Brackets: BHMA A156.9, B54102 standards; with shelf brackets, B54112; match cabinet Duty Level.

E. Drawer Slides: BHMA A156.9. Side mounted extending under bottom edge of drawer; with polymer rollers or internal ballbearing system, epoxy-coated steel, full extension type.
   1. Pencil Drawers 3 inches by 24 inches: Grade 1.
   2. Box Drawers 6 inches by 24 inches: Grade 1HD-100.
   3. File Drawers 12 inches by 24 inches: Grade 1HD-100.
   4. Keyboard Slides: Grade 1HD-100.
   5. Trash Bin Slides: Grade 1HD-100.

F. Locks: Provide complete system for each lock, including removable lock core, cylinder body, and strike plates.
   1. Cabinet Door Locks: BHMA A156.11, E07121.
   2. Drawer Locks: BHMA A156.11, E07041.
   3. Provide two keys for each lock.

G. Cabinet Door Locks:
   1. Provide two keys for each lock.

H. Drawer Locks:
   1. Where multiple drawers are indicated in one vertical unit, provide complete gang lock system that locks or unlocks all drawers with one operation. Include cylinder bodies, lock cores, clips, lockbars and retainers.
   2. Provide two keys for each lock.

I. Hardware Finishes: BHMA A156.18.
   1. Exposed Hardware: Architect selected.
   2. Concealed Hardware: Manufacturer standard.

2.5 DISPLAY CASE DOORS AND SHELVING

A. Display Case Swinging Doors:
   1. Manufacturer and Product:
      a. CR Laurence; Series 1301-SM Display Case Door System.
      b. Comparable product submitted and accepted prior to bidding.
   2. System Description: System shall include, but not be limited to: manual-swinging display case doors with top and bottom rails: Rail types shall be square type with top and bottom trim. Furnish as complete units with: locks, strike plate and other accessories necessary for complete and fully-functional installation.
      a. Refer to Section 088000 for glass requirements.
      b. Exposed aluminum surfaces shall have a clear satin anodized finish.

B. Display Case Sliding Doors:
   1. Manufacturer and Product:
      a. CR Laurence; Series 1301-CM Display Case Door System.
      b. Comparable product submitted and accepted prior to bidding.
   2. System Description: System shall include, but not be limited to: manual-sliding display case doors with top and bottom rails: Rail types shall be square type with top and bottom trim. Furnish as complete units with: locks, strike plate and other accessories necessary for complete and fully-functional installation.
      a. Refer to Section 088000 for glass requirements.
      b. Exposed aluminum surfaces shall have a clear satin anodized finish.

C. Display Case Shelf Standards and Brackets:
   1. Manufacturer and Product:
      a. Mockett; SH15 Series, Model SH15C.

b. Comparable product submitted and accepted prior to bidding.

2. Standards/Track: Architect will select from any of the two track (standard) styles. Tracks shall be single slotted type, fabricated from aluminum.
   a. Color: Factory finish in Black as selected by Architect.
3. Brackets: Brackets shall be rectangular shape, 1/4 inch wide and 1-1/4 inch high, similar to EZ Shelf Support Bracket. Bracket lengths shall be 11-11/16 inch, unless another length is indicated on Drawings. Brackets shall be fabricated from aluminum and shall be clear satin finished to match standards/tracks. Provide bracket lengths to suit shelving depths indicated.
   a. Color: Factory finish in Black as selected by Architect.
4. Accessories include, but are not limited to: Manufacturer's standard hold-down brackets, clear rubber bumper supports for glass shelves and fasteners to suit supporting substrate. Fasteners shall be finished to match standards/tracks.
5. Glass Shelves: Refer to Section 088000 for requirements.

2.6 PERFORMANCE

A. Surface Burning Performance: ASTM E84 Class A.
   1. Flame Spread Index: 25, maximum.
   2. Smoke Developed Index: 450, maximum.

B. Accessibility Requirements: Applicable provisions in Department of Justice publication 2010 ADA Standards for Accessible Design, ICC/ANSI A117.1, and state accessibility code.

2.7 MATERIALS

A. Wood Materials, General: AWI 300 for grade specified.

B. Panel Products:
   1. Hardwood Plywood, Veneer Core, and Veneers: ANSI HPVA HP-1.
   2. Medium Density Fiberboard: ANSI A208.2, Grade 130.

C. Interior Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber.

D. High Pressure Decorative Laminate: ISO 4586-3.

E. Thermally Fused Melamine Facing: Panels faced with melamine impregnated decorative paper; NEMA LD3, Grade VGL.

F. Adhesives: Recommended by facing material manufacturers, complying with VOC limitations.

G. Glass: Section 088000.

H. Fasteners: Type, size, and material to suit each application.

2.8 LUMBER AND PANEL MATERIAL TREATMENT

A. Wood Preservative Pressure Treatment:
   1. Exterior Items: AWPA N1.
   2. Interior Items: AWPA U1; Use Category UC2.

B. Fire Retardant Treatment:
   1. Chemically treated and pressure impregnated.
   2. Flame Spread: 25, maximum per ASTM E84.
   3. Label or otherwise identify fire retardant treated material.
   4. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.

2.9 FABRICATION

A. Shop assemble Work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, fabricate materials with ample allowance for cutting. Furnish trim for scribing and site cutting.

C. High-Pressure Decorative Laminate Finished Faces:
   1. Apply HPDL in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; conceal with concealed fasteners.
   2. Apply laminate backing sheet to reverse face of HPDL finished surfaces.

D. Fabrication Tolerances: ANSI/AWI 0641, specified grade.

2.10 FINISHES

A. Shop Priming: Prepare wood and shop prime materials with wood primer specified in Section 099000 Painting and Coating.

B. Shop Finishing - General:
   1. Grade: Premium.
   2. Sand Work smooth and set exposed nails and screws.
   3. Apply wood filler in exposed nail and screw indentations.
   4. Use wood filler matching surrounding surfaces and of types recommended for applied finishes.
   5. Backpriming: Compatible with finish coats; apply two coats to concealed surfaces of paneling and to end grain surfaces.

C. Transparent Finish:
   1. Finish: System 5, conversion varnish.
   2. Stain Color: Architect selected.
   3. Sheen: Semigloss.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with woodwork.

3.2 PREPARATION

A. Surface Preparation: ANSI/AWI 0620.

B. Conditioning:
   1. Acclimate products to installation environment per AWI 200 and ANSI/AWI 0620.

3.3 INSTALLATION - GENERAL

A. Follow ANSI/AWI 0620.

B. Installation Grade: Same as item being installed.

3.4 INSTALLATION

A. Install woodwork plumb and level.

B. Scribe Work abutting other components. Gaps per ANSI/AWI 0620, specified aesthetic grade. Do not use additional overlay trim to conceal larger gaps.

C. Install trim with adhesive and fine, finishing nails.

D. Cabinets:
   1. Anchor wall cabinets per ANSI/AWI 0641, specified duty level.
   2. Secure cabinets to floor using appropriate angles and anchorages.
   3. Install finish hardware not installed in shop.

E. Display Case Doors and Shelving:
   1. Install units plumb and level in strict accordance with manufacturer's written instructions.
   2. Check doors for proper operation and adjust as necessary.
   3. Install shelf hanging systems to configurations indicated and in accordance with manufacturer written instructions.

F. Site Finishing: Section 099000.

3.5 ADJUSTING

A. Test installed Work for rigidity and ability to support loads.

B. Lubricate and adjust hardware so doors and drawers operate smoothly.

3.6 CLEANING

A. Cleaning: Clean exposed and semi-exposed surfaces of woodwork.

B. Touch up shop-applied finishes. Replace damaged items that cannot be repaired.

3.7 PROTECTION

A. Protection: Protect installed woodwork from damage due to subsequent construction operations.

END OF SECTION

SECTION 070150.19

PREPARATION FOR RE-ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Partial tear-off of roof areas indicated to be repaired.

B. Principal Products:
1. Temporary protection materials.

C. Related Requirements:
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 075200: Modified bituminous membrane roofing.
5. Section 076200: Sheet metal flashing and trim.

1.2 REFERENCES

A. Definitions:
1. Roofing Terminology: Per ASTM D1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual".
2. Partial Roof Tear-Off: Removal of selected components and accessories from existing roofing system. Where indicated by repairs required, or where required by unit price when selected by Architect and Owner.
a. Remove loose aggregate and re-seal/repair all loose felts, cracks and blisters prior to repairs as noted on drawings.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting Attendees and Procedures:
1. Conduct meeting one week, minimum, before starting Work of this Section.
2. Agenda Items:
a. Roof removal preparation.
b. Reroofing phasing and scheduling.
c. Existing roof drains and roof drainage during each stage of reroofing, and roof-drain plugging and plug removal.
d. Construction schedule and availability of replacement roof materials, Installer's personnel, equipment, and facilities needed to avoid delays.

e. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect reroofing.
f. HVAC shutdown and sealing of air intakes.
g. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
h. Existing conditions that may require Architect notification before proceeding.
   1) Notify Architect and Owner if coal-tar roofing is existing at project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Phasing plan.

1.5 INFORMATIONAL SUBMITTALS

A. Photographs or Videotape: Show existing conditions of adjoining construction, including exterior and interior finish surfaces, that might be misconstrued as having been damaged by reroofing operations. Submit before Work begins.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Approved by warrantor of existing roofing system to work on existing roofing.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning roofing removal. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.7 FIELD CONDITIONS

A. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.

B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

C. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
   1. Remove only as much roofing in one day as can be made watertight in the same day.

1.8 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during reroofing, by methods and with materials so as not to void existing roofing system warranty. Notify warrantor before proceeding.
   1. Notify warrantor of existing roofing system on completion of reroofing, and obtain documentation verifying that existing roofing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 TEMPORARY PROTECTION MATERIALS

A. Expanded Polystyrene (EPS) Insulation: ASTM C 578.

B. Plywood: DOC PS1, Grade CD Exposure 1.

2.2 REPLACEMENT MATERIALS

A. New roofing materials are specified in Section 075000 - Membrane Roofing.

B. Wood blocking, curbs, and nailers are specified in Section 061053 - Miscellaneous Rough Carpentry.

2.3 AUXILIARY REROOFING MATERIALS

A. Use auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of new roofing system.

PART 3 - EXECUTION

3.1 PREPARATION

A. Shut off rooftop utilities and service piping before beginning the Work.

B. Test existing roof drains to verify that they are not blocked or restricted. Immediately notify Architect of any blockages or restrictions.

C. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

D. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

E. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs

specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

1. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing roofing system components that are to remain.

3.2 ROOF TEAR-OFF

A. General: Notify Owner each day of extent of roof tear-off proposed for that day and obtain authorization to proceed.

B. Partial Roof Tear-Off: Where indicated, remove existing roofing and immediately check for presence of moisture by visually observing substrate that is to remain.
   1. Coordinate with Owner's inspector to schedule times for tests and inspections immediately after removal.
   2. With an electrical capacitance moisture-detection meter, spot check substrate that is to remain.
   3. Remove wet or damp materials below existing roofing and above deck as directed by Architect and Owner.
   4. Inspect wood blocking, curbs, and nailers for deterioration and damage. If wood blocking, curbs, or nailers have deteriorated, immediately notify Architect.
   5. Bitumen and felts that are firmly bonded to concrete decks are permitted to remain if felts are dry. Remove unadhered bitumen, unadhered felts, and wet felts.
   6. Remove excess asphalt from steel deck that is exposed by removal of wet or damp materials. A maximum of 15 lb/100 sq. ft. of asphalt is permitted to remain on steel decks.
   7. Remove fasteners from deck.

3.3 DECK PREPARATION

A. Inspect deck after tear-off of roofing system.

B. If deck surface is unsuitable for receiving new roofing, or if structural integrity of deck is suspect, immediately notify Architect. Do not proceed with installation until directed by Architect.

3.4 DISPOSAL

A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
   1. Storage or sale of demolished items or materials on-site is not permitted.

B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION

SECTION 071113

BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Dampproofing.

B. Principal Products:
   1. Bituminous emulsified dampproofing.
   2. Protection board.
   3. Emulsified primer.

C. Related Requirements.
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 072100: Below grade insulation.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
   1. Coordinate Work results of this Section with foundation insulation installation.

B. Preinstallation Meeting Attendees and Procedures:
   1. Conduct meeting one week, minimum, before starting concrete work to receive dampproofing.
   2. Additional Attendees:
      a. Dampproofing membrane manufacturer.
      b. Concrete contractor.
      c. Installers of elements penetrating dampproofing.
      d. Earth retention contractor.
   3. Additional Agenda Items:
      a. Concrete curing methods.
      b. Substrate preparation.
      c. Testing and inspection.
      d. Protecting and repairing dampproofing.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver dampproofing and accessories in manufacturer undamaged packaging.

1.4 FIELD CONDITIONS

A. Ambient Conditions: Perform work within following limitations.
   1. Temperature: Do not apply membrane when air or surface temperatures are below 40 degrees F.
   2. Precipitation: None occurring during installation of the Work or forecast within 24 hours.
   3. Protect rolls from direct sunlight until ready for use.

PART 2 - PRODUCTS

2.1 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Manufacturers and Products:
   1. Basis of Design: BASF Corporation, Masterseal 610 or 615.
   2. Karnak Corporation.
   3. W.R. Meadows, Inc.
   4. Comparable product submitted and accepted.

B. Brush Coats: ASTM D1227, Type III, Class 1.

2.2 AUXILIARY MATERIALS

A. Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.

B. Emulsified-Asphalt Primer: ASTM D1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.

C. Protection Course: Fan folded, with a core of extruded-polystyrene board insulation faced on one side or both sides with plastic film, nominal thickness 1/4 inch, with a compressive strength of not less than 8 psi per ASTM D1621, and maximum water absorption by volume of 0.6 percent per ASTM C272/C272M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.

3.2 PREPARATION

A. Clean, prepare, and treat substrates. Provide clean, dust-free, and dry substrates for dampproofing application.

B. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing.

C. Clean substrates of projections and substances detrimental to the dampproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.

D. Apply patching compound to patch and fill cracks, open joints, and other imperfections; cover with asphalt-coated glass fabric.

3.3 APPLICATION

A. Apply dampproofing to provide continuous plane of protection.

B. Extend dampproofing over indicated surfaces.

C. Reinforce changes in plan with asphalt-coated glass fabric.

D. Apply two brush coats with thickness as recommended by manufacturer.

3.4 CLEANING

A. Clean spills and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturers of affected construction materials.

END OF SECTION

SECTION 072100

THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Foundation insulation.
2. Exterior soffit insulation.
3. Perimeter foundation wall rigid insulation.

B. Principal Products:
1. Rigid extruded polystyrene board insulation.
2. Mineral wool board and blanket insulation.
3. Foamed-in-place insulation.

C. Related Requirements.
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 071326: Below grade insulation installation.
5. Section 072600: Below slab on grade vapor retarders.
6. Section 075200: Roof insulation.
7. Section 092116: Acoustical insulation.
8. Section 133419: Metal building insulation.

1.2 ACTION SUBMITTALS

A. Product Data.

1.3 INFORMATIONAL SUBMITTALS

A. Test and Evaluation Reports: Manufacturer and Independent testing agency test results showing:
1. Thermal performance.
2. Surface burning characteristics.
3. Combustibility.
4. Density.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
   1. Store insulation in dry location, protected from elements.
   2. Handle insulation to prevent soiling and damage.
   3. Foam Board Insulation:
      a. Protect combustible insulation against ignition.
      b. Do not expose to sunlight except as necessary for installation.
      c. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 FOAM BOARD INSULATION

A. Extruded Polystyrene Board: ASTM C578.
   1. Manufacturers and Products:
      a. Kingspan CertiFoam 25.
      b. DuPont STYROFOAM.
      c. GreenGuard Type IV 25 psi XPS Insulation Board.
      d. Owens Corning FOAMULAR 250.
   2. Type IV, 25 psi, square or shiplap edges.
   3. Surface Burning Characteristics: ASTM E84:
      a. Flame Spread Index: 25, maximum.
      b. Smoke Developed Index: 450, maximum.

2.2 FIBROUS BOARD INSULATION

A. Unfaced Mineral-Wool Board: ASTM C612, Type III.
   1. Manufacturers and Products:
      a. Johns Manville MinWool CW4.
      b. Rockwool CavityRock.
      c. Thermafiber, Inc. RainBarrier HD.
   2. Nominal Density: 4 lb/cu. ft.
   3. Surface Burning Characteristics: ASTM E84:
      a. Flame Spread Index: 15, maximum.
      b. Smoke Developed Index: 0, maximum.
   4. Combustion: Passes ASTM E136.
   5. Fiber Color: Architect selected.

2.3 BLANKET INSULATION

A. Unfaced Glass-Fiber Blankets: ASTM C665, Type I.
   1. Manufacturers and Products:
      a. CertainTeed Corporation Fiber Glass Building Insulation.
      b. Johns Manville Unfaced Fiber Glass Batts.

c. Knauf Insulation EcoBatt Insulation.
d. Owens Corning EcoTouch Pink.

2. Surface Burning Characteristics: ASTM E84:
   a. Flame Spread Index: 25, maximum.
   b. Smoke Developed Index: 50, maximum.
3. Combustion: Passes ASTM E136.

B. Unfaced Mineral-Fiber Blankets: ASTM C665, Type I.
1. Manufacturers and Products:
   a. Johns Manville TempControl Mineral Wool.
   b. Owens Corning Thermafiber UltraBatt.
   c. Rockwool COMFORTBATT.
2. Surface Burning Characteristics: ASTM E84:
   a. Flame Spread Index: 25, maximum.
   b. Smoke Developed Index: 50, maximum.
3. Combustion: Passes ASTM E136.

2.4 FOAMED-IN-PLACE INSULATION

A. Closed-Cell Polyurethane Foam: ASTM C1029, Type II.
1. Manufacturers and Products:
   a. Carlisle SealTite PRO Closed Cell.
   b. CertainTeed Corporation CertaSpray CC.
   c. DuPont STYROFOAM Spray Polyurethane Foam Insulation.
   d. Gaco Western Inc Gaco WallFoam 183M.
   e. Henry Company Permax 2.0.
   f. Huntsman Building Solutions ProSeal.
   g. Johns Manville Corbond III.
   h. Master Builders Solutions Walltite.
   i. Preferred Solutions, Inc Staycell 302.
   j. SWD Urethane Company Quik-Shield 112XC.
2. Density: 1.5 lb/cu. ft, minimum.
3. Surface Burning Characteristics: ASTM E84:
   a. Flame Spread Index: 25, maximum.
   b. Smoke Developed Index: 450, maximum.
4. Accessory Products:
   a. Primer: Recommended by insulation manufacturer.
   b. Foam Stop: Plastic L-shaped extrusion, 60 mil thick minimum.

B. Thermal Barrier: 15-minute rated intumescent paint compatible with closed-cell polyurethane foam.
1. Manufacturers and Products:
   a. Fireshell Coatings F10E.
   b. International Fireproof Technology, Inc. DC-315.
   c. Preferred Solutions, Inc. Stayflex 2505.

2.5 INSULATION FASTENERS

A. Mechanical Fasteners: Insulation manufacturer recommended screws with integrated insulation-retaining washers for attachment through sheathing to metal framing.

B. Spindle-Type Adhered Anchors - Used for Temporary Support During Installation: Galvanized steel plate with galvanized or copper-coated steel spindle.
   1. Manufacturers and Products:
      a. AGM Industries.
      b. Gemco.
      c. Gripnail.
      d. Midwest Fasteners.
   2. Spindle Length: Suited to insulation depth.

C. Insulation-Retaining Washers: Galvanized steel self-locking washers.
   1. Washer Size: Recommended by anchor manufacturer.

D. Anchor Adhesive: Type recommended by anchor manufacturer for substrate.

2.6 INSULATION ADHESIVES

A. Adhesive: Product compatible with insulation and substrates, capable of securing insulation to substrate without damaging insulation or substrates.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates and remove projections and appurtenances that may damage insulation or inhibit adhesion.

3.2 INSTALLATION - GENERAL

A. Extend insulation to cover entire area shown to be insulated.

B. Insulate tightly around obstructions and penetrations.

C. Fill voids with closed-cell spray foam insulation.

D. Foam Board Insulation: Protect from extended sunlight exposure beyond manufacturers stated limits.

3.3 INSTALLATION OF BELOW-GRADE INSULATION

A. Horizontal Surfaces: Loosely lay insulation, butt units tightly. Stagger end joints.
   1. Insulation Coverage: Entire surface.
   2. Insulation Coverage: Extend 36 inches from exterior walls.

B. Vertical Surfaces: Fully adhere insulation with units butted tightly.
   1. Insulation Coverage: Entire surface below exterior grade line.
   2. Adhere insulation boards with mastic recommended by insulation manufacturer for use with required waterproofing membrane.
   3. Lap fabric facing over adjacent insulation boards and pin or tape in place to prevent displacement during backfilling.
   4. Close drainage channels at top edge with metal flashing or additional fabric pinned in place to prevent soil from entering drainage channels.
   5. Connect panels to subsurface drainage system.

3.4 INSTALLATION OF CAVITY WALL INSULATION

A. Mineral-Wool Board Insulation: Mount insulation boards on fasteners. Butt units tightly.
   1. Install washers to hold boards firmly against substrate.

3.5 INSTALLATION OF WALL CONTINUOUS INSULATION

A. Mineral-Wool Board Insulation: Mount insulation boards on fasteners. Butt units tightly.
   1. Space fasteners as recommended by manufacturer.
   2. Install washers to hold boards firmly against substrate.

3.6 INSTALLATION OF FRAMED WALL INSULATION

A. Blanket Insulation: Fill cavities between framing members with insulation. Snugly fit insulation.
   1. Recessed Lighting Fixtures: Maintain 3-inch clearance between insulation and fixtures not rated for insulation contact.
   2. Metal-Framed Wall Cavities over 96 Inches High:
      a. Faced Blankets: Tape flanges to stud faces.
      b. Unfaced Blankets: Apply insulation fasteners to stud faces before installing insulation.

3.7 PROTECTION

A. Protect insulation from damage due to weather, ultraviolet radiation, physical abuse, and other causes. Provide temporary coverings or enclosures until permanent construction is completed.

END OF SECTION

SECTION 072600

VAPOR RETARDERS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Vapor barrier below concrete slab on grade.

B. Principal Products:
   1. Sheet membrane vapor retarder.
   2. Accessories.

C. Related Requirements:
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 033000: Cast-in-Place Concrete.

1.2 ACTION SUBMITTALS

A. Product Data: Vapor retarders.

B. Samples: 6 by 6 inch, minimum.

1.3 WARRANTY

A. Manufacturer Warranty:
   1. Warrant against product failure.
      a. Failure includes manufacturing defects.
      b. Warranty period: Lifetime of building.

PART 2 - PRODUCTS

2.1 BELOW SLAB VAPOR RETARDER

A. Vapor Retarders: Sheet membrane complying with ASTM E1745, Class A.
   1. Manufacturers and Products:
      a. Stego Inustries Stego Wrap 15-Mil.
      b. Reef Industries Vaporguard.
      c. W. R. Meadows PERMINATOR 15-mil.
   2. Permeance: 0.01 perms, maximum per ASTM E96.

B. Installation Accessories:
   1. Seam Tape: Vapor retarder manufacturer's standard product.
   2. Penetration Sealer: Vapor retarder manufacturer's standard mastic.
   3. Pipe Boots: Vapor retarder manufacturer's standard product.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances and projections harmful to vapor retarders.

3.2 INSTALLATION

A. Installation - General: Comply with ASTM E1643.

B. Install vapor retarders over prepared grades. Lap joints 6 inches, minimum and seal with tape. Seal to perimeter foundation walls.

C. Seal around utility penetrations and columns.

3.3 PROTECTION

A. Protect vapor retarders. Repair damage before pouring floor slab.

END OF SECTION

SECTION 072700

AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Air barrier coating systems, AB-1.

B. Principal Products:
   1. Fluid applied vapor permeable air barrier system.
   2. Transition membrane.

C. Related Requirements.
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 074113: Roofing underlayment at metal roofing.
   5. Section 074213.23: Support subframing.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
   1. Coordinate air barrier installation with roofing, wall openings, and waterproofing installation.

B. Preinstallation Meeting Attendees and Procedures:
   1. Conduct meeting one week, minimum, before starting Work of this Section.
   2. Additional Attendees:
      a. Air barrier substrate installers.
      b. Installers of items penetrating air barriers.
      c. Adjacent roofing and waterproofing installers.
      d. Installers of storefront, window, curtain wall, and doors.
      e. Installers of cladding systems installed over air barriers.
      f. Testing agency.
   3. Additional Agenda Items:
      a. Substrate preparation.
      b. Transition detailing.
      c. Air barrier protection and repair.
      d. Air barrier testing and inspection.

C. Sequencing Procedures:
   1. Complete air barrier installation after roofing.
   2. Ultraviolet exposure. Do not expose air barrier materials to sunlight longer than manufacturer recommends.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Air barrier membrane.
   2. Primers.
   3. Preformed silicone seals.

B. Shop Drawings:
   1. Locations and extent of air barriers.
   2. Termination conditions.
   3. Gap and expansion joint bridging.
   4. Interface with other assemblies and materials.
   5. Outside and inside corners.
   6. Penetration sealing.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates: Certify air barrier membrane chemical and adhesive compatibility with adjacent and contacted materials.

B. Field Quality Control Submittals: Field test and inspection reports.

C. Qualification Statements: installer and testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Warranty Documentation: For air barrier.

1.6 QUALITY ASSURANCE

A. Qualifications:
   1. Installers:
      a. Air Barrier Subcontractor: ABAA Accredited.
      b. Individual Installers: Certified by Building Performance Quality Institute for the ABAA in accordance with its Site Quality Assurance Program.

B. Mockups: Construct field air barrier assembly mockup including backup wall, typical penetrations, and glazing assemblies.
   1. Mockup Size: 100 sf minimum.
   2. Demonstrate product interfaces, intersections, and terminations.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
   1. Store materials in their original undamaged packages in a clean, dry, protected location and within manufacturer recommended temperature range required.

1.8 FIELD CONDITIONS

A. Ambient Conditions: Perform Work within following limitations.
   1. Ambient and Surface Temperature: Within manufacturer acceptable range.
   2. Precipitation and Fog: None occurring.

1.9 WARRANTY

A. Installer Warranty:
   1. Air Barrier Assembly: Warrant against installation failure.
      a. Failure includes product disintegration, loss of airtight seal, loss of watertight seal, and adhesion failure.
      b. Warranty Period: 5 years.

PART 2 - PRODUCTS

2.1 VAPOR PERMEABLE FLUID APPLIED MEMBRANE AIR BARRIER

A. Air Barrier: Synthetic polymer, fluid applied membrane.
   1. Manufacturers and Products:
      a. Carlisle Coatings & Waterproofing Fire Resist Barritech VP.
      b. GCP Applied Technologies Perm-A-Barrier Liquid VPL Low Temperature.
      c. Henry Company Air-Block 17MR.
      d. Tremco ExoAIR 230.
      e. W.R. Meadows Air-Shield LMP.
   2. VOC Content: 100 g/L, maximum.
   3. Accessories: Air barrier membrane manufacturer approved primers, flashing, joint treatments, transition membranes, and reinforcing.

2.2 TRANSITION SEALERS

A. Transition Assemblies and Joint Sealants: Section 079200.

B. Preformed Silicone Seals: Low-modulus silicone extrusions.
   1. Manufacturers and Products:
      a. Dow Chemical DOWSIL Silicone Transition Strip.
      b. GE Sealants US11000 UltraSpan.
      c. Pecora Corp Sil-Span.
      d. PROSOCO R-Guard SureSpan EX.
      e. Tremco Spectrem Simple Seal.

2. Color: Architect selected.
3. Adhesive: Preformed silicone seal manufacturer approved medium or low-modulus silicone sealant.

2.3 PERFORMANCE

A. Environmental Performance: Continuous weather resistive assembly acting in conjunction with adjacent materials to resist air and water leakage into the building and to function as a drainage plane for incidental moisture.
   1. Air Infiltration:
      a. Material: ASTM E2178, 0.004 cfm/sf at 1.57 lb/sq ft pressure differential, maximum.
      b. Assembly: ASTM E2357, 0.04 cfm/sf at 1.57 lb/sq ft.
   2. Vapor Permeance: ASTM E96 Desiccant Method, 10 perms, minimum.

B. Flame Spread: Tested as a component of assembly passing NFPA 285.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surfaces are sound, dry, even, and free of contaminants.

B. Masonry: Verify joints are flush and completely filled and excess mortar is removed from veneer ties.

C. Sheathing: Verify corners, and edges are securely fastened, with fasteners set flush.

3.2 PREPARATION

A. Protection of In-Place Conditions: Mask and cover adjacent surfaces to protect from overspray.

B. Surface Preparation: Clean and prepare substrates.
   1. Ensure that penetrating Work is in place and complete.
   2. Remove loose mortar, dust, oil, grease, oxidation, mill scale and other contaminants.
   3. Fill cracks, joints, and gaps with air barrier manufacturer recommended products.

C. Gypsum Sheathing:
   1. Fill overdriven fastener holes.
   2. Seal exposed cut edges.

D. Priming: Prime substrate.

3.3 INSTALLATION - GENERAL

A. Coordinate the installation of air barrier membrane with other building elements.
   1. Connect air barrier to roofing and below grade waterproofing and roofing systems.
   2. Connect and seal air barrier material to exterior door, louver, storefront, and curtainwall systems.

B. Fluid Applied Air Barrier Installation: Apply air barrier system using manufacturer recommended minimum thickness and coats to provide building envelope continuity.

C. Sheet Membrane Air Barrier Installation: Adhere sheet membrane to substrate; ensure continuous air barrier configured to direct moisture to exterior.

D. Substrate Gaps and Joints: Bridge with manufacturer recommended transition membrane.
   1. Seal around penetrations with sealant.
   2. End of Day Procedure: Seal top edge of membrane with termination mastic.

3.4 FIELD QUALITY CONTROL

A. Field Tests and Inspections: Engage inspectors to perform tests and inspections and prepare reports. Allow inspectors access to Work areas.
   1. Failed Test Retest Cost: Contractor responsibility.

B. Inspections: May include the following:
   1. Correct and complete substrate preparation and priming.
   2. Air barrier continuity.
   3. Air barrier support against substrate.
   4. Site conditions maintained within manufacturer limits.
   5. UV Exposure below manufacturer limits.
   6. Proper air barrier installation.
   7. Adjacent material compatibility.
   8. Transitions at changes in direction and structural support at gaps have been provided.
   9. Connections between assemblies completed correctly.
   10. All penetrations have been sealed.

C. Testing: Tests may include the following:
   1. Air Leakage Location: Test per ASTM E1186, chamber pressurization or depressurization with smoke tracers.
   2. Assembly Air Leakage: Test per ASTM E2357.
   3. Whole Building Air Leakage: Test per ASTM E779.
   4. Air Barrier Adhesion: Test per ASTM D4541 or ABAA T002.

D. ABAA Installer Audits: Cooperate with ABAA testing agency. Allow access to Work areas and staging. Notify ABAA in writing of schedule for Work of this Section to allow sufficient time for testing and inspection. Do not cover Work of this Section until testing and inspection is accepted. Arrange and pay for site audits by ABAA to verify conformance with the material

manufacturer instructions, the site Quality Assurance Program used by ABAA, and this section of the project specification.

E. Non Conforming Work: Make corrections or replace, and retest.

3.5 CLEANING

A. Cleaning: Clean spillage from adjacent construction.

3.6 PROTECTION

A. Protection: Protect air barrier materials from damage until material is covered by permanent construction.
   1. Install cladding materials before exceeding material UV exposure limit.

END OF SECTION

SECTION 074213.23

METAL COMPOSITE MATERIAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Metal composite material panel assemblies for walls and soffits, including cladding and framing systems, MP-1.

B. Principal Products:
1. Metal composite material wall panels.
2. Cladding support subframing.
3. Installation accessories.

C. Related Requirements.
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 042000: Unit masonry.
5. Section 061600: Sheathing.
6. Section 072700: Air barriers.
7. Section 133419: Metal building systems.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
1. Coordinate metal composite panel installation with completion of air barrier and sheathing.

B. Preinstallation Meeting Attendees and Procedures:
1. Conduct meeting one week, minimum, before starting Work of this Section.
2. Additional Agenda Items:
   a. Methods and materials related to preparing substrates for panel installation.
   b. Special details at flashing, penetrations, openings, corners, copings, and other transition conditions.
   c. Coordination of continuous insulation installation.
   d. Cleaning, and repair or replacement procedures for damaged panels.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Panel materials.
   2. Installation system components and profiles.
   3. Support girt system components.
   4. Initial selection color charts and Samples.

B. Shop Drawings: Detail the following:
   1. Fabrication and installation layouts.
   2. Edge conditions at openings and corners.
   3. Penetrations.
   4. Flashing, trim and anchorage.
   5. Weep locations.

C. Samples:
   1. Extruded Installation Framing: 12 inch long section.
   2. Fabricated Samples: Fabricate finished metal composite material, 12 by 12 inches in size showing finish and return profile on two edges.

1.4 INFORMATIONAL SUBMITTALS

A. Delegated Design Submittals:
   1. Installation system design including support girt system and anchorage to substrate.

B. Field Quality Control Submittals: Field test and inspection reports.

C. Manufacturer Reports: Field instruction, test, and inspection reports.

D. Qualification Statements: fabricator, installer, and testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For metal composite materials wall panels.

B. Warranty Documentation: For metal composite material wall panels.

1.6 QUALITY ASSURANCE

A. Qualifications:
   1. Fabricator and Installer: Manufacturer trained and certified.

B. Mockups: Construct metal composite material wall panel installation; size and extent shown on Drawings. Demonstrate product interfaces, intersections, and terminations.
   1. Mockup Location: Field.
   2. Approved mockups establish work results standard.
   3. MCM Roof Edges: Laboratory test mockups per ANSI/SPRI/FM 4435 ES-1.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
   1. Handle metal composite material panels to prevent soiling and damage, including bending, warping, twisting, and marring of surfaces.

1.8 FIELD CONDITIONS

A. Ambient Conditions: Perform Work within following limitations.
   1. Temperature: 40 degrees F, minimum and rising, 90 maximum degrees F, maximum.
   2. Precipitation: None occurring and none predicted within 48 hours.
   3. Establish ambient conditions 48 hours, minimum before and maintain conditions during and 24 hours, minimum after installation.

B. Existing Conditions: Verify field measurements before fabrication. Show field measurements on Shop Drawings.

1.9 WARRANTY

A. Manufacturer Warranty:
   1. Warrant against product failure.
      a. Failure includes panel rupturing, cracking or puncturing, and deterioration of metal.
      b. Warranty Period: Two years.

B. Finish Warranty: Repair deteriorated finishes or replace components.
   1. Deterioration includes the following:
      a. Color Fading: More than 5 Hunter units per ASTM D2244.
      b. Chalking: More than No. 8 rating per ASTM D4214.
      c. Paint cracking, peeling or checking.
   2. Warranty Period: 20 years.

PART 2 - PRODUCTS

2.1 METAL COMPOSITE MATERIAL WALL PANELS

A. Aluminum Faced Composite Wall Panels, MP-1: Two aluminum facings bonded to solid, fire retardant core.
   1. Manufacturers and Products:
      a. Arconic Architectural Products Reynobond FR, basis of design.
      b. 3A Composites Alucobond Plus.
      c. Alcotex FR.
      d. Mitsubishi Chemical ALPOLIC/fr.
   2. Panel Thickness: 4 mm.
   3. Face Texture: Smooth.
   4. Finish: Color anodized.

5. Color: Medium Bronze, Architect selected.

2.2 CLADDING SYSTEM

A. Installation System: Attachment assembly components, panel stiffeners, and accessories required for complete system.
   1. Configuration: Ventilated rainscreen system.

B. Attachment Assembly Components: Extruded aluminum.
   1. Aluminum Extrusions: ASTM B221, manufacturer recommended alloy and temper.
   2. Fasteners: Corrosion resistant screws for anchorage to support girt systems.

C. Support Girt System: ASTM C645 Cold formed steel framing, CP 90 coating, sizes and shapes as shown on Drawings.
   1. Shape: Z furring.
   2. Fasteners: Corrosion resistant screws for anchorage to substrate.

D. Flashing and Trim: Same metal and finish as MCM face sheet.

E. Other System Components:
   1. Panel Fasteners: Concealed, non corroding, self tapping screws designed to withstand design loads.

2.3 PERFORMANCE

A. Delegate MCM attachment assembly design to fabricator licensed Professional Engineer.

B. Structural Design Criteria: See Structural Drawings.

C. Structural Loads: See Drawings.

D. Roof Edge Securement: MCM used as coping or roof edge trim.
   1. Design assembly to resist wind loads.
   2. Pass ANSI SPRI ES-1 testing.

E. Allowable Deflection: 1/360, maximum.

F. Fire Performance:
   1. Surface Burning: 25, maximum per ASTM E84.
   2. Smoke Developed Index: 450, maximum per ASTM E84.
   3. Fire Rated Wall Assemblies: Testing agency listed assembly requirements.
   4. Exterior Wall Testing: Wall assembly tested per NFPA 285.

G. Environmental Performance:
   1. Expansion and Contraction: Withstand thermal cycling over 120 degrees F ambient and 180 degrees F on material surfaces.

2.4 FABRICATION

A. Shop Fabrication: Form panel returns and profiles in shop.

B. Where needed to minimize oil canning and deflection from wind loads, provide stiffening angles on concealed side.

C. Fabricate panels with consistent grain directiondirected by Architect.

D. Form sections to shapes shown on Drawings, accurate in size, square, and free from distortion or defects.

E. Form pieces in longest practicable lengths.

F. Sheet Metal Flashing and Trim: Specified in Section 076200 and SMACNA Architectural Sheet Metal Manual requirements.
   1. Form from material thick enough to prevent oil canning and buckling. Hem exposed edges.
   2. Seams: Lapped and elastomeric sealed per SMACNA standards.
   3. Exposed Fasteners: Not permitted.

2.5 ALUMINUM FINISHES

A. Anodizing: AAMA 611 Class I or AAMA 612 with electrodeposition organic seal.
   1. Color: Medium bronze, Architect selected.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
   1. Verify substrate installation and air barrier application is complete and tested per Section 072700.
   2. Verify framing members are ready to receive panel systems.
   3. Verify penetrating items are ready for cladding system installation.

3.2 PREPARATION

A. Cold Formed Metal Girt System: Install per ASTM C754 in orientation, sizes, and locations shown on shop drawings.

3.3 INSTALLATION

A. Fasten panel support assembly to girt system.

B. Install panels in locations, spacings, and orientation shown on Drawings. Anchor panels securely.
   1. Rainscreen Systems: Leave gaps open between adjacent panels.

C. Accommodate thermal and structural movement without failure.

D. Erection Tolerances:
   1. Offset Between Adjacent Members: 1/16 inch, maximum.
   2. Variation from Plane or Location: 1/8 inch in 20 feet, maximum, non cumulative.

3.4 CLEANING

A. Remove site cuttings from finish surfaces.

B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

C. Clear weep holes and drainage channels.

END OF SECTION

SECTION 075200

MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Modified bituminous membrane roofing system, RF-1, RF-2, RF-3, RF-5.

B. Principal Products:
1. Modified bituminous membrane base sheet and interply sheet.
2. Modified bituminous membrane surfacing sheet.
3. Acrylic top coat surfacing.
4. Roof insulation.
5. Vapor retarder, VB-1.
6. Liquid flashing.
7. Cover board.
8. Substrate board.
9. Walkway protection.

C. Related Requirements.
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 061053: Miscellaneous rough carpentry.
5. Section 076200: Sheet metal flashing and trim.
6. Section 077100: Manufactured metal copings.

1.2 REFERENCES

A. Definitions:
1. Roofing Terminology: See ASTM D1079 and NRCA Roofing and Waterproofing Manual glossary.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting Attendees and Procedures:
1. Conduct meeting one week, minimum, before starting Work of this Section.
2. Additional Attendees:
a. Testing agency representative.
b. Installer of substrate deck or slab.
3. Agenda Items:

a. Preparation procedures.
b. Installation procedures.
c. Coordination and scheduling required with related Work.
d. Protection of construction and site.
e. Blocking and additional requirements for curved concrete roof conditions.

1.4 ACTION SUBMITTALS

A. System Submittal: FM Approvals RoofNav listing.

B. Product Data:
1. Roofing membrane and accessory products.
2. Substrate board.
3. Vapor retarders.
4. Roof insulation and cover board.
5. Roof walkway material.
6. Acrylic top coat surfacing.
7. Initial selection color charts and Samples.

C. Shop Drawings: Include plans, elevations, sections, details, intersections with adjacent assemblies, terminations, and attachments, including:
1. Base flashings.
2. Membrane terminations.
3. Flat and tapered insulation, including cants and slopes.
4. Mechanically Fastened Insulation: Provide roof plan. Show orientation of roof deck, insulation, fastening patterns, and spacing.

D. Samples:
1. Cap Sheet: 6 by 6 inch sample of each type and color.
2. Flexible walkway materials.

1.5 INFORMATIONAL SUBMITTALS

A. Certificates: Manufacturer affidavit that Project design and conditions have been reviewed and that the installation will be fully warrantable if correctly installed. This submittal may be in the form of a photocopy of manufacturer authorization to Installer to proceed with installation.

B. Field Quality Control Submittals: Field test and inspection reports.

C. Manufacturer Reports: Field test and inspection reports.

D. Qualification Statements:
1. Installer: Manufacturer authorization.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: Roof system maintenance requirements.

B. Warranty Documentation: For complete roof system.

C. Project Plaque: Provide permanent sign or framed document with the following information attached to wall near primary access to main roof.
   1. Roofing installer name, address, and telephone number.
   2. Roofing system manufacturer name, address, and telephone number.
   3. Starting date of warranty and length of warranty period.

1.7 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturers: UL listed and FM Approvals RoofNav listed for roofing system.
   2. Installer: Licensed, authorized, or approved by roofing manufacturer to install manufacturer roofing system and provide full specified warranty.
   3. Infrared Roof Moisture Survey Technician: NDT test technician certified to Level 2 minimum in thermal/infrared test method per American Society for Nondestructive Testing Recommended Practice SNT-TC-1A.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements: Store roofing system components protected from the elements, precipitation and standing water, freeze/thaw cycling, and protected from sunlight, if required.

1.9 FIELD CONDITIONS

A. Ambient Conditions: Perform work within limitations recommended by manufacturer.

B. Existing Conditions: Verify field measurements before fabrication. Show field measurements on Shop Drawings.

1.10 WARRANTY

A. Manufacturer Warranty: Warrant roofing system against failure.
   1. Total System Warranty: Include primary roof membrane and substrate boards, vapor retarder, roof insulation, cover boards, flashings, and metal edge assemblies, and other components of roofing system.
      a. Warranty Period: 30 years.
      b. Dollar Limit: None.

PART 2 - PRODUCTS

2.1 SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM

A. Cold Applied SBS Modified Bituminous Membrane Roofing: Multi component roofing system consisting of base sheet, intermediate sheet, and granule surfaced cap sheet.
   1. Environmental Performance:
      a. Initial Solar Reflectance Index: ASTM E1980; 82, minimum.
      b. Three Year Aged Solar Reflectance Index: ASTM E1980; 64, minimum.
      c. Emissivity: ANSI/CRRC S100; 0.75, minimum.
   2. Color: White and Architect selected.

2.2 COMPONENT MATERIALS

A. General: Provide components of roofing system recommended by manufacturer for a complete system.
   1. Component materials are all compatible with each other and adjacent materials.

B. Base Sheet: ASTM D6164/D6164M, Type I, Grade S, styrene-butadiene-styrene modified bituminous sheet, glass fiber mat reinforced, smooth surfaced.
   1. Manufacturers and Products:
      a. GAF RUBEROID HW Smooth.
      b. Holcim Elevate SBS Poly Base.
      c. Johns Manville Dynalastic 180 S.

C. Interply Sheet: Same as base sheet.

D. Cap Sheet: ASTM D6164/D6164M, Type II, Grade G, styrene-butadiene-styrene modified bituminous sheet, fire-retardant, non-woven fiberglass-reinforced polyester mat reinforced, granule surfaced.
   1. Manufacturers and Products:
      a. GAF HW Plus Granule FR.
      b. Holcim Elevate SBS Premium FR .
      c. Johns Manville Dynalastic 250 FR.

E. Acrylic Top Coat Surfacing:
   1. Manufacturer and Products:
      a. GAF; EnergyCote.
      b. Holcim Elevate; Acrylitop PC-100.
      c. Johns Manville; Acrylic CR.
   2. Description: Manufacturer recommended elastomeric acrylic topcoat providing solar reflectance required in performance Article below.

F. Flashing Sheet: Same material as cap sheet.

G. Liquid-Applied Flashing: Thixotropic, flexible, acrylic, PMMA based resin applied with fleece fabric to form a monolithic, reinforced flashing membrane.

H. Cold Application Adhesive: ASTM D3019 Type III.

I. Concrete primer: Roofing system manufacturer recommended product.

J. Termination Bars: Manufacturer standard stainless steel, pre-drilled for included anchors.

K. Fasteners: Compliant with FM Global 4470 for corrosion resistance, including metal or plastic washers, roof system manufacturer accepted.

L. Insulation Cant Strips: ASTM C208, Type II, Grade 1, cellulosic fiber insulation board.

2.3 SUBSTRATE BOARDS

A. Substrate Board: ASTM C1177, gypsum core, glass-mat facing, water resistant.
   1. Manufacturers and Products:
      a. Georgia-Pacific Corporation DensDeck Prime.
      b. National Gypsum Company Gold Bond eXP Extended Exposure Sheathing.
      c. USG Corporation Securock Glass Mat Roof Board.
   2. Thickness: 5/8 inch, Type X.

B. Fasteners: FM Global 4470 compliant for corrosion resistance, including metal or plastic washers.

2.4 VAPOR RETARDER

A. Self-Adhering Sheet Vapor Retarder: ASTM D1970, polyethylene film with rubber asphalt adhesive, slip resistant surface, and paper backing.
   1. Manufacturer and Product:
      a. GAF; SA Vapor Retarder XL.
      b. Holcim Elevate; V-Force Vapor Barrier.
      c. Johns Manville; JM Vapor Barrier SAR.
   2. Thickness: Minimum 30 mils.
   3. Permeance: 0.1 perm.
   4. Manufacturer may recommend priming with manufacturer standard primer.

2.5 ROOF INSULATION

A. General: Roof insulation, preformed boards, manufactured or approved by roof membrane manufacturer, manufacturer standard sizes, thicknesses shown on Drawings and that produce FM Global approved roof insulation.

B. Polyisocyanurate Board Insulation: ASTM C1289, Type II Class 2 Grade 3.
   1. Manufacturers:
      a. GAF Materials Corporation.

b. Holcim Elevate.
c. Johns Manville.

2. Thickness: 2.7 inches maximum per layer.

C. Tapered Insulation: Factory formed, tapered insulation boards, 1/4 inch per foot slope or as shown on Drawings.

D. Special Shapes: Provide preformed insulation shapes to form crickets, saddles, tapers, and other shapes to facilitate drainage.

E. Fasteners: FM Global 4470 compliant for corrosion resistance, including metal or plastic washers.

F. Adhesive: Recommended by insulation manufacturer for adhering insulation layers together and insulation to substrate.

1. Adhesive Types: Asphaltic, asbestos free, cold applied, Single or multi component urethane low rise, apply in bead or full spread as recommended by manufacturer.

2.6 COVER BOARDS

A. Water Resistant Glass Mat Faced Gypsum: ASTM C1177, 1/2 inch thick, factory primed.

1. Manufacturers and Products:
   a. Georgia-Pacific Corporation DensDeck Prime with Eonic Technology.
   b. National Gypsum Company DEXcell FA Glass Mat Roof Board.
   c. USG Corporation Securock Ultra-Light Coated Glass Mat Roof Board.

2.7 WALKWAYS

A. Walkway Pads: ASTM D6164/D6164M, Type I or II, Grade G, SBS modified asphalt sheet; granule surfaced; manufactured by roof membrane system manufacturer.

1. Size: 36 by 60 inches.
2. Color: Architect selected.

2.8 PERFORMANCE

A. Accelerated Weathering: ASTM G152, ASTM G154 or ASTM G155; withstand 2,000 hours of testing.

B. Impact Resistance: ASTM D3746 or ASTM D4272.

C. Compatibility: Roof system materials are to be compatible within themselves and with all adjacent material as installed.

D. Roof System Design: Certified by testing to resist uplift pressures as shown on Structural Drawings.

E. FM Global Listing: Roofing system and components follow requirements of FM Global 4450 or FM Global 4470, and must be listed in FM Global RoofNav for Class 1 noncombustible construction. Materials must retain FM Global markings.

F. Hail Resistance Rating: SH.

G. Exterior Fire Test Exposure: ASTM E108 or UL 790 testing by a qualified testing agency, Class A, products marked as compliant by testing agency.

H. Solar Reflectance Index: Minimum 82 initial SRI and Minimum 64 for 3 year aged SRI per ASTM E1980.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine and verify conditions for compliance with roof system manufacturer recommendations:
   1. Substrate.
   2. Roof openings and penetrations.
   3. Curbs, nailers, and cants.

3.2 PREPARATION

A. Clean and prepare substrate.

B. Protect roof drainage and other equipment and surfaces from roofing materials.

C. Acoustical Deck Insulation: Install insulation strips in roof deck ribs per deck manufacturer instructions.

3.3 ROOFING INSTALLATION - GENERAL

A. Complete terminations, flashings, roofing installation, and temporary measures by end of each workday and during rain events.

B. Tie-in to Existing Roof Systems: Use only compatible materials, maintaining weathertight condition and existing warranties.

3.4 INSTALLATION - SUBSTRATE BOARD

A. Install substrate boards with long sides perpendicular to roof slopes in straight lines, stagger end joints. Install with tight butt joints.
   1. Fasten substrate board to top flanges of steel deck per roofing system manufacturer instructions.
   2. Fasten substrate board to steel deck flanges per FM Global RoofNav and FM Global Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.

3.5 INSTALLATION - VAPOR RETARDER

A. Self-Adhering Sheet Vapor Retarder: Prime substrate. Install self-adhering sheet vapor retarder in place; lap side seams minimum 3-1/2 inches and ends minimum 6 inches. Seal laps by rolling.

B. Install vapor retarder to provide complete seal against air movement at penetrations and terminations.

3.6 INSTALLATION - INSULATION

A. Do not allow insulation to be exposed to precipitation or left exposed at the end of the workday.

B. Install tapered insulation under area of roofing to conform to slopes shown on Drawings.

C. Install insulation to required thickness. Where overall insulation thickness is 2.7 inches or greater, install in layers with staggered joints from joints of previous layer. Stagger joints a minimum of 6 inches in each direction.

D. Install insulation with long sides in straight rows with end joints staggered between rows, butt joints at edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
   1. Fit insulation by trimming, within 1/4 inch of nailers, obstructions, and penetrations.
   2. Trim and fit insulation at roof drains.

E. Adhered Insulation: Install each layer of insulation adhered to substrate as follows:
   1. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly press insulation in place.
   2. Set each layer of insulation in a uniform, full spread of insulation adhesive; firmly press insulation in place.
   3. Prime surface of concrete deck with asphalt primer at rate recommended by manufacturer. Allow primer to dry.
   4. Set each layer of insulation in a full coverage mopped layer of hot roofing asphalt, applied within plus or minus 25 deg F of manufacturer recommended temperature.

F. Mechanically Fastened and Adhered Insulation: Mechanically fasten first layer of insulation to deck using mechanical fasteners designed and sized for fastening roof insulation to each deck type.
   1. Fasten first layer of insulation per FM Global RoofNav for specified Windstorm Resistance Classification.
   2. Fasten first layer of insulation to resist uplift pressure in field, corners, and perimeter of roof.
   3. Set each subsequent layer of insulation in ribbons of bead-applied adhesive, firmly pressing insulation in place.
   4. Set each subsequent layer of insulation in a uniform application of full spread insulation adhesive, firmly pressing insulation in place.

5. Set each layer of insulation in a full coverage mopped layer of hot roofing asphalt, applied within plus or minus 25 deg F of manufacturer recommended temperature.

3.7 INSTALLATION - COVER BOARD

A. Install cover boards over insulation with long sides in straight lines and end joints staggered between rows. Offset joints from insulation layer below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck.
   1. Fasten cover boards per FM Global RoofNav for specified Windstorm Resistance Classification.
   2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.8 INSTALLATION - MEMBRANE

A. Unroll and relax all SBS sheets for approximately 30 minutes prior to installation.

B. Start installation of roofing in presence of roofing system manufacturer technical personnel.

C. Align roofing to an accurate layout, maintaining side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Prime substrate; apply membrane smooth, free from air pockets, wrinkles, or tears. Ensure full bond of membrane to substrate.

E. Extend membrane up cant strips and 8 inches minimum onto vertical surfaces, over parapets; secure in copings, and secure in roof edge metal.

F. Seal roofing membrane to wall construction air barrier.

G. Mop and seal membrane around roof protrusions and penetrations.

H. Provide waterproof cut-off to membrane at end of each day's operation. Remove cut-off before resuming roofing.

3.9 INSTALLATION - BASE SHEET FLASHING

A. Adhere flashings and flashing accessories to substrates.

B. Apply adhesive to substrate and underside of sheet flashing, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners per roofing manufacturer recommendations.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets per manufacturer requirements. Seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate using termination bars.

3.10 APPLICATION - LIQUID FLASHING

A. Mixing: Mix resins. Catalyze only the amount of material that can be used within its pot life.

B. Priming: Apply primer to prepared substrates.

C. Flashing Installation: Apply flashing. Apply membrane and fleece reinforcement fabric to the thickness required by manufacturer, using number of coats required.
   1. Extend resin onto vertical surfaces to height shown. Make exposed terminations straight and neat.

3.11 INSTALLATION - WALKWAYS

A. Flexible Walkways: Adhere walkway components to substrate with compatible adhesive.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to inspect and generate reports. Allow inspectors access to Work areas.
   1. Failed Test Retest Cost: Contractor responsibility.

B. Inspections may include the following:
   1. Substrate conditions.
   2. Substrate preparation.
   3. Vapor barrier application, if required.
   4. Membrane application.
   5. Flashings.
   6. Protection components.
   7. Penetrations and drainage components.

C. Infrared Roof Moisture Survey: ASTM C1153, ground-based, walk-over type.
   1. Electronically record the entire survey and report results.
   2. Include in the report thermograms of all suspect areas and corresponding daytime photos of the same locations.

D. Electric Leak Detection: ASTM D7877 and ASTM D8231. Engage testing agency to survey entire roof area for potential leaksas follows:
   1. EFVM.

E. Final Roof Inspection: Arrange for roofing system manufacturer technical personnel or approved agency to inspect roofing installation on completion.
   1. After completing testing, repair leaks, then repeat tests.
   2. Continue to make further repairs until roofing and flashings are watertight.

F. Provide test and inspection reports.

3.13 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. Upon completion of the Work, inspect roofing for deterioration and damage, describing same in a written report, and provide copies to Architect and Owner.

B. Correct deficiencies in membrane roofing systemby repairing or replacing components or the entire roofing membrane system as required, to an undamaged condition at the time of Substantial Completion and per warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 076200

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Counterflashing for membrane roof systems.
2. Counterflashing at roof mounted equipment and utility penetrations.
3. Roof drainage system flashing and components.

B. Principal Products:
1. Counterflashing.
2. Miscellaneous flashing.
3. Roof flashing and counterflashing.
4. Roof drainage components.

C. Related Requirements.
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 074113: Metal roofing.
5. Section 075200: Modified bituminous membrane roofing.
6. Section 077100: Roof specialties for coping and roof edge flashing.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
1. Coordinate work results of this Section with Section 075200.

B. Preinstallation Meeting Attendees and Procedures:
1. Conduct meeting one week and one month, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data:
1. Coil-coated sheet metal.
2. Initial selection color charts and samples.

B. Shop Drawings.
1. Show fabrication and profiles for each item.

2. Show base metals, thicknesses, and finishes.
3. Include attachment and connection details.
4. Include details for corners, changes in plane, expansion joints, and terminations.
5. Show locations of expansion joints.
6. Copings and Roof Edge Fascia Trim: Include NRCA tested design information.

C. Samples:
1. Gutters, Downspouts, Copings, and Roof Edge Fascia Trim: lengths in required finish. 12 inch lengths in required finish.
2. Coil-Coated Trim: 12 inch long sections in required finish.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates:
1. Fabricator: Certify that copings and roof edge fasciae trim are ANSI/SPRI/FM 4435 ES-1 tested.

1.5 CLOSEOUT SUBMITTALS

A. Warranty Documentation: Coil-coated sheet metal finish, Roof edge warranty, and Coping warranty.

1.6 QUALITY ASSURANCE

A. Qualifications:
1. Fabricators: Listed by UL, FM, or other agency acceptable to authority having jurisdiction to fabricate copings and roof edge fascia per NRCA tested designs to meet ANSI/SPRI/FM 4435 ES-1 securement requirements.

B. Field Samples: Construct sheet metal fabrications, 48 inches, minimum size. Demonstrate texture and color.
1. Approved Samples establish work results standard.
2. Remove Samples when Architect directs.

C. Mockups: Provide sheet metal fabrications for exterior wall mockup assemblies.
1. Approved mockups establish work results standard.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
1. Store sheet metal elevated above grade, protected from precipitation and stormwater runoff.
2. Handle fabrications to prevent twisting, bending, and abrasion.
3. Prevent contact with materials causing discoloration or staining.

1.8 WARRANTY

A. Include roof edges, coping, gutters, and downspouts in warranty for roofing system specified in Section 075200.

B. Finish Warranty: Repair deteriorated finishes or replace components.
   1. Deterioration includes the following:
      a. Color Fading: More than 5 Hunter units per ASTM D2244.
      b. Chalking: More than No. 8 rating per ASTM D4214.
      c. Paint cracking, peeling or checking.
   2. Warranty Period: 20 years.

C. Installer Warranty:
   1. Sheet Metal Fabrications: Warrant against installation failure.
      a. Failure includes damage by wind under stated design speed or thermal movement.
      b. Warranty Period: Two years.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

A. Design Wind Load Criteria: See Structural Drawings.

B. Environmental Performance:
   1. Expansion and Contraction: Withstand thermal cycling over 120 degrees F ambient and 180 degrees F on material surfaces.

2.2 MATERIALS

A. Galvanized Steel Sheet: ASTM A653; structural steel sheet, G90 zinc coating.
   1. Finish: Three coat fluoropolymer.
   2. Color: Architect selected; custom; metallic.

B. Aluminum-Zinc Alloy Coated Steel Sheet: ASTM A792, Commercial Quality, AZ55 coating designation.
   1. Finish: Three coat fluoropolymer.
   2. Color: Architect selected; custom; metallic.

C. Stainless Steel Sheet: ASTM A240; Type 304 or 316, dead soft fully annealed.
   1. Surface: Smooth.
   2. Finish: 4.

2.3 ACCESSORIES

A. Fasteners for Other Metals: Same material and finish as item being fastened, with soft neoprene washers where exposed.

B. Solder: ASTM B32; type suitable for application and material being soldered.

C. Waterproof Underlayment: Self adhesive sheets manufactured to withstand high temperature below metal components; minimum 30 mils thick. Supply recommended primer.
   1. Manufacturers and Products:
      a. Carlisle Coatings & Waterproofing Inc CCW WIP 300HT.
      b. GCP Applied Technologies Ice and Water Shield HT.
      c. Henry Company Blueskin PE200 HT.
      d. Owens Corning WeatherLock Specialty Tile & Metal.
      e. Polyguard Products, Inc. Deck-Guard HT Roofing & Watershield Underlayment.

D. Slip Sheet: Rosin-sized building paper.

E. Concealed Sealant: Butyl, ASTM C1311.
   1. Manufacturers and Products:
      a. Pecora Corporation BA-98.
      b. Tremco Butyl Sealant.

F. Exposed Sealant: See Section 079200.

G. Separation Coating: Bituminous paint; SSPC-Paint 12.

H. Plastic Cement: ASTM D4586, Type I.

I. Surface-Applied Reglets: Extruded aluminum with bottom edge drip and top edge sealant recess. Supply with stainless steel screws with neoprene washers and anchorage devices appropriate to substrate.

2.4 FABRICATION

A. Fabrication Reference Standards:
   1. SMACNA Architectural Sheet Metal Manual.
   2. NRCA Roofing Manual.

B. Form section shapes shown on Drawings, accurate in size, square, and free from distortion or defects.

C. Fabricate cleats of same material as sheet metal, interlocking with sheet.

D. Hem exposed edges on underside 1/2 inch; miter and seam corners.

E. Moving Joints: Sealed lapped, bayonet-type, or interlocking hooked seams.

F. Non Moving Joints: Sealed watertight.

G. Fabricate corners, changes in plane, and terminations in shop with minimum 18 inch legs.

H. Counterflashing:
   1. Material:
      a. Stainless Steel: SMACNA recommended and 0.019 inch minimum thickness.
   2. Fabricate to extend minimum 4 inches over protected construction, with hemmed bottom drip edge.
   3. Shop fabricate interior and exterior corners.

I. Gutters: Hanging:
   1. Material:
      a. Galvanized Steel; SMACNA recommended and 0.022 inch minimum base metal thickness.
      b. Aluminum-Zinc-Coated Steel; SMACNA recommended and 0.022 inch minimum base metal thickness.
   2. Profile: See Drawings.
   3. Expansion Joints: Maximum 50 feet on center.
   4. Expansion Joints: Midway between downspouts.
   5. Outlets: Beehive strainers of stainless steel wire.
   6. Supports: Brackets or Straps.

J. Downspouts:
   1. Material:
      a. Galvanized Steel; SMACNA recommended and 0.022 inch minimum base metal thickness.
      b. Aluminum-Zinc-Coated Steel; SMACNA recommended and 0.022 inch minimum base metal thickness.
   2. Profile: See Drawings.
   3. Supports: Straps spaced maximum 5 ft on center, same metal as downspouts.

K. Parapet Scuppers: Two-piece fabrications, with mounting flanges. Lap pieces 4 inches minimum in direction of water flow.
   1. Material:
      a. Galvanized Steel; SMACNA recommended and 0.022 inch minimum base metal thickness.
      b. Aluminum-Zinc-Coated Steel; SMACNA recommended and 0.022 inch minimum base metal thickness.

L. Roof Edge Fascia Trim: Fabricate per NRCA details for tested designs.
   1. Material:
      a. Galvanized Steel; SMACNA recommended and 0.022 inch minimum base metal thickness.
      b. Aluminum-Zinc-Coated Steel; SMACNA recommended and 0.022 inch minimum base metal thickness.
   2. Length: 8 to 12 ft long units.
   3. Joints: Overlap 4 inches.
   4. Scuppers: Fabricate fascia with scuppers that extend 4 inches beyond fascia and have drip edge.

M. Copings: Fabricate per NRCA details for tested designs.
   1. Material:
      a. Galvanized Steel; SMACNA recommended and 0.022 inch minimum base metal thickness.
      b. Aluminum-Zinc-Coated Steel; SMACNA recommended and 0.022 inch minimum base metal thickness.
   2. Length: 8 to 12 ft long units.
   3. Joints: Butt joints with 12 inch concealed backing plate.

N. Steep Slope Roofing Fabrications:
   1. Material:
      a. Galvanized Steel; SMACNA recommended and 0.022 inch minimum base metal thickness.
      b. Aluminum-Zinc-Coated Steel; SMACNA recommended and 0.022 inch minimum base metal thickness.
      c. Stainless Steel: SMACNA recommended and 0.019 inch thickness.
   2. Eave and Rake Flashing: Extend 2 inches onto roof sheathing and 1/4 inch below sheathing.
   3. Valley Flashing: 24 inch minimum sheet width.

O. Roof Drain Flashing:
   1. Material:
      a. Stainless Steel: SMACNA recommended and 0.016 inch minimum thickness.

2.5 METALLIC-COATED STEEL FINISHES

A. Liquid Fluoropolymer Steel Sheet Coil Coatings: Three coat system; metallic finish, 70 percent PVDF resin by weight, minimum.
   1. Pencil Hardness, ASTM D3363, HB - H.
   2. Salt Spray Resistance, ASTM G85, 1,000 hours.
   3. Humidity Resistance, ASTM D2247, 1,000 hours.
   4. Dry Film Thickness: ASTM D1400, Paint system manufacturer recommended.
   5. Color: See Drawings and selected by Architect from manufacturers full range of custom options.
      a. CP-1, CP-2, CP-3, and CP-4 are each a different color selection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that roof openings, penetrations, and curbs through roof are solidly set, reglets in place, and nailing strips located.

B. Verify that roofing base flashings are in place, sealed, and secure.

3.2 PREPARATION

A. Paint concealed uncoated metal surfaces with 15 mil minimum thickness separation coating.

3.3 INSTALLATION

A. Installation Reference Standards:
   1. SMACNA Architectural Sheet Metal Manual.
   2. NRCA Roofing Manual.

B. Install flashing with concealed fasteners.

C. Secure fabrications with concealed fasteners where possible.

D. Apply plastic cement between metal and bituminous materials.

E. Separate dissimilar metals with separation coating or non absorptive gaskets.

F. Underlayment:
   1. Self-Adhered: Prime surfaces and install according to manufacturers instructions.

G. Slip Sheet: Apply on top of underlayment prior to installing sheet metal flashing work.

H. Counterflashing: Install counterflashing in contact with base flashing.
   1. Anchor counterflashing in reglets with wedges and apply sealant to joint per Section 079200.
   2. Drill counterflashing installed with surface mounted reglets so that anchorage fasteners go through the sheet metal. Apply sealant to back side of top edge and fasten reglet to wall construction. Apply sealant to top edge per Section 079200.
   3. Lap ends of counterflashing minimum 6 inches.

I. Secure gutters in place and install end caps with sealed joints. Install strainers in outlets.

J. Install downspouts plumb; anchored maximum 5 ft on center and within 2 ft of elbows and ends.
   1. Connect downspouts to underground drain piping with watertight joints.

K. Parapet Scuppers: Anchor securely in place and seal flanges watertight to wall face and to roof base flashing.

L. Edge Fascia Trim: Coordinate installation with roofing system to provide watertight protection for wall.
   1. Install trim in straight lines with accurately aligned profiles.
   2. Apply sealant to both edges of backing plates at joints.
   3. Install anchorage base and cleats with screws.
   4. Install fascia with continuous cleat.
   5. Install covers with full engagement of anchorage cleats and uniform joint width.

M. Copings: Coordinate installation with roofing system to provide watertight protection for wall.
   1. Install copings in straight lines with accurately aligned profiles.
   2. Apply sealant to both edges of backing plates at joints.
   3. Install anchorage base and cleats with screws.
   4. Install outer edge with continuous cleat.
   5. Install covers with full engagement of anchorage cleats and uniform joint width.

3.4 CLEANING

A. Remove soiling, stains, and hand prints.

B. Uncoated Galvanized Steel Sheet: Remove substances that would impair paint bond.

END OF SECTION

SECTION 077100

ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Parapet copings.
2. Roof edge flashings.

B. Principal Products:
1. Manufacturer engineered metal coping and roof edge systems.
2. Pipe penetration boxes.

C. Related Requirements.
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 075200: Modified bituminous membrane roofing.
5. Section 076200: Sheet Metal Flashing and Trim for shop fabricated metal flashing.
6. Section 079200: Joint sealants.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
1. Coordinate work results of this Section roofing and wall air and water barrier membrane for continuity of protection against water and air infiltration.

B. Preinstallation Meeting Attendees and Procedures:
1. Conduct meeting in conjunction with roofing preinstallation meeting.

1.3 ACTION SUBMITTALS

A. Product Data:
1. Manufactured coping system; include factory-fabricated termination and transition shapes.
2. Manufactured edge securement trim for low slope roofing; include factory fabricated termination and transition shapes.
3. Manufactured roof expansion joint system; include factory fabricated termination and transition shapes.
4. Pipe penetration boxes.
5. Initial selection color charts.

B. Shop Drawings: Show profiles and dimensions, joining methods, accessory item locations, anchorage and flashing details, and adjacent construction interfaces.

C. Samples: Specified metal and finish.
   1. Coping Covers: 12 inches long, minimum.
   2. Edge Securement Trim: 12 inches long, minimum.

1.4 INFORMATIONAL SUBMITTALS

A. Test and Evaluation Reports: Manufacturer or Independent testing agency test results showing wind uplift resistance as tested per ANSI/SPRI/FM 4435 ES-1.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

B. Warranty documentation.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Section 075200 roofing system installer.

B. Mockups: Provide components for exterior wall mockup assemblies.
   1. Approved mockups establish work results standard.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Prevent deformation, abrasion, and other damage during handling and installation.

B. Remove strippable finish protection film when recommended by manufacturer.

1.8 FIELD CONDITIONS

A. Existing Conditions: Verify field measurements before fabrication. Show field measurements on Shop Drawings.

1.9 WARRANTY

A. Include roof specialties in roof system warranty specified in Section 075200.

B. Manufacturer Warranty: Warrant against product and installation failure.
   1. Failure includes products blowing off, deforming, leaking, or causing membrane roofing failure when exposed to specified wind conditions.
   2. Warranty Period: 20 years.

C. Finish Warranty: Repair deteriorated finishes or replace components.
   1. Deterioration includes the following:
      a. Color Fading: More than 5 Hunter units per ASTM D2244.
      b. Chalking: More than No. 8 rating per ASTM D4214.
      c. Paint cracking, peeling or checking.
   2. Warranty Period: 20 years.

PART 2 - PRODUCTS

2.1 MANUFACTURED ROOF EDGE SYSTEMS

A. Roof Edge Requirements: Engineered systems tested per ANSI/SPRI/FM 4435 ES-1 for roofing membrane securement.

B. Manufactured Coping System: Snap-on cover with concealed gasketed splice plates that accommodate thermal movement and drain water out of system; no exposed fasteners.
   1. Manufacturers:
      a. ATAS International, Inc.
      b. Carlisle - Drexel Metals.
      c. Hickman Edge Systems LLC.
      d. Metal-Era, Inc.
      e. Petersen Aluminum.
      f. SAF Perimeter Systems.
   2. Configuration: Full width of wall.
   3. Cover Material: Galvanized steel or Aluminum-zinc-coated steel sheet, smooth finish.
   4. Cover Thickness: 0.063 inch.
   5. Cover Finish: PVDF coil coating.
   6. Cover Profile: Sloped toward roof.
   7. Cover Face: Drip edge.
   8. Cover Dimensions: See Drawings.
   9. Securement: Continuous cleats.
   10. Anchorage Fasteners: Stainless steel screws.
   11. Accessories: Factory fabricated units for terminations and changes in direction or plane.

C. Manufactured Roof Edge Trim: Snap-on cover with concealed gasketed splice plates that accommodate thermal movement and drain water out of system; no exposed fasteners.
   1. Manufacturers:
      a. ATAS International, Inc.
      b. Carlisle - Drexel Metals.
      c. Hickman Edge Systems LLC.
      d. Metal-Era, Inc.
      e. Petersen Aluminum.
      f. SAF Perimeter Systems.
   2. Profile: See Drawings.
   3. Cover Material: Galvanized steel and Aluminum-zinc-coated steel sheet, smooth finish.
   4. Cover Thickness: 0.063 inch.

5. Cover Finish: PVDF coil coating.
6. Cover Dimensions: See Drawings.
7. Securement: Continuous cleats.
8. Anchorage Fasteners: Stainless steel screws.
9. Accessories: Factory fabricated units for terminations and changes in direction or plane.

2.2 PIPE PENETRATION BOXES

A. Pipe Penetration Boxes: Insulated waterproofing aluminum housings with pipe penetrations.
   1. Manufacturers and Products:
      a. Roof Penetration Housings Roof VAULT.
   2. Construction: Galvanized or Aluminum-zinc coated steel welded body with powder coating.
   3. Penetration Configuration: As required for watertight installation with multiple penetrations.

2.3 PERFORMANCE

A. Structural Loads: See Structural Drawings.
   1. Wind Load:

B. Environmental Performance:
   1. Expansion and Contraction: Accommodate 180 degree F surface and 120 degree F ambient temperature differential without failure.

2.4 STAINLESS STEEL FINISHES

A. Stainless Steel: 4 finish.

2.5 GALVANIZED STEEL FINISHES

A. Coil Coating, Metallic: Three coat fluoropolymer finish with minimum 70 percent PVDF resin.
   1. Color: See Drawings and selected by Architect from manufacturers full range of custom options.
      a. CP-1, CP-2, CP-3, and CP-4 are each a different color selection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that wood blocking for support and anchorage is positioned correctly, securely fastened, level, and in plane.

B. Verify that installation surfaces are clean, dry, and free of foreign matter.

C. Verify that wall air barrier membrane extends under roof membrane flashing on the anchorage blocking.

D. Verify that roof membrane flashing extends over anchorage blocking and is securely fastened to the blocking.

3.2 INSTALLATION

A. Install roof specialties to provide weatherproof performance and prevent water intrusion into building enclosure elements or interior.

B. Copings:
1. Install copings in straight lines with accurately aligned profiles.
2. Install anchorage base and cleats with screws.
3. Install splice plates with continuous gaskets that prevent lateral movement of water to void below cover.
4. Install covers with full anchorage cleat engagement and uniform joint width.

C. Edge Securement Trim:
1. Install trim in straight lines with accurately aligned profiles.
2. Install anchorage base and cleats with screws.
3. Install splice plates with continuous gaskets that prevent lateral movement of water to void below cover.
4. Install covers with full anchorage cleat engagement and uniform joint width.

D. Pipe Penetration Boxes:
1. Install with flanges fully supported on structural deck.
2. Anchor units rigidly and securely.

3.3 PROTECTION

A. Protect roof specialties from foot traffic and damage.

3.4 CLEANING

A. Remove soiling and stains from installed components.

END OF SECTION

SECTION 077200

ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Manufactured roof curbs.
2. Roof hatch with ladder access to roof.

B. Principal Products:
1. Roof curbs.
2. Roof hatch.

C. Related Requirements:
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 055000: Roof access ladder.
5. Section 075200: Modified bituminous membrane roofing system.
6. Section 076200: Sheet metal flashing and trim.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
1. Coordinate roof accessories with roofing installation.

B. Preinstallation Meeting Attendees and Procedures:
1. Require roof hatch and accessory installer to attend roofing system preinstallation meeting.

1.3 ACTION SUBMITTALS

A. Product Data: Each roof accessory type and size.
1. Mounting type, materials, and hardware.
2. Initial selection color charts and Samples.

B. Shop Drawings: Plans, elevations, and attachment details.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

B. Warranty Documentation: For roof hatch.

1.5 WARRANTY

A. Manufacturer Warranty:
   1. Warrant roof hatches against product failure.
   2. Warranty Period: 5 years.

PART 2 - PRODUCTS

2.1 ROOF ACCESS HATCHES

A. Roof Personnel Access Hatches: Seamless welded construction.
   1. Manufacturers:
      a. Babcock-Davis.
      b. Bilco Company.
      c. Milcor Company.
      d. Nystrom, Inc.
      e. Williams Brothers Corporation of America.
   2. Size: 48 by 48 inches.
   3. Hatch Curb: Insulated double wall thermally broken construction with integral counterflashing and anchorage flanges.
      a. Material: Aluminum.
      b. Insulation: Polyisocyanurate or Extruded polystyrene, 3 inch thickness.
   4. Hatch Lid: Insulated double wall construction; single leaf.
      a. Material: Aluminum.
      b. Metal Thickness: Manufacturer recommended for design wind and live load criteria.
      c. Insulation: Same as curb.
   5. Hardware: Stainless steel.
      a. Automatic opening with hold open arm when latch is released.
      b. Latch Handles: Interior and exterior.
      c. Perimeter Gasket: Continuous.
      d. Locking: Interior padlock hasp.
   6. Steel Deck Anchorage: Stainless steel fasteners.
   7. Finish: Powder coating.
      a. Color: Architect selected.

B. Safety Posts: Hatch manufacturer telescoping aluminum tube.
   1. Anchorage: Supply components for attachment to roof access ladder.
   2. Finish:
      a. Safety yellow powder coating.

C. Hatch Mounted Safety Railings.
   1. Safety Railings: Hatch manufacturer standard or recommended systemsized to fit hatch, 29 CFR 1910.29 compliant.
      a. Posts and Rails: 1-1/2 inch diameter, 42 inch overall height above roof surface.
      b. Construction: Aluminum; pipes or tubes.
      c. Gate: Hinged, self-closing and self-latching.
      d. Gate Hardware: Corrosion resistant hinges and latching mechanism.
      e. Mounting Hardware: Corrosion resistant type for attachment to curb without penetrating roof membrane.
   2. Performance: Engineered and tested by manufacturer.
      a. Top Rail Concentrated Load: 200 pounds applied at any point in any direction.
      b. Top and Intermediate Rail Uniform Load: 50 plf applied in any direction.
      c. Concentrated and uniform loads need not be assumed to act concurrently.
   3. Finish: Safety yellow powder coating.

2.2 EQUIPMENT SUPPORT CURBS

A. Equipment Supports: Insulated prefabricated roof curbs.
   1. Manufacturers:
      a. Custom Curb Inc.
      b. Thybar Corp.
      c. Roof Products & Systems Corp.
   2. Curb Profile: Manufacturer standard compatible with roofing system.
   3. Insulation: Factory-insulated 1-1/2-inch-thick glass-fiber board insulation.
   4. Liner Sheets: Same material as curb, manufacturer standard thickness and finish.
   5. Nailers: Factory installed wood nailer along curb top flange, continuous around curb perimeter.
   6. Metal Counterflashing: Manufacturer standard; match curb metal and finish.
   7. Height: 12 inches above roof membrane, minimum.
   8. Length: See Drawings.
   9. Material: Aluminum.
   10. Finish: Powder coating.
      a. Color: Architect selected.

2.3 PERFORMANCE

A. Structural Loads: See Drawings.

B. Environmental Performance:
   1. Expansion and Contraction: Withstand 120 degree F ambient and 180 degree F surface thermal cycling without failure.

2.4 INSTALLATION MATERIALS

A. Protective Coating: Bituminous, ASTM D1187 Type 1 or II.

B. Anchorage Fasteners: Stainless steel screws.

2.5 FABRICATION

A. Fabricate curbs and hatches for 12 inch height above roof surface.

B. Where deck slope exceeds 1:48, fabricate tapered curbs to provide level lid.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that deck surfaces and roof openings are ready to receive Work of this Section.

3.2 PREPARATION

A. Apply protective coating on aluminum surfaces contacting cementitious materials, wood, and dissimilar metals.

3.3 INSTALLATION

A. Set curbs in full contact with roof deck.

B. Anchor roof accessories to resist specified loads.

C. Attach safety railings securely to hatch curbs.

D. Attach safety posts to roof access ladders.

E. Lubricate and adjust hardware for smooth, accurate operation.

F. Touch up damaged factory-applied finishes.

3.4 CLEANING

A. Cleaning: Remove soiling and stains.

END OF SECTION

SECTION 078400

FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Joint firestopping in or between fire-resistance-rated assemblies.
   2. Penetration firestopping in fire-resistance rated assemblies.

B. Principal Products:
   1. Joint firestopping.
   2. Penetration firestopping.

C. Related Requirements:
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 079200: Joint sealants.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
   1. Coordinate joint construction and penetrations to accommodate firestopping.

B. Scheduling: Notify testing agency seven days minimum before firestopping installation and provide access for inspection.

C. Preinstallation Meeting Attendees and Procedures:
   1. Conduct meeting one month, minimum, before starting Work of this Section.
   2. Additional Attendees: All installers of firestopping.
   3. Additional Agenda Items:
      a. Selection of products to meet source requirements.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Product characteristics, performance and limitation criteria.
   2. Submit descriptions of tested designs listed in submitted schedule.

B. Engineering Judgements: For conditions not covered by listed designs, provide judgements on systems or assemblies to meet fire protection requirements by a licensed professional engineer, for presentation to authority having jurisdiction.

C. Schedule: List opening locations and sizes, penetrating items, and assembly numbers.

1.4 INFORMATIONAL SUBMITTALS

A. Installer Certificate: Applicator approval letter from manufacturer and UL Qualified Firestop Contractor certification.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For Firestopping.

B. Warranty Documentation: For Firestopping.

1.6 QUALITY ASSURANCE

A. Qualifications:
   1. Specialty Firestop Contractor: Firm approved per FM Global 4991 or UL Qualified Firestop Program.
   2. Licensed Professionals: Registered in state in which Project is located.

B. Certifications: From Installer that firestopping is installed properly.

C. Field Samples: Construct example of exposed firestopping, minimum size of a standard installation. Demonstrate finish.
   1. Approved Samples establish work results standard.

1.7 FIELD CONDITIONS

A. Ambient Conditions: Perform Work within field conditions recommended by manufacturer of firestopping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Firestopping Product Manufacturers:
   1. 3M Fire Protection Products.
   2. Hilti, Inc.
   3. HOLDRITE.
   4. RectorSeal.
   5. Specified Technologies, Inc.

2.2 PENETRATION AND JOINT FIRESTOPPING

A. General:
   1. Firestopping: Materials manufactured and installed to resist the spread of fire, smoke, and gasses, that maintain the fire resistance ratings of the horizontal and vertical assemblies into which they are installed.
   2. Firestopping Materials and Systems: Compatible with each other and substrates where installed.

B. Fire Rated Wall Penetrations: Firestopping rated per ASTM E814 or UL 1479, positive pressure differential tested at 0.01 inch wg.
   1. Wall Types: Fire walls, Fire barriers, Smoke partitions, and Fire partitions.
   2. F-Rating: Equal to or greater than assembly where installed.

C. Fire Rated Joint Assemblies: Firestopping rated per ASTM E1966 or UL 2079.
   1. Fire Resistance Rating: Equal to or greater than assembly where installed.

D. Smoke Barriers: Firestopping rated per UL 1479.
   1. L-Rating: 0.30 inches wg, maximum; follow both of the following:
      a. 5.0 cfm per square foot of penetration opening, maximum.
      b. Cumulative leakage of 50 cfm per 100 sq. ft of floor or wall area, maximum.

E. Exposed Firestopping Materials: ASTM E84; Flame Spread 25, Smoke Developed 450, maximum.
   1. Color: Architect selected.

F. Accessory Materials: Firestopping manufacturer materials and components, approved by qualified testing and inspection agency, required for complete installation and fire rating of each firestopping assembly.
   1. Forming and Backing Materials:
      a. Rock wool and mineral wool insulation.
      b. Sealants.
      c. Form boards.
      d. Sealant backers or fillers.
      e. Temporary forms.
   2. Primers.
   3. Collars.
   4. Sleeves.

2.3 PERFORMANCE

A. Provide firestopping systems that are tested by a qualified testing agency acceptable to authorities having jurisdiction.

B. Mark firestopping systems with classification markings by one of the following, as acceptable to authorities having jurisdiction.
   1. UL Fire Resistance Directory.
   2. FM Global Building Materials Approval Guide.
   3. Intertek Group Directory of Building Products.

2.4 MATERIALS AND COMPONENTS

A. Collars and Sleeves: Factory assembled collars and sleeves, consisting of a metal outer sleeve lined with intumescent material, and flanges and gaskets to mount the unit and seal the ends.

B. Sealants:
   1. Latex: Single component, moisture resistant after curing.
   2. Silicone: Single component, neutral curing, pourable for horizontal and nonsag for vertical or sloped applications.

C. Intumescent Sheets: Composite sheets of galvanized steel and intumescent material designed for various opening sizes.

D. Wrap Strips: Foil faced, intumescent, elastomeric sheets.

E. Pillows: Compressible, intumescent cases.

F. Putties: Non-hardening, water-resistant, dielectric materials containing no inorganic fibers, silicones, or solvents.

G. Mortars: Prepackaged dry mixes of hydraulic cement, binders, and lightweight aggregates, mixed with water at installation site.

H. Silicone Foam: Multicomponent, site mixed elastomer that expands and cures in place as a stable, flexible foam.

2.5 MIXING

A. Mix materials to produce product characteristics required by manufacturer and testing agency.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Follow manufacturer requirements for each type of firestopping installation.

3.2 PREPARATION

A. Surface Preparation:
   1. Mask surfaces that will remain exposed after installation of firestopping.

3.3 INSTALLATION

A. Forming Materials: Install to retain and properly shape installed firestopping to achieve required fire rating.
   1. Remove combustible or temporary forming materials after curing firestopping.

B. Install firestopping materials to achieve required fire ratings.
   1. Apply materials to adhere to all contact surfaces.
   2. Fill all voids around openings.
   3. Finish firestopping that will be exposed after curing.

3.4 IDENTIFICATION

A. Permanently attach identification labels within 6 inches of edge of firestopping installations. Make labels visible toward the direction from which a person might approach to remove or alter the firestopping.

B. Provide labels that contain the following:
   1. Required Text: Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage.
   2. Contact information for installation Contractor.
   3. Firestopping testing agency design designation.
   4. Date of installation.
   5. Manufacturer name.
   6. Installer name.

3.5 FIELD QUALITY CONTROL

A. Field Tests and Inspections: Engage inspectors to perform tests and inspections and prepare reports. Allow inspectors access to Work areas.
   1. Failed Test Retest Cost: Contractor responsibility.
   2. Do not begin construction until inspectors have verified compliance of materials.
   3. Do not use materials that fail tests and inspections.

B. Tests and Inspections:
   1. Joint Firestopping: ASTM E2393.
   2. Penetration firestopping: ASTM E2174.

C. Repair or replace firestopping that is damaged or removed during inspection and testing.

D. Non-Conforming Work: Make corrections or replace, and retest.

E. Enclose firestopping after inspection reports confirm firestopping follows requirements.

3.6 CLEANING AND PROTECTION

A. Remove excess firestopping materials. Do not damage adjacent materials.

B. Protect firestopping installations from damage or deterioration. Repair or replace firestopping that is damaged or removed before Substantial Completion.

END OF SECTION

SECTION 079200

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Exterior joint sealants.
2. Interior joint sealants.

B. Principal Products:
1. Sealant compatible with existing brick veneer for restoration of joints.
2. Exterior sealants at new concrete walk.
3. Elastomeric sealants.
4. Mildew-resistant sealant.
5. Paintable sealant.

C. Related Requirements.
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 078400: Firestopping.
5. Section 088000: Glazing seals.
6. Section 092116: Acoustical sealant.
7. Section 093000: Tile control joints.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
1. Coordinate work of this section with work of other sections to provide weatherproof construction.

B. Preinstallation Meeting Attendees and Procedures:
1. Conduct meeting minimum one week before starting Work of this Section for exterior building sealants.
2. Additional Attendees:
   a. Installers of exterior building sealants.
   b. Glazing system installer.
   c. Air barrier installer.
   d. Roofing installer.
3. Additional Agenda Items:
   a. Selections of proprietary brands of exterior sealants.

b. Testing as needed to verify sealants on the exterior are compatible with surfaces.

1.3 ACTION SUBMITTALS

A. Submittal Procedures:
1. Provide submittals for all sealants, exterior and interior, in a single group, regardless of how many subcontractors will install sealants. Multiple submittals for sealants are not acceptable.

B. Product Data:
1. Each sealant type.
2. Expanding tape seals.
3. Initial selection color charts and Samples.

C. Joint Sealant Schedule:
1. Joint types.
2. Joint locations.
3. Sealant types and proprietary products.
4. Joint sealant colors.

D. Samples:
1. Cured sealant custom color ribbons; 12 inches minimum length.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates:
1. Provide written verification and list of products for Work under subsequent work packages that the same proprietary sealants will be used that were used for previous work packages.

B. Test and Evaluation Reports: Manufacturer or independent testing agency testing results:
1. Compatibility between sealant and substrate and priming requirements for each substrate and sealant; test per ASTM C794 .
2. Staining potential; test per ASTM C1248.

C. Field Quality Control Submittals: Field test and inspection reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data.

B. Warranty Documentation: Sealants.

1.6 QUALITY ASSURANCE

A. Qualifications:
   1. Installers: Five year documented experience with successful installations, and a trained member of SWR Institute.

B. Preconstruction Testing: Complete testing 30 days minimum before scheduled field installation or as recommended by manufacturer.
   1. Adhesion: Field Test exterior wall sealants for adhesion to metal, stone, masonry, and concrete per ASTM C794 to determine need for primer and substrate preparation.
   2. Staining: Laboratory Test exterior wall and interior tile sealants for staining of metal, stone, masonry, concrete, and substrates per ASTM C1248.

1.7 FIELD CONDITIONS

A. Ambient Conditions: Perform work within following limitations.
   1. Temperature: Perform work within sealant manufacturer published temperature limits.
   2. Precipitation: None occurring and none predicted within 24 hours.

1.8 WARRANTY

A. Manufacturer Warranty:
   1. Exterior Sealants: Warrant joint sealants will provide a watertight weather seal for the Warranty duration.
      a. Failure includes loss of elastomeric properties and required performance attributes.
      b. For porous substrates, failure also includes discoloration of substrates.
      c. Warranty Period, Urethanes: Five years.
      d. Warranty Period, Silicones: 20 years except as follows.

PART 2 - PRODUCTS

2.1 SEALANTS - GENERAL

A. Source Control: Provide one proprietary product for each type of sealant required, regardless of what Subcontractor installs the sealant.
   1. Installers of joint sealants under subsequent work packages must use the same proprietary sealants used in the first work package that includes joint sealants.

B. Select proprietary sealants for compatibility with other construction products that the sealants will contact.

C. Multiple colors may be required for exposed sealants to coordinate with substrate colors.

2.2 EXTERIOR EXPOSED NONTRAFFIC SEALANTS

A. Class 100/50 Silicone Nonstaining Sealant: Single component, nonsag, neutral curing; ASTM C920, Type S, Grade NS, Class 100/50, Use NT; classed as nonstaining when tested per ASTM C1248.
   1. Manufacturers and Products:
      a. Dow DOWSIL 790.
      b. GE Construction Sealants s SCS2700 SilPruf. LM.
      c. Pecora Corporation 890FST.
      d. Sika Corporation Sikasil WS-290 FPS.
      e. Tremco Spectrem 1.
   2. Colors: Architect selected.

2.3 EXTERIOR PEDESTRIAN TRAFFIC SEALANTS

A. Pourable Silicone Sealant: ASTM C920, Type S, Grade P, Class 100/50, Uses T, M, A, O.
   1. Manufacturers and Products:
      a. Dow DOWSIL 890 SL.
      b. Pecora Corporation 300SL or 322FC.
      c. Tremco Spectrem 900SL.
   2. Color: Architect selected.

2.4 EXTERIOR CONCEALED SEALANTS

A. Butyl Sealant: ASTM C1311.
   1. Manufacturers and Products:
      a. Pecora Corporation BC-158.
      b. Tremco Butyl Sealant.
      c. C.R. Laurence 888.

B. Class 25 Concealed Silicone Sealant: Single component, nonsag, acid curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
   1. Manufacturers and Products:
      a. Dow DOWSIL 999-A.
      b. Pecora Corporation 860.

2.5 EXTERIOR PREFORMED JOINT SEALS

A. Expanding Tape Seals: Precompressed, self expanding secondary seal behind liquid sealants, wax free.
   1. Manufacturers and Products:
      a. Emseal Joint Systems Backerseal.
   2. Tape Size: Manufacturer recommended for Project applications.

B. Expanding Tape Seals with Color Facing: Silicone-coated, compressed, adhesively attached, primary seal joint filler.
   1. Manufacturers and Products:
      a. Emseal Joint Systems Seismic Colorseal.
   2. Joint Size: Manufacturer recommended for Project applications.
   3. Installation Sealant: Silicone sealant in same color as facing.
   4. Color: Architect selected.

2.6 INTERIOR SEALANTS AND CAULKING

A. Interior Color Sealant: Silane-modified polymer sealant or urethane; ASTM C920, Type S, Grade NS, Class 50, Uses T and NT.
   1. Manufacturers and Products:
      a. Master Builders Solutions MasterSeal NP150.
      b. Pecora Corporation DynaTrol I XL Hybrid or DynaTrol I XL FTH.
      c. Tremco Dymeric 240FC.
   2. Colors: Architect selected.
   3. Applications:
      a. Interior joints noted as‘sealant’ on Drawings.
      b. Control and expansion joints in tile, except where sanitary sealant is shown.
      c. Terminations of wall coverings at tile and other materials.
      d. Sealant joints in ornamental metals.

B. Sanitary Sealant: Mildew-resistant silicone; ASTM C920, Type S, Grade NS, Class 25 or greater, Use NT.
   1. Manufacturers and Products:
      a. Dow DOWSIL 786 SILICONE SEALANT.
      b. Pecora Corporation; 898 NST.
      c. Tremco Incorporated Tremsil 200 Sanitary.
   2. Colors: Architect selected.
   3. Applications:
      a. Joints around plumbing fixtures and fittings.
      b. Joints between tile.
      c. Perimeters of lavatory counters.
      d. Control and expansion joints in food preparation areas.

C. Paintable Caulking: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
   1. Manufacturers and Products:
      a. Master Builders Solutions MasterSeal NP 520.
      b. Pecora Corporation AC20.
      c. Tremco Tremflex 834.
   2. Applications:
      a. Interior joints noted as 'caulking.'.
      b. Joints, crevices, and irregularities wider than hairline joints in or between dissimilar materials and painted surfaces.

c. Perimeters of door frames, frames and trim for glazing, and frames or trim for other wall and ceiling openings at painted surfaces.
d. Ceiling joints between structural precast concrete floor planks.

2.7 INSTALLATION ACCESSORIES

A. Primer: As required by sealant manufacturer.

B. Backer Rod: ASTM C1330, Type C, closed-cell or Type O, open-cell, manufacturer recommended types.

C. Bond Breaker Tape: Self-adhesive plastic tape to prevent sealant from adhering to back of joint.

D. Cleaners: Manufacturer recommended types.

E. Masking: Non-staining, self-adhesive.

2.8 MIXES

A. Multicomponent Sealants: Mix components immediately before use.

B. Field-Tinted Products: Mix colorant with base to uniform consistency and custom color.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean joint surfaces for optimum adhesion. Remove dirt, moisture, and incompatible substances.

B. Roughen vitreous and glazed joint surfaces as recommended by sealant manufacturer.

C. Remove laitance and form release agents from concrete.

D. Existing Joints: Cut out and remove existing joint sealants down to original substrate. Small amounts of elastomeric sealants left in surface irregularities of concrete and masonry may be left in place subject to Architect approval, provided that they are securely bonded to surface, are compatible with new sealant, and are tested to demonstrate that suitable adhesion with new sealant can be achieved. Where these conditions cannot be met, remove existing sealants completely.

E. Prime joint surfaces where recommended by sealant manufacturer. Protect adjacent surfaces from misapplication or spillage of primer.

F. Mask surfaces adjacent to joints to receive elastomeric sealants. Remove masking after tooling.

3.2 INSTALLATION

A. Installation Reference Standard: Follow ASTM C1193.

B. General Installation Requirements:
   1. Exterior Joint Sealants: Provide continuous, weatherproof seals to prevent infiltration of air and water through the joints.
   2. Interior Joint Sealants: Provide continuous seals to prevent air and smoke infiltration through the joints in which they are installed. Install sanitary sealant to prevent water infiltration.
   3. Appearance: Apply sealants with smooth surfaces free of gaps, voids, bubbles, lumps, crevices, runs, drips, striations, and other irregularities.

C. Set joint filler units at uniform depths in joints to support sealants and maintain proper sealant cross section shape and depth recommended by manufacturer for each application.

D. Set joint filler for sealant neck dimension 1/3 of joint width, maximum, or as recommended by manufacturer for application.

E. Install joint fillers under compression and friction fit. Do not install filler units that have absorbed water.
   1. Do not leave voids or gaps between ends of joint filler units.
   2. Do not stretch, twist, puncture, or tear joint fillers.
   3. Remove joint fillers that have absorbed moisture or which have ruptured gas cells and install suitable new fillers before sealant application.

F. Install bond breaker tape where shown on Drawings or where joint filler is not used to prevent adhesion to back of joint.

G. Deposit sealants in uniform, continuous ribbons without gaps or air pockets.

H. Tool sealants to ensure full adhesion. Form smooth, slightly concave surface.

I. Cure joint sealants.

3.3 FIELD QUALITY CONTROL

A. Field Tests and Inspections: Engage inspectors to perform tests and inspections and prepare reports. Allow inspectors access to work areas.
   1. Failed Test Retest Cost: Contractor responsibility.
   2. Do not use materials that fail tests and inspections.

B. Adhesion Testing: ASTM C1521, Method A.
   1. Perform two tests.
   2. Report Content:
      a. Presence of voids and discontinuities.

b. Sealant dimensions and seal shape.
c. Failures in adhesion and cohesion.

C. Non Conforming Work: Remove sealants that do not pass tests, reapply sealant, and retest.

3.4 CLEANING

A. Clean spills, misapplications, and material migrations immediately as they occur.

B. Clean marred surfaces by whatever means are necessary to eliminate evidence of spillage.

END OF SECTION

SECTION 081113

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Interior hollow metal doors and frames, HM-1.

B. Principal Products:
   1. Hollow metal doors and frames.

C. Related Requirements.
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 081416: Flush wood doors.
   5. Section 087100: Door hardware.
   6. Section 088000: Glazing.
   7. Section 099000: Painting and coatings.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordinate Work of this Section with masonry partitions, gypsum board partitions, glass and glazing, acoustic sealant, finish painting, and electrical power and control wiring.

B. Preinstallation Meetings:
   1. Conduct meeting one month, minimum, before starting Work of this Section.
   2. Attendees: partition and wiring installers.
   3. Agenda Items: fire rating, smoke rating, acoustic rating, and electrified hardware wiring requirements.

1.3 ACTION SUBMITTALS

A. Product Data.
   1. Hollow metal doors and frames.

B. Shop Drawings: Show construction, sizes, configurations, reinforcements, anchorages, installation details.
   1. Door elevations showing cutouts.
   2. Door frame elevations.
   3. Hardware mounting locations.

C. Door Schedule: Use same designations as Drawings.
   1. Show door and frame types, sizes, ratings, glazing, and hardware sets.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturers: SDI Certified.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
   1. Store and handle door frames maintaining spreader bars in place until installation.

1.6 FIELD CONDITIONS

A. Existing Conditions: Verify field measurements before fabrication. Show field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
   1. Ceco Door.
   2. Curries.
   3. Pioneer Industries.
   4. Republic Doors and Frames.
   5. Steelcraft.

2.2 INTERIOR DOORS AND FRAMES - EXTRA HEAVY DUTY

A. Doors: ANSI/SDI A250.8; 1-3/4 inch thick.
   1. Classification: Level 3, Physical Performance Level A.
   2. Model: 2, Seamless.
   3. Faces: Steel sheet, 0.042 inch thick, A60 coating.
   4. Fire Rated Door Core: Manufacturer standard.
   5. Non-Fire Rated Door Core: Kraft paper honeycomb.

B. Frames: ANSI/SDI A250.8.
   1. Material: Steel sheet, 0.053 inch thick, coating matching door face.
   2. Construction: Full profile welded, mitered corners.

2.3 OTHER FRAMES

A. Frames: ANSI/SDI A250.8; heavy duty.
   1. Application: Frames for borrowed lights.
   2. Material: Steel sheet, 0.053 inch thick, G90 coating.

3. Construction: Full profile welded, mitered corners.

2.4 LOUVERS

A. Interior Door Louvers: SDI 111.
   1. Type: Sight proof.
   2. Blade Profile: Inverted V.
   3. Blade Material: Steel sheet, 0.048 inch thick, coating matching door face.
   4. Frame Material: Steel sheet, 0.053 inch thick, coating matching door face.

2.5 PERFORMANCE

A. Fire Resistance:
   1. Test: NFPA 252 or UL 10C.
   2. Labeling: NFPA 80.
   3. Glazing Size Limits: NFPA 80.

B. Smoke Resistance:
   1. Test: UL 1784.
   2. Air Leakage: 3.0 cfm/sf, maximum leakage at 0.10 inch water pressure differential.

C. Environmental Performance: Exterior doors.
   1. Air Infiltration: AAMA/WDMA/CSA 101/I.S.2/A440 or NFRC 400; 0.20 cfm/sf, maximum at 1.57 psf pressure differential.
   2. Thermal Transmission: U-0.37, maximum.

2.6 MATERIALS

A. Steel Sheet: ASTM A653/A653M; hot-dip galvanealed or galvanized coating.

B. Insulation:
   1. Door Core: Polyurethane.
   2. Door Frame: ASTM C665, Type 1, unfaced mineral fiber.

C. Glass and Glazing: See Section 088000.

D. Fasteners: Manufacturer standard.
   1. Steel Coating: ASTM A153/A153M hot-dip galvanized.

2.7 FABRICATION

A. Fabricate doors and frames with hardware reinforcement welded in place.
   1. Reinforce doors and frames for surface applied hardware without through bolting.
   2. Hardware Locations: ANSI A250.8.

B. Door Edges: Beveled.

C. Frames within Masonry Openings:
   1. Protect frame hardware preparations with mortar guard boxes.
   2. Head: 2 inches aligning with coursing.

D. Attach astragal to one leaf of paired fire rated doors.

E. Reinforce frames wider than 48 inches with flush roll formed steel channels fitted tightly into frame head.

F. Prepare interior frames for silencers, except where sound seals or smoke seals are specified.
   1. Single Door Strike Jambs: 3 silencers.
   2. Paired Door Heads: 2 silencers.

G. Frame Mullions for Double Doors:
   1. Fixed: Profile matching jambs.
   2. Removable: See Section 087100.

H. Frame Transom Bars: Fixed, profile matching jamb.

I. Attach fire rating and smoke rating label to each fire rated door and frame.
   1. Fire Rated Doors: Fire rating label.
   2. Indicate temperature rise rating for stair doors.
   3. Smoke Rated Doors: Smoke rating label.

J. Fabrication Tolerances: SDI-117.

2.8 FINISHES

A. Primer Materials: ANSI/SDI A250.10, rust inhibiting.

B. Finish Materials: ANSI/SDI A250.3.
   1. Color: Architect selected.

C. Painting:
   1. Liquid.
   2. Powder.

2.9 ACCESSORIES

A. Removable Stops: Steel sheet, rolled channel shape, square corners.

B. Paired Door Astragals: Steel, T-shaped.

C. Galvanizing Repair Materials: ASTM A780/A780M.

D. Weatherstripping: See Section 087100.

E. Silencers: See Section 087100.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
   1. Verify opening sizes are within tolerance limits.

3.2 INSTALLATION

A. Install doors and frames. Follow ANSI/SDI A250.8.
   1. Fire Rated Doors: NFPA 80.

B. Interface with Other Work:
   1. Coordinate door frame and anchor installation with masonry, gypsum board, and concrete jamb construction.
   2. Coordinate door and frame installation with door hardware installation. See Section 087100. Install silencers before installing frame.
   3. Coordinate removable stop installation with glass installation. See Section 088000.

C. Install steel reinforcement channels between two abutting frames. Anchor channels to overhead structure and floor.

D. Install door louvers plumb and level.

E. Installation Tolerances: SDI-117.

F. Repair damaged zinc coatings. Follow ASTM A780/A780M.

G. Seal door frames to adjacent wall and partition construction. See Section 079200.

H. Field paint doors and frames. See Section 099000.

3.3 FIELD QUALITY CONTROL

A. Field Tests and Inspections: Engage inspectors to perform tests and inspections and prepare reports. Allow inspectors access to Work areas.
   1. Failed Test Retest Cost: Contractor responsibility.

B. Inspections:
   1. Fire Rated Doors: Inspect per NFPA 80.
   2. Egress Doors: Inspect per NFPA 101.

C. Reporting: Prepare code-required reports and submit to Owner.

D. Non-Conforming Work: Make corrections or replace, and retest.

3.4 ADJUSTING

A. Adjust door for smooth and balanced door movement.

B. Ensure fire rated doors self close and latch.

END OF SECTION

SECTION 081119

STAINLESS-STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Exterior stainless-steel metal doors and frames.

B. Principal Products:
   1. Stainless-steel door frames.
   2. Stainless-steel doors.

C. Related Requirements:
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 081113: Hollow metal doors and frames.
   5. Section 087100: Door hardware.
   6. Section 088000: Glazing.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordinate Work of this Section with masonry partitions, gypsum board partitions, glass and glazing, acoustic sealant, and electrical power and control wiring.

B. Preinstallation Meetings:
   1. Conduct meeting one month, minimum, before starting Work of this Section.
   2. Attendees: partition and wiring installers.
   3. Agenda Items: fire rating, smoke rating, acoustic rating, and electrified hardware wiring requirements.

1.3 ACTION SUBMITTALS

A. Product Data.
   1. Stainless steel doors and frames.

B. Shop Drawings: Show construction, sizes, configurations, reinforcements, anchorages, installation details.
   1. Door elevations showing cutouts.
   2. Door frame elevations.
   3. Hardware mounting locations.

C. Door Schedule: Use same designations as Drawings.
   1. Show door and frame types, sizes, ratings, glazing, and hardware sets.

D. Samples.
   1. Factory Finish: 3 by 5 inches, minimum applied to specified metal.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturers: SDI Certified.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
   1. Store and handle door frames maintaining spreader bars in place until installation.

1.6 FIELD CONDITIONS

A. Existing Conditions: Verify field measurements before fabrication. Show field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
   1. Ceco Door.
   2. Curries.
   3. Greensteel Industries, Ltd.
   4. Steelcraft.

2.2 EXTERIOR DOORS AND FRAMES - MAXIMUM DUTY

A. Doors: ANSI/SDI A250.8; 1-3/4 inch thick.
   1. Applications: Exterior.
   2. Classification: Level 4, Physical Performance Level A.
   3. Model: 2, Seamless.
   4. Faces: Stainless steel sheet, 0.050 inch thick, Type 316.
   5. Core: Insulated.
   6. Top and Bottom Edges: Closure channel, top edge sealed watertight.

B. Frames: ANSI/SDI A250.8.
   1. Material: Stainless steel sheet, 0.078 inch thick, Type 316.
   2. Construction: Full profile welded, mitered corners.
   3. Thermal Break: Manufacturer standard.

2.3 PERFORMANCE

A. Fire Resistance:
   1. Test: NFPA 252 or UL 10C.
   2. Labeling: NFPA 80.
   3. Glazing Size Limits: NFPA 80.

B. Smoke Resistance:
   1. Test: UL 1784.
   2. Air Leakage: 3.0 cfm/sf, maximum leakage at 0.10 inch water pressure differential.

C. Environmental Performance: Exterior doors.
   1. Air Infiltration: AAMA/WDMA/CSA 101/I.S.2/A440 or NFRC 400; 0.20 cfm/sf, maximum at 1.57 psf pressure differential.
   2. Water Penetration: AAMA/WDMA/CSA 101/I.S.2/A440; no leakage at 9.19 psf pressure differential.
   3. Thermal Transmission: U-0.37, maximum.

2.4 MATERIALS

A. Stainless Steel Sheet: ASTM A 240/A 240M, austenitic stainless-steel, Type 316.

B. Steel Sheet: ASTM A653/A653M; hot-dip galvanealed or galvanized coating.

C. Insulation:
   1. Door Core: Polyurethane.
   2. Door Frame: ASTM C665, Type 1, unfaced mineral fiber.

D. Glass and Glazing: See Section 088000.

E. Fasteners: Manufacturer standard, Type 316 stainless steel.

2.5 FABRICATION

A. Fabricate doors and frames with hardware reinforcement welded in place.
   1. Reinforce doors and frames for surface applied hardware without through bolting.
   2. Hardware Locations: ANSI A250.8.

B. Door Edges: Beveled.

C. Frames within Masonry Openings:
   1. Protect frame hardware preparations with mortar guard boxes.
   2. Head: 2 inches aligning with coursing.

D. Attach astragal to one leaf of paired fire rated doors.

E. Reinforce frames wider than 48 inches with flush roll formed steel channels fitted tightly into frame head.

F. Prepare interior frames for silencers, except where sound seals or smoke seals are specified.
   1. Single Door Strike Jambs: 3 silencers.
   2. Paired Door Heads: 2 silencers.

G. Frame Mullions for Double Doors:
   1. Fixed: Profile matching jambs.
   2. Removable: See Section 087100.

H. Frame Transom Bars: Fixed, profile matching jamb.

I. Attach fire rating and smoke rating label to each fire rated door and frame.
   1. Fire Rated Doors: Fire rating label.
   2. Indicate temperature rise rating for stair doors.
   3. Smoke Rated Doors: Smoke rating label.

J. Fabrication Tolerances: SDI-117.

2.6 STAINLESS STEEL FINISHES

A. Stainless Steel Finishes: Remove tool and die marks and stretch lines, or blend into finish. Grind and polish surfaces to produce uniform finish, free of cross scratches. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

B. Finish: No. 6, Dull Satin.

C. Grain Direction: For finishes exhibiting grain, run grain vertically on door faces and frame jambs.

2.7 ACCESSORIES

A. Removable Stops: Stainless steel sheet, rolled channel shape, square corners.

B. Paired Door Astragals: Steel, T-shaped.

C. Weatherstripping: See Section 087100.

D. Silencers: See Section 087100.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
   1. Verify opening sizes are within tolerance limits.

3.2 INSTALLATION

A. Install doors and frames. Follow ANSI/SDI A250.8.
   1. Fire Rated Doors: NFPA 80.

B. Interface with Other Work:
   1. Coordinate door frame and anchor installation with masonry, gypsum board, and concrete jamb construction.
   2. Coordinate door and frame installation with door hardware installation. See Section 087100. Install silencers before installing frame.
   3. Coordinate removable stop installation with glass installation. See Section 088000.

C. Install stainless steel reinforcement channels between two abutting frames. Anchor channels to overhead structure and floor.

D. Install door louvers plumb and level.

E. Installation Tolerances: SDI-117.

F. Seal door frames to adjacent wall and partition construction. See Section 079200.

3.3 FIELD QUALITY CONTROL

A. Field Tests and Inspections: Engage inspectors to perform tests and inspections and prepare reports. Allow inspectors access to Work areas.
   1. Failed Test Retest Cost: Contractor responsibility.

B. Inspections:
   1. Fire Rated Doors: Inspect per NFPA 80.
   2. Egress Doors: Inspect per NFPA 101.

C. Reporting: Prepare code-required reports and submit to Owner.

D. Non-Conforming Work: Make corrections or replace, and retest.

3.4 ADJUSTING

A. Adjust door for smooth and balanced door movement.

B. Ensure fire rated doors self close and latch.

END OF SECTION

SECTION 083100

ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Wall and ceiling access doors and panels.

B. Principal Products:
   1. Fire rated access doors.
   2. Non-rated access doors.

C. Related Requirements.
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 099000: Painting and coatings.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
   1. Coordinate sizes and locations with controls, valves, traps, dampers, cleanouts, and similar items requiring operation that are located behind finished surfaces.

B. Preinstallation Meeting Attendees and Procedures:
   1. Conduct meeting one week, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data: Sizes, types, finishes, hardware, scheduled locations, fire resistance listings, and details of adjoining Work.
   1. Initial selection color charts and Samples.

B. Shop Drawings:
   1. Locations and sizes of wall and ceiling access doors.
   2. Locations and sizes of floor doors and cellar doors.

C. Samples: 12 by 12 inch unit with required frame, anchors, and finish.
   1. Samples will be returned to Contractor for installation in Project.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations and sizes of access doors and panels.

B. Maintenance data.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Fire Rated Door Inspector: NFPA 80, section 5.2.3.1.

PART 2 - PRODUCTS

2.1 WALL AND CEILING ACCESS DOORS AND PANELS

A. Flush Steel Access Doors: Flush door with exposed frame; non rated.
   1. Manufacturers and Products:
      a. Babcock-Davis BNT.
      b. Karp Associates DSB-214SM.
      c. Milcor M.
      d. Nystrom NT.
      e. Williams Brothers Corporation of America WB Basic 300 Series.
   2. Material: Steel sheet; ASTM A879.
      a. Door: 0.062 inch thick, nominal.
      b. Frame: 0.062 inch thick, nominal.
      c. Finish: Factory primed.
   3. Material: Stainless steel sheet; ASTM A666, Type 304.
      a. Door and Frame: 0.063 inch thick, nominal.
      b. Finish: 4 satin polish.
   4. Hinges: Continuous.
   5. Latches: Keyed cam lock operation.
   6. Accessories:
      a. Gasketing.
      b. Masonry anchors.

B. Gypsum Board Access Doors: Flush door with frame flanges concealed by gypsum board joint finishing compound.
   1. Manufacturers and Products:
      a. Babcock-Davis BNW.
      b. Karp Associates KDW.
      c. Milcor DW.
      d. Nystrom NW.
      e. Williams Brothers Corporation of America WB DW 400 Series.
   2. Material: Steel sheet; ASTM A879.
      a. Door: 0.075 inch thick, nominal.
      b. Frame: 0.062 inch thick, nominal.

c. Finish: Factory primed.

3. Material: Stainless steel sheet; ASTM A666, Type 304.
   a. Door and Frame: 0.063 inch thick, nominal.
   b. Finish: #4 satin polish.
4. Hinges: Continuous.
5. Latches: Keyed cam lock operation.
6. Accessories:
   a. Gasketing.
   b. Masonry anchors.

C. Recessed Pan Access Doors: Pan door for gypsum board infill.
1. Manufacturers and Products:
   a. Babcock-Davis BRW.
   b. Karp Associates RDWPD.
   c. Milcor DWR.
   d. Nystrom RW.
   e. Williams Brothers Corporation of America WB RDW Series.
2. Door Recess: See Drawings.
3. Material: Galvannealed steel sheet; ASTM A653.
   a. Door and Frame: 0.062 inch thick, nominal.
   b. Finish: Factory primed.
4. Material: Stainless steel sheet; ASTM A666, Type 304.
   a. Door and Frame: 0.063 inch thick, nominal.
   b. Finish: #4 satin polish.
5. Hinges: Continuous.
6. Latches: Keyed cam lock operation.
7. Accessories:
   a. Gasketing.

D. Fire Rated Access Doors: Flush doors with concealed flange.
1. Manufacturers and Products:
   a. Acudor FB-5060-DW.
   b. Babcock Davis BUW.
   c. Nystrom IT.
2. Door Construction: Mineral fiber insulation enclosed in sheet metal.
3. Material: Galvannealed steel sheet; ASTM A653.
   a. Door: 0.04 inch thick, nominal.
   b. Frame: 0.064 inch thick, nominal.
   c. Finish: Powder coat primer.
4. Hinges: Concealed continuous type.
5. Latches: Self-closing, self-latching hardware, key operated.
6. Accessories:
   a. Gasketing.
   b. Masonry anchors.

2.2 PERFORMANCE

A. Fire Rated Access Door Construction: Conform to one of the following:
   1. Wall Access Doors: NFPA 252 or UL 10B.
   2. Ceiling Access Doors: ASTM E119 or UL 263.

B. Fire Rated Floor Door: Tested in accordance with NFPA 288.

C. Installed Fire Rated Access Door Assembly: Conform to NFPA 80 for rating shown on Drawings.

D. Attach label from agency approved by authority having jurisdiction to identify each fire rated access door.

2.3 MATERIALS

A. Steel Sheet: ASTM A1008, cold rolled.

B. Galvanized Steel Sheet: ASTM A653, Structural Quality.

C. Stainless Steel Sheet: ASTM A666; Type 304 or 316.

D. Aluminum Sheet: ASTM B209, manufacturer recommended alloy and temper.

2.4 FABRICATION

A. Welded Units: Fabricate units of continuous welded construction; weld, fill, and grind exposed joints flush and smooth.

B. Size Variations: Obtain acceptance of manufacturers standard size units which vary slightly from sizes shown or scheduled.

C. Provide manufacturers recommended anchorage fasteners for Project applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify rough openings for access doors and panels are correctly sized and located.

3.2 INSTALLATION

A. Secure frames rigidly in place, plumb and level in opening, with plane of door and panel face parallel to adjacent finished surface.
   1. Set concealed frame type units flush with adjacent finished surfaces.

B. Position units to provide convenient access to concealed Work requiring access.

C. Install fire rated units in accordance with NFPA 80 and requirements for fire listing.

3.3 FIELD QUALITY CONTROL

A. Field Tests and Inspections: Engage inspectors to perform tests and inspections and prepare reports. Allow inspectors access to Work areas.
   1. Retesting of Failed Tests: Performed at Contractor expense.

B. Fire Rated Access Panels: Inspect per NFPA 80, section 5.2.

C. Non Conforming Work: Remove and replace, and retest.

3.4 SCHEDULES

A. Corridor Ceilings: Gypsum board finish type, 24 x 24 inch size, screwdriver slot lock, primed and one coat baked enamel, White.

B. Washroom Walls Above Urinal Valves: Ceramic tile finish type, 12 x 12 inch size, cylinder lock, primed and two coat baked enamel to match ceramic tile color.

END OF SECTION

SECTION 083323

OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Overhead coiling doors at counters.

B. Principal Products:
   1. Overhead coiling door.

C. Related Requirements.
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 055000: Metal fabrications.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
   1. Coordinate installation of Work for support and anchorage of overhead coiling doors.
   2. Coordinate power and control wiring for electrically operated doors.

B. Preinstallation Meeting Attendees and Procedures:
   1. Conduct meeting one week, minimum, before starting Work of this Section.
   2. Additional Attendees: Installers of power and control wiring.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Each type of overhead coiling door, including tracks and hardware.
   2. Motor operators, controls, and obstruction detection devices.
   3. Initial selection color Samples.

B. Shop Drawings.
   1. Each overhead coiling door type.
   2. Support and anchorage details.

C. Door Schedule: Use same designations as Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

B. Warranty documentation.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Installers: Factory trained and authorized.

1.6 WARRANTY

A. Manufacturer Warranty: Warrant doors against defects in material and workmanship.
   1. Overhead Coiling Doors: Warrant against product failure.
      a. Failure Includes: Defects in materials and workmanship.
      b. Warranty Period: 5 years.

PART 2 - PRODUCTS

2.1 COILING COUNTER DOORS

A. Overhead Coiling Counter Doors: ANSI/DASMA 203.
   1. Manufacturers and Products:
      a. CornellCookson ESC20.
      b. McKeon CS3000 Series.
      c. Overhead Door Corp Model 657.
      d. Comparable product submitted and accepted prior to bidding.
   2. Operation Cycles: 20 cycles per day; 20,000 cumulative with tamperproof counter.
   3. Operation: Manual.
   4. Door Curtains:
      a. Slats: Flat.
      b. Stainless steel.
      c. Stainless Steel Finish: #4 satin polish.
   5. Locking: Padlockable side bolt.
      a. Provide interlock switches on motor operated units.
   6. Countertops:
      a. Material: Stainless steel, No. 4 finish; 14 gauge.

2.2 COMMON COMPONENTS

A. Hoods:
   1. Material, Finish: Same as curtain.
   2. Shape: See Drawings.

B. Bottom Bars:
   1. Material, Finish: Same as curtain.
   2. Type: Heavy duty.
   3. Supply sloped bottom bar at doorways with cross slope pavement.

C. Jamb Guides:
   1. Material, Finish: Same as curtain.
   2. Endlocks for Exterior Doors: As recommended for door size and operation.

D. Counterbalances: Adjustable enclosed helical torsion spring with grease sealed ball bearings or self lubricating graphite bearings for rotating members.

E. Locking: Architect selected.
   1. Provide interlock switches on motor operated units.

F. Manual Operators: Crank; 25 pound effort, maximum.

G. Motor Operators:
   1. Gear reduced type, mounted on head shaft.
   2. Sufficient power to operate door.
   3. Manually operable in case of power failure.
   4. Electrical Characteristics: 115 VAC, single phase.
   5. Disconnect Switch: Factory mounted on equipment.

H. Controls:
   1. Control Station: Surface mounted momentary contact push button station marked OPEN, CLOSE, and STOP.
   2. Automatic Re-Opening: Electric sensing strip on bottom bar and photoelectric sensors that immediately stop downward travel and reverse direction to fully opened position when obstruction is detected.

2.3 PERFORMANCE

A. Delegate overhead door design to manufacturer licensed Professional Engineer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that Work for structural support and anchorage is adequate.

3.2 INSTALLATION

A. Install doors plumb and parallel to supporting walls.

B. Anchor door tracks and operators rigidly and securely to prevent movement during door operation.

C. Install doors to operate smoothly without binding or distortion.

D. Install perimeter gaskets to provide continuous seals and for uniform compression.

E. Electrically Operated Doors:
   1. Make wiring connections between power supply and operator and between operator and controls.
   2. Adjust limit switches for accurate movement.
   3. Adjust obstruction detection controls.

3.3 FIELD QUALITY CONTROL

A. Field Tests and Inspections: Engage inspectors to perform tests and inspections and prepare reports. Allow inspectors access to Work areas.
   1. Failed Test Retest Cost: Contractor responsibility.

B. Testing:
   1. Test obstruction detection controls.

C. Non-Conforming Work: Make corrections or replace, and retest.

3.4 CLEANING

A. Clean factory primed surfaces of soiling and substances that affect subsequent finish painting.

3.5 CLOSEOUT ACTIVITIES

A. Demonstration: Coordinate demonstration with Owner staff.
   1. Demonstrate operation of electrically operated doors.

END OF SECTION

SECTION 084113

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Exterior storefront system, SF2, SF3.
2. Interior storefront system.

B. Principal Products:
1. Thermally broken storefront framing.
2. Non-thermally broken storefront framing.
3. Glazed aluminum doors.

C. Related Requirements:
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 055000: Steel supports.
5. Section 054000: Cold formed steel framing supports.
6. Section 076200: Sheet metal flashing and trim.
7. Section 084413: Glazed aluminum curtain walls.
8. Section 084513: Structured polycarbonate panel assemblies.
9. Section 085113: Operable windows in storefront.
10. Section 088000: Glazing.

1.2 REFERENCES

A. Reference Standards:
1. AAMA/WDMA/CSA 101/I.S.2/A440, North American Fenestration Standard.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting Attendees and Procedures:
1. Conduct meeting one month, minimum, before starting Work of this Section.
2. Additional Agenda Items:
   a. Coordination with curtain wall installation.
   b. Hardware not supplied under this Section.

1.4 ACTION SUBMITTALS

A. Special Requirements: Transmit required submittals concurrently with submittals for the curtain wall system.

B. Product Data:
1. Storefront framing, included tested performances.
2. Glazed aluminum entrance doors.
3. Entrance door hardware specified in this Section.
4. Initial selection color charts and Samples.

C. Shop Drawings:
1. Plans and elevations for each installation.
2. Anchorage and support details.
3. Details for continuity of air and water barrier with adjacent construction.
4. Flashing and internal drainage details.
5. Thermal expansion and deflection provision details.
6. Trim details.
7. Extruded sill and stool details.
8. Sizes and locations of loads transmitted to building structural supports.

D. Schedules: Door hardware coordinated with hardware specified in Section 087100.

E. Samples:
1. Typical Framing Member: 12 inches long in required finish.
2. Door: 12 by 12 inch bottom door corner showing construction, reinforcement, glazing, and weatherstripping.

1.5 INFORMATIONAL SUBMITTALS

A. Delegated Design Submittals: Design calculations.

B. Field Quality Control Submittals: Field test and inspection reports.

C. Manufacturer Reports: Field instruction, test, and inspection reports.

D. Qualification Statements: Testing agency and Installer.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For framing system, doors, hardware, finishes, and structural sealant.

B. Warranty Documentation: For framing system, doors, hardware, and finishes.

1.7 QUALITY ASSURANCE

A. Qualifications:
   1. Installer: NACC certified contractor, AGMT certified glazing technicians, certified under National Glass Association Certified Glass Installer Program, or Manufacturer trained or approved.
   2. Licensed Professionals: Registered in state in which Project is located.

B. Field Samples: Construct aluminum storefront, 200 sf, minimum size.
   1. Photograph installation of sill flashing with end dams and other concealed components. Provide access to record photographs when requested by Architect.
   2. Field Samples are subject to Field Quality Control testing to verify performance.
   3. Approved Samples establish Work results standard.

C. Mockups: Demonstrate product assembly, intersections, and terminations.
   1. Build mockup of typical wall area as shown on Drawings.
   2. Mockup Location: Field.
   3. Mockups are subject to Field Quality Control testing to verify performance.
   4. Photograph installation of sill flashing with end dams and other concealed components. Provide access to record photographs when requested by Architect.
   5. Approved mockups establish work results standard.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements: Follow AAMA CW-10.
   1. Protect aluminum components from bending and from impact, abrasion, and other harmful contacts.
   2. Maintain factory applied finish protections intact until removal is recommended by manufacturer.

1.9 FIELD CONDITIONS

A. Existing Conditions: Verify field measurements before fabrication. Show field measurements on Shop Drawings.

1.10 WARRANTY

A. Manufacturer Warranty: Repair or replace components that do not follow requirements or that fail in materials or workmanship.
   1. Failures under design conditions specified in performance requirements.
      a. Breakage or loss of glass.
      b. Permanent deformation of components or assemblies.
      c. Water penetration through fixed glazing.
      d. Failure of hardware specified in this Section.
   2. Warranty Period: Five years.

B. Finish Warranty: Repair deteriorated finishes or replace components.
   1. Deterioration includes the following:
      a. Color Fading: More than 5 Hunter units per ASTM D2244.
      b. Chalking: More than No. 8 rating per ASTM D4214.
      c. Paint cracking, peeling or checking.
   2. Warranty Period: 20 years.

PART 2 - PRODUCTS

2.1 ALUMINUM-FRAMED STOREFRONTS

A. Exterior Storefront, SF2: Thermally broken extruded aluminum framing system, reinforced to support loads.
   1. Manufacturers and Products:
      a. Kawneer Trifab 451T.
      b. YKK AP YES 45 TU Front.
   2. Construction: Thermally broken.
   3. Glass Installation: 4-side captured, installed from exterior.
   4. Glazing Plane: Front.
   5. Profile Dimensions: See Drawings.
   6. Finish: Color anodized.
      a. Color: Kawneer; Dark Bronze Anodized, basis of design.

B. Exterior Storefront, SF3: Thermally broken extruded aluminum framing system, reinforced to support loads.
   1. Manufacturers and Products:
      a. Kawneer Trifab 601T.
      b. YKK AP YES 600.
   2. Construction: Thermally broken.
   3. Wind Borne Debris: Impact Resistant.
   4. Glass Installation: 4-side captured, installed from exterior.
   5. Glazing Plane: Front.
   6. Profile Dimensions: See Drawings.
   7. Finish: Mica coating.
      a. Color: Kawneer; Dark Bronze Anodized, basis of design.

C. Interior Storefront: Nonthermal extruded aluminum framing system, reinforced to support loads.
   1. Manufacturers and Products:
      a. Kawneer Trifab 451.
      b. YKK AP YES 45 TU Front.
   2. Glazing Plane: Front.
      a. See Drawings for location of front glazing plane.
   3. Profile Dimensions: See Drawings.
   4. Finish: Color anodized.
      a. Color: Kawneer; Dark Bronze Anodized, basis of design.

D. Sills: Extruded aluminum, finished same as framing.

E. Stools: Extruded aluminum finished same as framing.
   1. Include integral gypsum board receiver channel.

F. Formed Trim: Aluminum sheet, 0.060 inch minimum thickness, finished same as framing.

G. Exposed Flashing: Aluminum sheet, 0.060 inch minimum thickness, finished same as framing.

2.2 GLAZING

A. Glass: Section 088000.

B. Glazing Gaskets:
   1. Material: Silicone or EPDM or other synthetic rubber; PVC not permitted.
   2. Color: Black.

C. Structural Silicone Glazing Sealant: Manufactured specifically for structural adhesion of glass; ASTM C1184.
   1. Manufacturers and Products:
      a. Dow DOWSIL 995 or DOWSIL 983.
      b. GE Momentive UltraGlaze SSG4000 or UltraGlaze SSG4000AC.
      c. Tremco Proglaze SSG or Proglaze II.

D. Weatherseal Sealant: Section 079200.

2.3 GLAZED ALUMINUM DOORS

A. Doors: Manufactured by storefront manufacturer, sized to coordinate with storefront framing. Provide internal reinforcement needed for hardware.
   1. Thickness: 2 inches.
   2. Stiles: See Drawings.
   3. Bottom Rail: ADA-compliant.
   4. Exterior Doors: Thermally broken, prepared for 1-inch insulating glass.
   5. Interior Doors: Prepared for 1/4 inch glass.
   6. Glazing Beads: Beveled profile.
   7. Manufacturer Name Plates: Not permitted.
   8. Finish: Match framing.
      a. Color: Architect selected.

2.4 HARDWARE

A. Hardware: See Section 087100 for items not specified in this Section.

B. Weatherstripping: Manufacturer standard replaceable head and jamb type that meets performance requirements.

C. Interior Door Silencers: Manufacturer standard replaceable resilient type.

D. Removable Mullions: Extruded aluminum finished same as framing; BHMA A156.3.

2.5 OPERABLE WINDOWS

A. Operable Windows: See Section 085113.

2.6 PERFORMANCE

A. Delegate exterior storefront system design to manufacturer licensed Professional Engineer.

B. Structural Design Criteria: See Structural Drawings.

C. Structural Loads: See Drawings and Applicable code compliant.
   1. Include loads from window cleaning and maintenance equipment.

D. Deflection: At design wind speed.
   1. Perpendicular to Wall: 1/180 of span, not to exceed 3/4 inch edge of glass deflection.
   2. Parallel to Glass Plane: 1/360 of span, not to exceed 1/8 inch.

E. Seismic Movement: Design to criteria stated on Structural Drawings.

F. Wind Movement: Design to criteria stated on Structural Drawings.

G. Structural Movement: Design to criteria stated on Structural Drawings.

H. Structural Silicone Glazing Criteria: Limit working stress of sealants to 20 psi.
   1. Tensile Strength: 50 psi minimum tested per ASTM C1135.
   2. Adhesion: 60 lb/inch minimum tested per ASTM C1401, Destructive Test Method A, Appendix X2.

I. Environmental Performance:
   1. Air Infiltration: ASTM E283.
      a. Fixed Framing and Glass: 0.06 cfm/sq. ft., maximum at 6.24 lbf/sq.ft. static air pressure differential.
      b. Single Doors: 1.00 cfm/sq. ft., maximum at 1.57 lbf/sq.ft. static air pressure differential.
   2. Water Penetration: ASTM E331.
      a. Fixed Framing and Glass: No water at 10.0 lbf/sq.ft. static air pressure differential.
   3. Thermal Transmission: NFRC 100; 0.40 U-Factor, maximum.
   4. Condensation Resistance: NFRC 500; 45, minimum.
   5. Solar Heat Gain Coefficient: NFRC 200; 0.40, maximum.
   6. Expansion and Contraction: Withstand thermal cycling over 120 degrees F ambient temperature and 180 degrees F on material surfaces.

J. Accessibility Requirements: Applicable provisions in Department of Justice publication 2010 ADA Standards for Accessible Design, ICC/ANSI A117.1, and state accessibility code.

2.7 MATERIALS

A. Aluminum: Manufacturer recommended alloy and temper.
   1. Extruded Profiles: ASTM B221.
   2. Sheet and Plate: ASTM B209.
   3. Structural Items: ASTM B308.

B. Steel Reinforcement: Galvanized or manufacturer recommended coating to prevent galvanic reaction with aluminum framing.
   1. Structural Shapes: ASTM A36/A36M.
   2. Cold-Rolled Shapes: ASTM A1008/A1008M.
   3. Hot-Rolled Shapes: ASTM A1011/A1011M.

C. Concealed Flashing: Dead soft stainless steel 0.018 inch thick.

D. Assembly Sealants: Silicone.
   1. VOC Content: 250 g/L, maximum.

E. Fasteners: Stainless steel.
   1. Where exposed or semi-exposed, use countersunk flathead screws finished to match adjacent surface.

F. Separation Coating: Bituminous paint; SSPC-Paint 12.

G. Concrete Anchors: Manufacturer recommend expansion or screw anchors.

2.8 FABRICATION

A. Fabricate components for uniform 1/2 inch shim space at jambs and heads.

B. Fabricate joints flush, hairline, and weathertight.

C. Provide internal reinforcements needed for performance requirements.

D. Maintain thermal break of exterior assemblies.

E. Conceal fasteners and attachments from view.

F. Provide flat closure plates for open channel perimeter frame members.

G. Fabricate sheet metal components per SMACNA Architectural Sheet Metal Manual.
   1. Fabricate trim and flashing in lengths to minimize number of joints.
   2. Fabricate trim to uniform sizes and profiles with smooth, flat surfaces free of oil-canning or other distortion.

3. Fabricate trim for concealed anchorage where possible.

H. Prepare components in shop for door hardware installation.

I. Weep Holes: Round or oblong, manufacturer recommended size; manufacturer recommended spacing.

J. Provide continuity of drainage for condensation and infiltrated water to system weeps.

K. Glazing Option: Framing and doors may be factory glazed before delivery to Project site.

L. Fabrication Tolerances:
1. Square: 1/8 inch maximum difference in diagonal measurements.
2. Corner, Face Offsets: 1/16 inch maximum.
3. Bow in Framing Members: 1/16 inch maximum.
4. Joints: Hairline at permanent connections, 1/16 inch maximum at removable glazing stops.

2.9 FINISHES

A. Anodizing: AAMA 611 Class I or AAMA 612 with electrodeposition organic seal.
1. Color: Dark bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that adjoining air and water barriers are in place and extend into rough openings beyond location of exterior joint seals.

3.2 PREPARATION

A. Separation Coating: Apply bituminous paint to surfaces that will contact concrete, dissimilar metals, masonry, and preservative-treated wood, or provide other permanent isolation material.

3.3 INSTALLATION

A. Do not install damaged or substandard components, including items that have deficient finishes.
1. Corrections in field are subject to Architect approval before installation.
2. Return components to factory for remanufacturing or refinishing, or provide new components to replace items that cannot be satisfactorily corrected in field.

B. Install steel reinforcement channels between two abutting frames. Anchor channels to overhead structure and floor.

C. Coordinate attachment and sealing of exterior assemblies to air and water barrier materials to ensure continuity.

D. Install assemblies plumb, level, square, and accurately aligned.

E. Anchor assemblies securely to structural elements.

F. Set sill members and flashing with two lines of continuous sealant per Section 079200.

G. Install flashing with end dams. Lap joints minimum 6 inches and seal watertight. Secure flashing with non-penetrating anchorages.

H. Fill shim spaces with mineral fiber or spray polyurethane foam insulation.

I. Remove debris, dirt, aluminum scraps, and other materials from glazing channels.

J. Doors: Install for smooth operation and weathertight fit.
   1. Hardware: Mount with concealed fasteners.
   2. Set thresholds in continuous bed of sealant or gasketing and fasten rigidly in place so they do not rock or cause noise when walked on.

K. Verify that internal drainage and weeps are fully functional.

L. Glass Installation: Section 088000.

M. Tolerances:
   1. Variance from Plumb, Plane, and Level: 1/8 inch in 10 feet and 1/4 inch in 40 feet, maximum.
   2. Variance in Alignment Between Adjacent Units: 1/16 inch, maximum .

3.4 STRUCTURAL SILICONE GLAZING

A. Installation Standard: Follow ASTM C1401.

B. Clean bond surfaces. Prime per structural sealant manufacturer recommendations.

C. Mask adjacent surfaces to prevent misapplication.

D. Install structural sealant to form continuous, watertight seals.

E. When sealant has fully cured, remove temporary glass retainers and fill voids with sealant.

F. Install weatherseal sealant per Section 079200 to produce weatherproof joints.

3.5 OPERABLE WINDOWS

A. Install operable windows parallel to plane of storefront.

B. Seal perimeter joint watertight.

3.6 FIELD QUALITY CONTROL

A. Field Tests and Inspections: Engage agency to perform tests and inspections and prepare reports. Allow inspectors access to Work areas.
   1. Failed Test Retest Cost: Contractor responsibility.
   2. Verify that sealants have cured fully before testing.
   3. Perform tests before interior wall finishes installation.

B. Water Spray Test: AAMA 501.2.
   1. Initial Test Location: Architect designated area of storefront.
   2. Additional Locations: Test three additional Architect designated areas during remaining installation period.
   3. Pass Criteria: No water penetration.

C. Air Infiltration Testing: AAMA 503.
   1. Locations: Water resistance test locations.
   2. Test Pressure: Specified in Performance article.
   3. Allowable Leakage: 1.0 times rate specified in Performance article per ASTM E283.

D. Structural Sealant Testing: ASTM C1401, Destructive Test Method A, Appendix X2.
   1. Initial Test Location: Architect designated area of storefront.
   2. Additional Locations: Test three additional Architect designated areas on each elevation during remaining installation period.
   3. Pass Criteria: Specified in Performance article.
   4. Repair areas damaged by testing.

E. Non-Conforming Work: Make corrections or replace, and retest.

3.7 ADJUSTING

A. Adjust doors and door hardware for smooth operation and secure weathertight closure.

B. Adjust door closers per ADA requirements.

C. Adjust operable windows and hardware for smooth operation and secure, weathertight closure.

3.8 CLEANING

A. Remove protective material from factory finished aluminum surfaces.

B. Clean exposed surfaces. Remove excess sealants, and glazing materials.

3.9 PROTECTION

A. Protect storefronts from contaminating substances and glass damage.

END OF SECTION

SECTION 084413

GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Glazed aluminum curtain wall systems, CW1.

B. Principal Products:
1. Curtain wall systems.

C. Related Requirements.
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 055000: Steel supports.
5. Section 054000: Cold formed steel framing supports.
6. Section 076200: Sheet metal flashing and trim.
7. Section 084113: Aluminum framed entrances and storefront.
8. Section 084513: Structured polycarbonate panel assemblies.
9. Section 088000: Glazing.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting Attendees and Procedures:
1. Conduct meeting one week and one month, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data:
1. Curtainwall framing, included tested performances.
2. Sealant for structural glazing.
3. Glazed aluminum entrance doors.
4. Entrance door hardware specified in this Section.
5. System finishes with initial selection color charts and samples.

B. Shop Drawings:
1. Plans and elevations for each installation.
2. Anchorage and support details.
3. Sizes and locations of loads transmitted to building structural supports.

4. Air and water barrier continuity details. Show adjacent construction.
5. Flashing and internal drainage details.
6. Provisions for thermal expansion, deflection, and building movement.
7. Details of sill extensions.
8. Interior extruded window treatment head pocket detailss.
9. Formed sheet metal trim details.

C. Schedules: Door hardware coordinated with hardware specified in Section 087100.

D. Samples:
1. Typical Framing Member: 12 inches long in required finish.
2. Trim: Extruded sill extension in required finish.
3. Door: 12- by 12-inch bottom door corner showing construction, reinforcement, glazing, and weatherstripping.

1.4 INFORMATIONAL SUBMITTALS

A. Delegated Design Submittals: Design calculations.

B. Field Quality Control Submittals: Field test and inspection reports.

C. Manufacturer Reports: Field instruction, test, and inspection reports.

D. Qualification Statements: Installer and Testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For framing system, doors, hardware, finishes and structural sealant.

B. Warranty Documentation: For curtain wall systems and finishes.

1.6 QUALITY ASSURANCE

A. Qualifications:
1. Installer: NACC certified contractor, AGMT certified glazing technicians, certified under National Glass Association's Certified Glass Installer Program, or Certified by curtain wall manufacturer.
2. Licensed Professionals: Registered in state in which Project is located.
3. Testing Agency: Qualified per ASTM E699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.

B. Field Samples: Construct curtain wall system, 200 sf, minimum size.
1. Photograph installation of sill flashing with end dams and other concealed components. Provide access to record photographs when requested by Architect.
2. Field samples are subject to Field Quality Control testing to verify performance.
3. Approved samples may remain as part of Work.

4. Approved samples establish work results standard.

C. Mockups: Demonstrate product assembly, intersections, and terminations.
1. Build mockup of typical wall area as shown on Drawings.
2. Mockups are subject to Field Quality Control testing to verify performance.
3. Photograph installation of sill flashing with end dams and other concealed components. Provide access to record photographs when requested by Architect.
4. Approved mockups establish work results comparison standard.
5. Remove mockups when acceptable to Architect.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements: AAMA CW-10.
1. Store aluminum components elevated above grade, protected from precipitation and stormwater runoff.
2. Protect aluminum components from bending and from impact, abrasion, and other harmful contacts.
3. Maintain factory applied finish protections intact until time removal is recommended by manufacturer.

1.8 FIELD CONDITIONS

A. Existing Conditions: Verify field measurements before fabrication. Show field measurements on Shop Drawings.

B. Sealants: Minimum 40 deg F application temperature.

1.9 WARRANTY

A. Manufacturer Warranty: Repair or replace components that do not follow requirements or that fail in materials or workmanship.
1. Failures under design conditions specified in performance requirements.
a. Breakage or loss of glass.
b. Permanent deformation of components or assemblies.
c. Water penetration through fixed glazing.
d. Failure of hardware specified in this Section.
2. Warranty Period: Ten years.

B. Manufacturer Finish Warranty: Repair deteriorated finishes or replace components.
1. Deterioration includes the following:
a. Color Fading: More than 5 Hunter units per ASTM D2244.
b. Chalking: More than No. 8 rating per ASTM D4214.
c. Paint cracking, peeling or checking.
2. Warranty Period: 20 years.

PART 2 - PRODUCTS

2.1 ALUMINUM-FRAMED CURTAINWALL

A. Aluminum-Framed Curtainwall, CW: Extruded aluminum, thermally broken framing system.
   1. Manufacturers and Products:
      a. Kawneer 1620UT System.
      b. Comparable product submitted and accepted prior to bidding.
   2. System Assembly: Site assembled construction.
   3. Construction: Thermally broken.
   4. Water Management: Pressure equalized system with internal weep drainage and mullion baffles to eliminate stack-effect air movement within internal spaces.
   5. Glass Installation: 4-side captured.
   6. Profile Dimensions: See Drawings.
   7. Finish: Color anodized.
      a. Color: Kawneer; Dark Bronze Anodized, basis of design.

2.2 GLAZING

A. Glass: See Section 088000.

B. Glazing Gaskets:
   1. Material: Silicone; PVC not permitted.
   2. Color: Black.

C. Structural Silicone Glazing Sealant: Manufactured specifically for structural adhesion of glass; ASTM C1184.
   1. Manufacturers and Products:
      a. Dow DOWSIL 995 or DOWSIL 983.
      b. GE Momentive UltraGlaze SSG4000.
      c. Tremco Proglaze SSG or Proglaze II.
   2. Color: Architect selected.

D. Weatherseal Sealant: See Section 079200.

2.3 GLAZED ALUMINUM DOORS AND HARDWARE

A. Doors: Provide internal reinforcement needed for hardware.
   1. Thickness: 2 inches.
   2. Stiles: Medium.
   3. Bottom Rail: ADA-compliant.
   4. Exterior Doors: Thermally broken, prepared for 1-inch insulating glass.
   5. Interior Doors: Prepared for 1/4 inch glass.
   6. Glazing Beads: Beveled profile.
   7. Manufacturer Name Plates: Not permitted.

B. Hardware: See Section 087100 for for items not specified in this Section.

C. Weatherstripping: Manufacturer standard replaceable type that meets performance requirements.

D. Interior Door Silencers: Manufacturer standard replaceable resilient type.

E. Removable Mullions: Extruded aluminum finished same as framing; BHMA A156.3.

2.4 PERFORMANCE

A. Delegate curtainwall system design to manufacturer licensed Professional Engineer.

B. Structural Design Criteria: See Structural Drawings.

C. Structural Loads: See Structural Drawings; include loads from window cleaning and maintenance equipment.

D. Wind Movement: Design to criteria stated on Structural Drawings.

E. Structural Movement: Design to criteria stated on Structural Drawings.

F. Structural Silicone Glazing Criteria: Limit working stress of sealants to 20 psi.
   1. Tensile Strength: 50 psi minimum tested per ASTM g C1135.
   2. Adhesion: 60 lb/inch minimum tested per ASTM C1401, Destructive Test Method A, Appendix X2.

G. Allowable Deflection: At design wind speed.
   1. Perpendicular to Wall: 1/180 of span, not to exceed 3/4 inch edge of glass deflection.
   2. Parallel to Glass Pane: 1/360 of span, not to exceed 1/8 inch.
   3. Cantilever:

H. Environmental Performance:
   1. Air Infiltration: ASTM E283.
      a. Fixed Framing and Glass: 0.06 cfm/sq. ft., maximum at 6.24 lbf/sq.ft. static air pressure differential.
      b. Single Doors: 1.00 cfm/sq. ft., maximum at 1.57 lbf/sq.ft. static air pressure differential.
   2. Water Penetration: ASTM E331.
      a. Fixed Framing and Glass: No water at 10.0 lbf/sq.ft. static air pressure differential.
   3. Thermal Transmission: NFRC 100; 0.40 U-Value, maximum.
   4. Condensation Resistance: NFRC 500; 45, minimum.
   5. Solar Heat Gain Coefficient: NFRC 200; 0.40, maximum.
   6. Expansion and Contraction: Withstand thermal cycling over 120 degrees F ambient temperature and 180 degrees F on material surfaces.

I. Accessibility Requirements: Applicable provisions in Department of Justice publication 2010 ADA Standards for Accessible Design, ICC/ANSI A117.1, and state accessibility code.

2.5 MATERIALS

A. Aluminum: Manufacturer recommended alloy and temper.
   1. Extruded Profiles: ASTM B221.
   2. Sheet and Plate: ASTM B209.
   3. Structural Items: ASTM B308.

B. Steel Reinforcement: Galvanized or Manufacturer recommended coating to prevent galvanic reaction with aluminum framing.
   1. Structural Shapes: ASTM A36/A36M.
   2. Cold-Rolled Shapes: ASTM A1008/A1008M.
   3. Hot-Rolled Shapes: ASTM A1011/A1011M.

C. Trim, Exposed Flashing: Minimum 0.060 inch aluminum sheet in same finish as curtainwall framing.

D. Concealed Flashing: Dead-soft stainless steel 0.018 inch thick.

E. Assembly Sealants: Silicone.
   1. VOC Content: 250 g/L, maximum.

F. Fasteners: Stainless steel.
   1. Where exposed or semi-exposed, use countersunk flathead screws finished to match adjacent surface.

G. Separation Coating: Bituminous paint; SSPC-Paint 12.

H. Concrete Anchors: Group 1 stainless steel expansion anchors.

2.6 FABRICATION

A. Fabricate components for uniform 1/2 inch shim space at jambs and heads.

B. Fabricate joints flush, hairline, and weathertight.

C. Provide internal reinforcements needed for performance requirements.

D. Maintain thermal break of exterior assemblies.

E. Conceal fasteners and attachments from view.

F. Fabricate sheet metal components per SMACNA Architectural Sheet Metal Manual.
   1. Fabricate trim and flashing in lengths to minimize number of joints.

2. Fabricate trim to uniform sizes and profiles with smooth, flat surfaces free of oil-canning or other distortion.
3. Fabricate trim for concealed anchorage where possible.

G. Prepare components in shop for door hardware installation.

H. Provide continuity of drainage for condensation and infiltrated water to system weeps.

I. Glazing Option: Framing and doors may be factory glazed before delivery to Project site.

J. Fabricate system to accept operable windows so that glass in closed position is in plane with curtainwall glass.

K. Fabrication Tolerances:
1. Square: 1/8 inch maximum difference in diagonal measurements.
2. Corner, Face Offsets: 1/32 inch maximum.
3. Bow in Framing Members: 1/16 inch maximum.
4. Joints: Hairline at permanent connections, 1/32 inch maximum at removable glazing stops.

2.7 FINISHES

A. Anodizing: AAMA 611 Class I or AAMA 612 with electro-deposition organic seal.

B. Mica Coating: Three- coat fluoropolymer finish with minimum 70 percent PVDF resin by weight in color coat and clear top coat; AAMA 2605.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that vertical alignment is within adjustment tolerance of curtainwall system.

B. Verify that adjoining air and water barriers are in place and extend into rough openings beyond location of exterior joint seals.

3.2 PREPARATION

A. Separation Coating: Apply bituminous paint to aluminum surfaces that will contact concrete, dissimilar metals, masonry, and preservative-treated wood, or provide other permanent isolation material.

3.3 INSTALLATION

A. Do not install damaged or substandard components, including items that have deficient finishes.
   1. Corrections in field are subject to Architect approval before installation.
   2. Return components to factory for remanufacturing or refinishing, or provide new components to replace items that cannot be satisfactorily corrected in field.

B. Coordinate attachment and sealing of exterior assemblies to air and water barrier materials to ensure continuity.

C. Install assemblies plumb, level, square, and accurately aligned.

D. Anchor assemblies securely to structural elements.

E. Set sill members and flashing with two lines of continuous sealant per Section 079200.

F. Install flashing with end dams. Lap joints minimum 6 inches and seal watertight. Secure flashing with non-penetrating anchorages.

G. Fill shim spaces with mineral fiber or spray polyurethane foam insulation.

H. Remove debris, dirt, aluminum scraps, and other materials from glazing channels.

I. Verify that internal drainage and weeps are fully functional.

J. Glass Installation: Section 088000.

K. Tolerances:
   1. Variance from plumb, plane, and level: 1/8 inch in 10 feet and 1/4 inch in 40 feet, maximum.
   2. Variance in Alignment Between Adjacent Units: 1/16 inch, maximum, and 1/8 inch if units are separated by a reveal.

3.4 STRUCTURAL SILICONE GLAZING

A. Clean bond surfaces. Prime per structural sealant manufacturer recommendations.

B. Mask adjacent surfaces to prevent misapplication.

C. Install structural sealant to form continuous, watertight seals.

D. When sealant has fully cured, remove temporary glass retainers and fill voids with sealant.

E. Install weather seal sealant per Section 079200 to produce weatherproof joints.

3.5 ENTRANCE DOOR INSTALLATION

A. Install doors for smooth operation, weathertight fit, and secure locking.

B. Hardware: Mount with concealed fasteners.

C. Set thresholds in continuous bed of sealant or gasketing and fasten rigidly in place so they do not rock or cause noise when walked on.

D. Adjust closers per ADA requirements.

3.6 OPERABLE WINDOW INSTALLATION

A. Install windows for smooth operation, weathertight fit, and secure latching.

B. Adjust opening limits as directed by Owner.

3.7 FIELD QUALITY CONTROL

A. Field Tests and Inspections: Engage agency to perform special inspections and tests, and to prepare reports. Allow inspectors access to work areas.
   1. Failed Test Retest Cost: Contractor responsibility.
   2. Verify that sealants have cured fully before testing.
   3. Perform tests before interior wall finishes installation.

B. Water Spray Test: AAMA 501.2.
   1. Initial Test Location: Architect designated area of storefront.
   2. Additional Locations: Test three additional Architect designated areas during remaining installation period.
   3. Pass Criteria: No water penetration.

C. Air Infiltration Testing: AAMA 503.
   1. Locations: Water resistance test locations.
   2. Test Pressure: Specified in Performance article.
   3. Allowable Leakage: 1.0 times rate specified in Performance article per ASTM E283.

D. Structural Sealant Testing: ASTM C1401, Destructive Test Method A, Appendix X2.
   1. Initial Test Location: Architect designated area of curtain wall.
   2. Additional Locations: Test three additional Architect designated areas on each elevation during remaining installation period.
   3. Pass Criteria: Specified in Performance article.
   4. Repair areas damaged by testing.

E. Non-Conforming Work: Remove and replace, and re-test.

3.8 CLEANING

A. Remove protective material from factory finished aluminum surfaces.

B. Wash surfaces as recommended by storefront and sealant manufacturers.

C. Remove excess sealant.

END OF SECTION

SECTION 084513

STRUCTURED-POLYCARBONATE-PANEL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Aluminum-framed assemblies glazed with translucent polycarbonate panels, SF-1.

B. Principal Products:
   1. Aluminum framing.
   2. Polycarbonate glazing.
   3. Accessory materials.

C. Related Requirements:
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 084113: Aluminum storefronts.
   5. Section 084413: Glazed aluminum curtain wall.
   6. Section 076200: Sheet metal and flashing.
   7. Section 079200: Joint sealant.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Conference: Conduct conference one month, minimum before starting the work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum components of panel assemblies.

B. Shop Drawings: For panel assemblies.
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Include details of provisions for assembly expansion and contraction and for draining moisture within the assembly to the exterior.

C. Samples: In manufacturer's standard size.
   1. For each type of structured-polycarbonate panel.
   2. For each type of exposed finish for framing members.

D. Fabrication Samples: Of each framing system intersection and adjacent panels, made from 12-inch lengths of full-size framing members and showing details of the following:
   1. Joinery.
   2. Anchorage.
   3. Expansion provisions.
   4. Translucent polycarbonate panels.
   5. Glazing installation components.
   6. Flashing and drainage.

E. Submittal: For panel assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Delegated Design Submittal: Provide delegated design analysis data signed and sealed by manufacturer professional engineer.

B. Qualification Data: For qualified Installer.
   1. For Professional Engineer.
   2. For Installer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for products included in assemblies for this Project, including the following:
   1. Flame Spread and Smoke Developed (UL 723).
   2. ASTM D635; Burn Extent.
   3. ASTM D2244; Color Difference.
   4. ASTM E84; Smoke Density.
   5. ASTM E84; Interior Flame Spread.
   6. AST D2244; Color Difference.
   7. UL-972; Impact Strength.
   8. ASTM C 297 after aging by ASTM D 1037; Bond Tensile Strength.
   9. ASTM D 1002; Bond Shear Strength.
   10. ASTM E330; Uniform Static Air Pressure.
   11. ASTM E695; Static Loading.
   12. NFRC 700; NFRC System U-Factor Certification.
   13. NFRC 202; NFRC Visible Light Transmittance.
   14. NFRC or Calculations; Solar Heat Gain Coefficient.
   15. AAMA 1503; Condensation Resistance Factor.
   16. ASTM E 330; Structural Performance.
   17. ASTM E 331; Water Penetration.
   18. ASTM E2707; Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure.
   19. ASTM E413; Sound Transmission Loss (STC).

D. ICC Evaluation Service Report (ICC-ESR) for compliance with IBC Building Code.

E. Field quality-control reports.

F. Sample Warranties: For special warranties.

G. Submit installer certificate signed by installer, certifying compliance with project qualification requirements.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For panel assemblies to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Professional Engineer Qualifications: Experienced in the design of similar work and licensed in the Commonwealth of Pennsylvania.

B. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of panel assemblies that fail in materials or fabrication workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
      c. Water leakage.
   2. Warranty Period: Five years from date of Substantial Completion.

B. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace translucent polycarbonate panels that exhibit defects in materials or workmanship within specified warranty period.
   1. Defects include, but are not limited to, the following:
      a. Delamination.
      b. Color changes exceeding requirements.
      c. Fiberbloom: Development of a rough exterior surface.
      d. Losses in light transmission beyond 6 percent from original when measured after 10 years according to ASTM D 1003.
   2. Warranty Period: 10 years from date of Substantial Completion.
   3. Warranty Period for Hail Damage: Five years from date of Substantial Completion for hail stone penetration exceeding requirements.

C. Special Aluminum-Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.
   1. Failures include, but are not limited to, checking, crazing, peeling, chalking, and fading of finishes.
   2. Warranty Period: 20 years from date of Substantial Completion.

D. Installer's Warranty: Installer agrees to repair or replace components of panel assemblies that fail in installation workmanship within specified warranty period.
   1. Failures include, but are not limited to, installation defects and water leakage.
   2. Warranty Period: 3 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TRANSLUCENT POLYCARBONATE-PANEL ASSEMBLIES

A. Single Source Responsibility: Provide an assembly of two independent insulated glazing panes in one integrated assembly, incorporated into a complete aluminum frame system that has been tested and warranted by the manufacturer as a single source system.

B. Manufacturer and Product:
   1. Kingspan; Uniquad. 4.25 inch System.
   2. Comparable product submitted and accepted prior to bidding.

2.2 ALUMINUM FRAMING SYSTEMS

A. Components: Manufacturer's standard extruded-aluminum members of thickness required and reinforced as required to support imposed loads.

B. Aluminum: Alloy and temper recommended in writing by manufacturer for type of use and finish indicated.
   1. Sheet and Plate: ASTM B 209.
   2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
   3. Extruded Structural Pipe and Tubes: ASTM B 429.
   4. Structural Profiles: ASTM B 308.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims.

D. Fasteners and Accessories: Manufacturer's standard, corrosion-resistant, nonstaining, and nonbleeding fasteners and accessories; compatible with adjacent materials.
   1. At closures, retaining caps, or battens, use ASTM A 193, 300 series stainless-steel screws.
   2. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
   3. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended in writing by manufacturer.

E. Anchor Bolts: ASTM A 307, Grade A, galvanized steel.

F. Concealed Flashing: Corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

G. Exposed Flashing and Closures: Aluminum sheet not less than 0.040-inch thick, finished to match framing.

H. Framing Gaskets: Manufacturer's standard gasket system with low-friction surface treatment designed specifically for retaining translucent polycarbonate panels.

I. Frame-System Sealants: As specified in Section 079200 "Joint Sealants."

J. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 TRANSLUCENT GLAZING

A. Translucent Panels: Constructed of double glazed polycarbonate with tight cell sizes not exceeding 0.18 inch wide. Cells of size greater than 0.18 inch shall not be acceptable.

B. Pane Thickness: 10 mm.

C. Glazing Panel Thickness: 4.25 inches.

D. Panel End Seals: Continuous factory-applied, self-adhered micro-filter tape over open panel cells.

E. Provide manufacturer standard, co-extruded ultra violet protective layer.

2.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 to design translucent polycarbonate-panel assemblies.

B. Provide translucent glazing panel system registered in the NFERC Product Directory. Provide Product Certified Product Directory number.

C. Structural Loads: See Drawings.

D. Deflection Limits:
   1. Vertical Panel Assemblies: Limited to 1/120 of clear span for each assembly component of aluminum framing and panel joint in accordance with IBC Table 1604.3 for exterior walls with flexible materials.
   2. Overhead Panel Assemblies: Limited to 1/60 of clear span for each assembly component of aluminum framing and panel joint in accordance with IBC Table 1604.3, footnote h.

E. Structural-Test Performance: Panel assemblies tested according to ASTM E 330, as follows:
   1. When tested at positive and negative wind-load design pressures, assemblies do not show evidence of deflection exceeding specified deflection limits.
   2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not show evidence of material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
   3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Hail Stone Impact Resistance: Panel assemblies that resist penetration by hail stone smaller than 1-3/16 inch diameter, impacting panel surface at a final velocity up to 44 ft/sec per ASTM E 822.

G. Panel Clip Performance: Corrosion-resistant clips tested to meet a minimum 90 lb/sq. ft. wind uplift when tested according to ASTM E 330.

H. Panel End Seals: Continuous factory-applied, self-adhered micro-filter tape over open panel cells.

I. Panel Performance:
   1. Smoke-Developed Index: 450 or less according to ASTM E 84, or 75 or less according to ASTM D 2843.
   2. Flame Spread: 25 or less when tested according to ASTM E 84.
   3. Combustibility Classification: Class CC1 based on testing according to ASTM D 635.
   4. Interior Finish Classification: Class A based on testing according to ASTM E 84.
   5. Visible Light Transmittance (VT) Loss: 6 percent maximum over 10 years, measured in accordance with ASTM D 1003.
   6. Thermal Aging: When exposed to 300 deg F for 25 minutes, interior and exterior panels tested in accordance with ASTM D 2244.
      a. Color Retention: 0.75 (Hunter) units ΔE maximum fade.
      b. Color Darkening: 0.3 (Hunter) units ΔL maximum.
      c. Cracking or Crazing: None when exposed to 300 deg F for 25 minutes.
      d. Delamination: None when exposed to 300 deg F and 0 deg F for 25 minutes.
   7. Impact Resistance: No failure at an impact of 500 lbf when tested according to ASTM E 695.
   8. Concentrated Loading: No damage while applying a load of 600 lbf over 1 sq. ft. when tested according to OSHA, 29 CFR Section 1910.23(e)(8); and no damage while applying a load of 400 lbf over 3 inches in diameter according to ASTM E 661.

J. Water Penetration under Static Pressure: Provide panel assemblies that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 330 at a minimum negative load of -105 PSF and positive load of 130 PSF.

K. Thermal Movements: Allow for thermal movements from ambient- and surface-temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.5 FABRICATION

A. Fabricate aluminum components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fitted joints with ends coped or mitered.
   3. Internal guttering systems or other means to drain water passing through joints and moisture migrating within assembly to exterior.

B. Fabricate aluminum sill closures with weep holes and for installation as continuous component.

C. Reinforce aluminum components as required to receive fastener threads.

2.6 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two-coat AAMA 2604, fluoropolymer containing not less than 70 percent PVDF resin by weight in color coat finish. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   1. Color and Gloss: Kingspan; Quaker Bronze, basis of design.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions.
   1. Do not install damaged components.
   2. Fit joints between aluminum components to produce hairline joints free of burrs and distortion.
   3. Rigidly secure nonmovement joints.
   4. Install anchors with separators and isolators to prevent metal corrosion, electrolytic deterioration, and immobilization of moving joints.
   5. Seal joints watertight unless otherwise indicated.

B. Metal Protection: Where aluminum components will contact dissimilar materials, protect against galvanic action by painting contact surfaces with corrosion-resistant coating or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.

C. Install components plumb and true in alignment with established lines and elevations.

D. Erection Tolerances: Install panel assemblies to comply with the following maximum tolerances:
   1. Alignment: Limit offset from true alignment to 1/32 inch where surfaces abut in-line, edge-to-edge, at corners, or where a reveal or protruding element separates aligned surfaces by less than 3 inches; otherwise, limit offset to 1/8 inch.
   2. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet, but no greater than 1/2 inch over total length.

3.3 CLEANING

A. Pre-test, then clean exposed panels per manufacturer instructions. Refer to and follow manufacturer instructions for use of cleaning products or solvents.

END OF SECTION

SECTION 085113

ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Operable aluminum window inserts in exterior storefront systems.

B. Principal Products:
1. Aluminum windows.
2. Hardware.
3. Insect screens.

C. Related Requirements.
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 072100: Thermal insulation.
5. Section 072700: Air barriers.
6. Section 076200: Sheet metal flashing and trim.
7. Section 079200: Joint sealants.
8. Section 084113: Aluminum framed entrances and storefronts.
9. Section 084413: Glazed aluminum curtain walls.
10. Section 088000: Glazing.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
1. Coordinate window installation with construction of rough openings and air barrier application.

B. Preinstallation Meeting Attendees and Procedures:
1. Conduct meeting one week, minimum, before starting Work of this Section.
2. Additional Agenda Items:
   a. Preparatory work performed under other sections.
   b. Provisions for anchoring, flashing, weeping, and sealing windows.

1.3 ACTION SUBMITTALS

A. Product Data:
1. Windows.

2. Hardware.
3. Glass.
4. Initial selection color charts and Samples.

B. Shop Drawings.
1. Plans, elevations, and sections for each window type, showing the following:
a. Anchorage and support details.
b. Air barrier continuity details.
c. Thermal expansion provisions.
d. Flashing and drainage details.
e. Trim details.
f. Extruded sill and stool details.
g. Glass material identification, including strength, tint, and coating.

C. Window Schedule: Use same designations shown on Drawings.

D. Samples:
1. Typical frame member 12 inches long in required finish.
2. Color sample, manufacturer standard size.
3. Hardware: Full sized Samples. Approved Samples may not be incorporated into Work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Statements: Installer.

B. Test and Evaluation Reports: Independent testing agency test results showing compliance with requirements.

C. Field Quality Control Submittals: Field test and inspection reports.

D. Manufacturer Reports: Field instruction, test, and inspection reports.

E. Qualification Statements: fabricator, installer, and testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For aluminum windows.

B. Warranty Documentation: For aluminum windows.

1.6 QUALITY ASSURANCE

A. Qualifications:
1. Installer: NACC certified Contractor, AGMT certified glazing technicians, certified under National Glass Association, Certified Glass Installer Program, or Window manufacturer certified.

B. Field Samples: Install one window.
   1. Field Sample Testing: See Field Quality Control article.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect factory finished aluminum surfaces with wrapping and strippable coating.

1.8 WARRANTY

A. Manufacturer Warranty:
   1. Aluminum windows: Warrant against product failures:
      a. Defective material or workmanship, excessive deflection, water leakage, condensation, and air infiltration.
      b. Operation and hardware failure.
      c. Insulating glass seal failure, including misting or dusting between panes.
   2. Warranty Period:
      a. Window: 10 years.
      b. Insulating Glass: 10 years.

B. Finish Warranty: Repair deteriorated finishes or replace components.
   1. Deterioration includes the following:
      a. Color Fading: More than 5 Hunter units per ASTM D2244.
      b. Chalking: More than No. 8 rating per ASTM D4214.
      c. Paint cracking, peeling or checking.
   2. Warranty Period: 20 years.

PART 2 - PRODUCTS

2.1 ALUMINUM WINDOWS

A. Aluminum Windows: AAMA/WDMA/CSA 101/I.S.2/A440.
   1. Manufacturers and Products:
      a. Kawneer; GlassVent.
      b. Comparable product submitted and accepted.
   2. Framing: Thermally broken.
      a. Frame Depth: 2-1/2 inches.
   3. Sills, Stools, Head Trim, Jamb Trim, and Receptors: Extruded aluminum finished to match windows.
      a. Shapes and Sizes: See Drawings and Required for complete, weatherproof installation.
   4. Operation: Combination of the following types; locations shown on Drawings.
      a. Hopper.
   5. Glass: See Section 088000.
   6. Projecting Window Hardware:
      a. Sash lock: Lever handle with cam lock. Furnish pole handle of size to allow access to sash locks and operable windows.

b. Operator: Geared rotary handle fitted to projecting sash arms with limit stops, removable.
c. Sash Arms: Zinc plated steel, friction pivot joints with nylon bearings, removable pivot clips for cleaning.
d. Opening Limit: 4 inches, provide custodial key release.
1) Egress Windows: Unlimited opening.
e. Exposed Hardware Finish: Architect selected.
7. Exterior Finish: Color anodized.
a. Color: Kawneer; Dark Bronze Anodized, basis of design.
8. Interior Finish: Color anodized.
a. Color: Kawneer; Dark Bronze Anodized, basis of design.

B. Insect Screens:
1. Screen Frames: Rolled aluminum, with mitered joints, sized to fit operable unit.
2. Screen Mesh: Aluminum wire fabric, 18 by 16 mesh.
a. Mesh Color: Architect selected.

C. Weatherstripping: Manufacturer standard type, full perimeter of each operating sash.

D. Accessories: Hardware, fastenings, clips, fins, anchors, glazing beads and other appurtenances necessary for complete installation.

2.2 PERFORMANCE

A. Structural Loads: See Structural Drawings and Applicable code and ASCE 7 compliant.
1. Wind Design Pressure: See Structural Drawings.
2. Test Method: ASTM E330, Procedure A.
3. Proof Load: 150 percent of design wind load.
4. Deflection: Limited to flexure limit of glass in any direction, with full recovery of glazing materials.

B. Performance Ratings: AAMA/WDMA/CSA 101/I.S.2/A440.
1. Performance Class: AW.

C. Environmental Performance:
1. Air Infiltration: ASTM E283, 0.1 cfm/sf of window area at 6.24 psf pressure differential.
2. Water Penetration: ASTM E331; none, at pressure differential defined by AAMA 101.
3. Thermal Transmission: NFRC 100, whole window; U- 0.38, maximum.
4. Condensation Resistance: AAMA 1503, whole window; 45 CRF, minimum.
5. Solar Heat Gain Coefficient: NFRC 200, whole window; 0.40 SHGC, maximum.
6. Expansion and Contraction: Withstand 120 degree F ambient and 180 degree F surface thermal cycling without failure.
a. Resist buckling stress on glass, joint sealant failure, damaging loads on structural elements, damaging loads on fasteners, and reduction in performance.

D. Accessibility Requirements: Applicable provisions in Department of Justice publication 2010 ADA Standards for Accessible Design, ICC/ANSI A117.1, and state accessibility code.

2.3 MATERIALS

A. Aluminum Extrusions: ASTM B221.

B. Aluminum Sheet: ASTM B209.

C. Assembly Sealants: Silicone.
   1. VOC Content: 250 g/L maximum.

D. Fasteners: Stainless steel.
   1. Where exposed or semi-exposed, use countersunk flathead screws finished to match adjacent surface.

E. Separation Coating: Bituminous paint; SSPC-Paint 12.

F. Concrete Anchors: Group 1 stainless steel expansion anchors.

G. Internal Reinforcement: Hot-dip galvanized steel structural shapes or cold formed sheet fabrications.

2.4 FABRICATION

A. Fabricate window components for uniform 1/2 inch shim space at jambs and heads.

B. Fabricate joints flush, hairline, and weathertight.

C. Provide internal reinforcements needed for loading requirements and anchorage to substrate.

D. Maintain exterior assemblies thermal break.

E. Conceal fasteners and attachments from view.

F. Fabricate sheet metal components per SMACNA Architectural Sheet Metal Manual.
   1. Fabrication Length: Minimize trim and flashing joints.
   2. Fabricate trim to uniform sizes and profiles with smooth, flat surfaces free of oil canning or other distortion.
   3. Fabricate trim for concealed anchorage where possible.

G. Prepare components for hardware installation.

H. Weatherstrip operable units.

I. Provide continuity of drainage for condensation and infiltrated water to system weeps.

J. Separation Coating: Apply bituminous paint to surfaces that will contact concrete, dissimilar metals, masonry, and preservative-treated wood, or provide other permanent isolation material.

K. Glazing: Factory glazed.

L. Fabrication Tolerances:
1. Square: 1/8 inch maximum variation in diagonal measurements.
2. Corner, Face Offsets: 1/32 inch maximum.
3. Bow in Framing Members: 1/16 inch maximum.
4. Joints: Hairline at permanent connections, 1/32 inch maximum at removable glazing stops.

2.5 FINISHES

A. Anodizing: AAMA 611 Class I or AAMA 612 with electro-deposition organic seal.
1. Color: Kawneer; Dark Bronze Anodized, basis of design.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify wall openings are ready to receive windows.
1. Verify adjoining air barriers are in place and extend into rough openings beyond exterior joint seals.

3.2 INSTALLATION

A. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

B. Install windows plumb and level, free of warp or twist.

C. Maintain dimensional tolerances and alignment with adjacent Work.

D. Install sills, stools, and sill end angles.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Coordinate attachment and seal of perimeter air barrier and vapor retarder materials.

G. Fill shim spaces with mineral fiber or spray polyurethane foam insulation.

H. Install perimeter sealant per Section 079200.

I. Install operating hardware.

3.3 INSTALLATION TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 feet noncumulative or 1/8 inches per 10 feet, whichever is less.

3.4 FIELD QUALITY CONTROL

A. Field Tests and Inspections: Engage inspectors to perform tests and inspections and prepare reports. Allow inspectors access to Work areas.
   1. Retesting of Failed Tests: Performed at Contractor expense.
   2. Verify that sealants have cured fully before testing.
   3. Perform tests before interior wall finishes installation.

B. Window Testing, General: Test three windows of each type per AAMA 502.
   1. Test Locations: Acceptable to Architect.
   2. Test Types: Water resistance and Air infiltration.

C. Water Resistance Testing:
   1. Test Pressure: full value of test pressure specified in Performance article.

D. Air Infiltration Testing:
   1. Test Pressure: Specified in Performance article.
   2. Allowable Leakage Rate: 1.5 times specified rate.

E. Non Conforming Work: Make corrections or replace, and retest.

3.5 ADJUSTING

A. Adjust operating sashes and hardware for smooth operation and secure weathertight closure.

3.6 CLEANING

A. Remove protective material from factory finished aluminum surfaces.

B. Wash metal and glass surfaces after installation and shortly before Substantial Completion inspection.

C. Remove excess sealant.

END OF SECTION

SECTION 087100

DOOR HARDWARE

PART 1 - GENERAL

SCHEDULE 0 - SUMMARY

PRODUCT DATA SHEET 0 - Section includes:

1.1 Mechanical and electrified door hardware
1.2 Electronic access control system components
1.3 Field verification, preparation and modification of existing doors and frames to receive new door hardware.

PRODUCT DATA SHEET 1 - Section excludes:

1.1 Windows
1.2 Cabinets (casework), including locks in cabinets
1.3 Signage
1.4 Toilet accessories
1.5 Overhead doors

PRODUCT DATA SHEET 2 - Related Sections:

1.1 Division 01 Section “Alternates” for alternates affecting this section.
1.2 Division 06 Section “Rough Carpentry”
1.3 Division 06 Section "Finish Carpentry”
1.4 Division 07 Section “Joint Sealants” for sealant requirements applicable to threshold installation specified in this section.
1.5 Division 08 Sections:

A. “Metal Doors and Frames”
B. “Flush Wood Doors”
C. “Stile and Rail Wood Doors”
D. “Interior Aluminum Doors and Frames”
E. "Aluminum-Framed Entrances and Storefronts"
F. “Stainless Steel Doors and Frames”
G. “Special Function Doors”
H. "Entrances”

1.6 Division 09 sections for touchup, finishing or refinishing of existing openings modified by this section.

1.7 Division 26 “Electrical” sections for connections to electrical power system and for low-voltage wiring.
1.8 Division 28 “Electronic Safety and Security” sections for coordination with other components of electronic access control system and fire alarm system.

SCHEDULE 1 - REFERENCES

PRODUCT DATA SHEET 0 - UL, LLC

1.1 UL 10B - Fire Test of Door Assemblies
1.2 UL 10C - Positive Pressure Test of Fire Door Assemblies
1.3 UL 1784 - Air Leakage Tests of Door Assemblies
1.4 UL 305 - Panic Hardware

PRODUCT DATA SHEET 1 - DHI - Door and Hardware Institute

1.1 Sequence and Format for the Hardware Schedule
1.2 Recommended Locations for Builders Hardware
1.3 Keying Systems and Nomenclature
1.4 Installation Guide for Doors and Hardware

PRODUCT DATA SHEET 2 - NFPA – National Fire Protection Association

1.1 NFPA 70 – National Electric Code
1.2 NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
1.3 NFPA 101 – Life Safety Code
1.4 NFPA 105 – Smoke and Draft Control Door Assemblies
1.5 NFPA 252 – Fire Tests of Door Assemblies

PRODUCT DATA SHEET 3 - ANSI - American National Standards Institute

1.1 ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
1.2 ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
1.3 ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
1.4 ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
1.5 ANSI/SDI A250.8 - Standard Steel Doors and Frames

SCHEDULE 2 - SUBMITTALS

PRODUCT DATA SHEET 0 - General:

1.1 Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
1.2 Prior to forwarding submittal:

A. Comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, "EXAMINATION" article, herein.
B. Review drawings and Sections from related trades to verify compatibility with specified hardware.
C. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

PRODUCT DATA SHEET 1 - Action Submittals:

1.1 Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
1.2 Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:

A. Wiring Diagrams: For power, signal, and control wiring and including:
   1. Details of interface of electrified door hardware and building safety and security systems.
   2. Schematic diagram of systems that interface with electrified door hardware.
   3. Point-to-point wiring.
   4. Risers.

1.3 Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.

A. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

1.4 Door Hardware Schedule:

A. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
B. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
C. Indicate complete designations of each item required for each opening, include:
   1. Door Index: door number, heading number, and Architect's hardware set number.
   2. Quantity, type, style, function, size, and finish of each hardware item.
   3. Name and manufacturer of each item.
   4. Fastenings and other pertinent information.

5. Location of each hardware set cross-referenced to indications on Drawings.
6. Explanation of all abbreviations, symbols, and codes contained in schedule.
7. Mounting locations for hardware.
8. Door and frame sizes and materials.
9. Degree of door swing and handing.
10. Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

1.5 Key Schedule:

A. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
B. Use ANSI/BHMA A156.28 “Recommended Practices for Keying Systems” as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
C. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
D. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
E. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
F. Prepare key schedule by or under supervision of supplier, detailing Owner’s final keying instructions for locks.

PRODUCT DATA SHEET 2 - Informational Submittals:

1.1 Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
1.2 Provide Product Data:

A. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
B. Include warranties for specified door hardware.

PRODUCT DATA SHEET 3 - Closeout Submittals:

1.1 Operations and Maintenance Data: Provide in accordance with Division 01 and include:

A. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
B. Catalog pages for each product.
C. Final approved hardware schedule edited to reflect conditions as installed.
D. Final keying schedule
E. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

F. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

PRODUCT DATA SHEET 4 - Inspection and Testing:

1.1 Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:

A. fire door assemblies, in compliance with NFPA 80.
B. required egress door assemblies, in compliance with NFPA 101.

SCHEDULE 3 - QUALITY ASSURANCE

PRODUCT DATA SHEET 0 - Qualifications and Responsibilities:

1.1 Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.

1.2 Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.

1.3 Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

A. For door hardware: DHI certified AHC or DHC.
B. Can provide installation and technical data to Architect and other related subcontractors.
C. Can inspect and verify components are in working order upon completion of installation.
D. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.

1.4 Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

PRODUCT DATA SHEET 1 - Certifications:

1.1 Fire-Rated Door Openings:

A. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.

B. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

1.2 Smoke and Draft Control Door Assemblies:

A. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
B. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

1.3 Electrified Door Hardware

A. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

1.4 Accessibility Requirements:

A. Comply with governing accessibility regulations cited in “REFERENCES” article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

PRODUCT DATA SHEET 2 - Pre-Installation Meetings

1.1 Keying Conference

A. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
   1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
   2. Preliminary key system schematic diagram.
   3. Requirements for key control system.
   4. Requirements for access control.
   5. Address for delivery of keys.

1.2 Pre-installation Conference

A. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
B. Inspect and discuss preparatory work performed by other trades.
C. Inspect and discuss electrical roughing-in for electrified door hardware.
D. Review sequence of operation for each type of electrified door hardware.
E. Review required testing, inspecting, and certifying procedures.

F. Review questions or concerns related to proper installation and adjustment of door hardware.

1.3 Electrified Hardware Coordination Conference:

A. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

SCHEDULE 4 - DELIVERY, STORAGE, AND HANDLING

PRODUCT DATA SHEET 0 - Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

PRODUCT DATA SHEET 1 - Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.

PRODUCT DATA SHEET 2 - Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

PRODUCT DATA SHEET 3 - Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

PRODUCT DATA SHEET 4 - Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

PRODUCT DATA SHEET 5 - Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

SCHEDULE 5 - COORDINATION

PRODUCT DATA SHEET 0 - Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

PRODUCT DATA SHEET 1 - Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

PRODUCT DATA SHEET 2 - Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

PRODUCT DATA SHEET 3 - Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

PRODUCT DATA SHEET 4 - Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation.

SCHEDULE 6 - WARRANTY

PRODUCT DATA SHEET 0 - Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1.1 Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

1.2 Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer’s published listings.

A. Mechanical Warranty
   1. Locks
      a. Schlage L Series: 3 years
      b. Falcon: 10 years
   2. Exit Devices
      a. Falcon: 10 years
   3. Closers
      a. LCN 4000 Series: 30 years

SCHEDULE 7 - MAINTENANCE

PRODUCT DATA SHEET 0 - Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PRODUCT DATA SHEET 1 - Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

SCHEDULE 0 - MANUFACTURERS

PRODUCT DATA SHEET 0 - The Owner requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings,

the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: “No Substitute.”

2.1 Where “No Substitute” is noted, submittals and substitution requests for other products will not be considered.

PRODUCT DATA SHEET 1 - Approval of alternate manufacturers and/or products other than those listed as “Scheduled Manufacturer” or “Acceptable Manufacturers” in the individual article for the product category are only to be considered by official substitution request in accordance in section 01 25 00.

PRODUCT DATA SHEET 2 - Approval of products from manufacturers indicated in “Acceptable Manufacturers” is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer’s product.

PRODUCT DATA SHEET 3 - Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

SCHEDULE 1 - MATERIALS

PRODUCT DATA SHEET 0 - Fabrication

2.1 Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer’s recognized installation standards for application intended.
2.2 Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
2.3 Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with “Metal Doors and Frames”, “Flush Wood Doors”, “Stile and Rail Wood Doors” to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

PRODUCT DATA SHEET 1 - Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.

2.1 Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
2.2 Use materials which match materials of adjacent modified areas.
2.3 When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.

PRODUCT DATA SHEET 2 - Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

2.1 Where fasteners are exposed to view: Finish to match adjacent door hardware material.

SCHEDULE 2 - HINGES

PRODUCT DATA SHEET 0 - Manufacturers and Products:

2.1 Scheduled Manufacturer and Product:

A. Stanley FBB series

2.2 Acceptable Manufacturers and Products:

A. Ives 5BB series
B. Hager BB1191/1279 series
C. McKinney TB series

PRODUCT DATA SHEET 1 - Requirements:

2.1 Provide hinges conforming to ANSI/BHMA A156.1.
2.2 Provide five knuckle, ball bearing hinges.
2.3 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:

A. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
B. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

2.4 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:

A. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
B. Interior: Heavy weight, steel, 5 inches (127 mm) high

2.5 2 inches or thicker doors:

A. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
B. Interior: Heavy weight, steel, 5 inches (127 mm) high

2.6 Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
2.7 Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
2.8 Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
2.9 Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

A. Steel Hinges: Steel pins
B. Non-Ferrous Hinges: Stainless steel pins
C. Out-Swinging Exterior Doors: Non-removable pins
D. Out-Swinging Interior Lockable Doors: Non-removable pins

E. Interior Non-lockable Doors: Non-rising pins

2.10 Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

SCHEDULE 3 - CONTINUOUS HINGES

PRODUCT DATA SHEET 0 - Manufacturers:

2.1 Scheduled Manufacturer:

A. Stanley

2.2 Acceptable Manufacturers:

A. Ives
B. Hager

PRODUCT DATA SHEET 1 - Requirements:

2.1 Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
2.2 Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
2.3 Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
2.4 Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
2.5 On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
2.6 Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2.7 Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

SCHEDULE 4 - FLUSH BOLTS

PRODUCT DATA SHEET 0 - Manufacturers:

2.1 Scheduled Manufacturer:

A. Ives

2.2 Acceptable Manufacturers:

A. Rockwood
B. McKinney

PRODUCT DATA SHEET 1 - Requirements:

2.1 Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

SCHEDULE 5 - MORTISE LOCKS

PRODUCT DATA SHEET 0 - Manufacturers and Products:

2.1 Scheduled Manufacturer and Product:

A. Schlage L9000 series

2.2 Acceptable Manufacturers and Products:

A. Best 45H series
B. Corbin-Russwin ML2000 series

PRODUCT DATA SHEET 1 - Requirements:

2.1 Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
2.2 Indicators: Where specified, provide indicator window measuring a minimum 2-inch x 1/2 inch with 180-degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
2.3 Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
2.4 Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to “KEYING” article, herein.
2.5 Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.
2.6 Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
2.7 Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches. Provide motor based electrified locksets that comply with the following requirements:

A. Universal input voltage – single chassis accepts 12 or 24VDC to allow for changes in the field without changing lock chassis.
B. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case
C. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
D. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate "hot levers" in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
E. Connections – provide quick-connect Molex system standard.

2.8 Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

A. Lever Design: 03

SCHEDULE 6 - MORTISE LOCKS

PRODUCT DATA SHEET 0 - Manufacturers and Products:

2.1 Scheduled Manufacturer and Product:

A. Falcon MA series

2.2 Acceptable Manufacturers and Products:

A. Corbin-Russwin ML2000 series
B. Sargent 8200 series

PRODUCT DATA SHEET 1 - Requirements:

2.1 Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
2.2 Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
2.3 Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
2.4 Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.
2.5 Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
2.6 Provide electrified options as scheduled in the hardware sets. Where scheduled, provide a request to exit (RX) switch that is actuated with rotation of inside lever.

2.7 Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

A. Lever Design: Sutro

SCHEDULE 7 - EXIT DEVICES

PRODUCT DATA SHEET 0 - Manufacturers and Products:

2.1 Scheduled Manufacturer and Product:

A. Falcon 24/25 series

2.2 Acceptable Manufacturers and Products:

A. Sargent 19-43-GL-80 series
B. Von Duprin 35A/98 series

PRODUCT DATA SHEET 1 - Requirements:

2.1 Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2.2 Cylinders: Refer to “KEYING” article, herein.
2.3 Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
2.4 Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
2.5 Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
2.6 Provide flush end caps for exit devices.
2.7 Provide exit devices with manufacturer’s approved strikes.
2.8 Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
2.9 Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
2.10 Provide cylinder or hex-key dogging as specified at non fire-rated openings.
2.11 Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
2.12 Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.

2.13 Provide electrified options as scheduled.

2.14 Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

SCHEDULE 8 - CYLINDERS

PRODUCT DATA SHEET 0 - Manufacturers:

2.1 Scheduled Manufacturer and Product:

A. High Security Best #5C7DD

2.2 Acceptable Manufacturers and Products:

A. No Substitute

PRODUCT DATA SHEET 1 - Requirements:

2.1 Provide cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.

SCHEDULE 9 - KEYING **[EDIT SECTION TO SUIT PROJECT]**

PRODUCT DATA SHEET 0 - **Scheduled System:**

2.1 **Existing non-factory registered system:**

A. Provide cylinders/cores keyed into Owner's existing keying system managed by Owner's locksmith, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference. Contact:
   1. Firm Name:
   2. Contact Person:
   3. Telephone:

PRODUCT DATA SHEET 1 - Requirements:

2.1 Construction Keying:

A. Replaceable Construction Cores.
   1. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
      a. 3 construction control keys
      b. 12 construction change (day) keys.
   2. Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2.2 Permanent Keying:

A. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
   1. Master Keying system as directed by the Owner.

B. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.

C. Provide keys with the following features:
   1. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
   2. Patent Protection: Keys and blanks protected by one or more utility patent(s).

D. Identification:
   1. Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
   2. Identification stamping provisions must be approved by the Architect and Owner.
   3. Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
   4. Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
   5. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.

E. Quantity: Furnish in the following quantities.
   1. Change (Day) Keys: 3 per cylinder/core.
   2. Master Keys: 6.

SCHEDULE 10 - KEY CONTROL SYSTEM

PRODUCT DATA SHEET 0 - Manufacturers:

2.1 Scheduled Manufacturer:

A. Telkee

2.2 Acceptable Manufacturers:

A. HPC
B. Lund

PRODUCT DATA SHEET 1 - Requirements:

2.1 Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.

A. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
B. Provide hinged-panel type cabinet for wall mounting.

SCHEDULE 11 - DOOR CLOSERS

PRODUCT DATA SHEET 0 - Manufacturers and Products:

2.1 Scheduled Manufacturer and Product:

A. LCN 4010/4110/4020 series

2.2 Acceptable Manufacturers and Products:

A. Corbin-Russwin DC8000 series
B. Sargent 281 series

PRODUCT DATA SHEET 1 - Requirements:

2.1 Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. Certify surface mounted mechanical closers to meet fifteen million (15,000,000) full load cycles. ISO 9000 certify closers. Stamp units with date of manufacture code.
2.2 Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
2.3 Cylinder Body: 1-1/2-inch (38 mm) diameter with 11/16-inch (17 mm) diameter double heat-treated pinion journal.
2.4 Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
2.5 Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
2.6 Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
2.7 Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers. When closers are parallel arm mounted, provide closers which mount within 6-inch (152 mm) top rail without use of mounting plate so that closer is not visible through vision panel from pull side.
2.8 Pressure Relief Valve (PRV) Technology: Not permitted.
2.9 Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI/BHMA Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).

2.10 Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

SCHEDULE 12 - DOOR CLOSERS – HIGH SECURITY

PRODUCT DATA SHEET 0 - Manufacturers and Products:

2.1 Scheduled Manufacturer and Product:

A. LCN 4210/4510 Smoothee Series

2.2 Acceptable Manufacturers and Products:

A. No Substitute

PRODUCT DATA SHEET 1 - Requirements:

2.1 Provide high security door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2.2 Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
2.3 Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
2.4 Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
2.5 Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
2.6 Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
2.7 Pressure Relief Valve (PRV) Technology: Not permitted.
2.8 Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
2.9 Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

DOOR TRIM

PRODUCT DATA SHEET 2 - Manufacturers:

2.1 Scheduled Manufacturer:

A. Ives.

2.2 Acceptable Manufacturers:

A. McKinney
B. Rockwood

PRODUCT DATA SHEET 3 - Requirements:

2.1 Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

SCHEDULE 13 - PROTECTION PLATES

PRODUCT DATA SHEET 0 - Manufacturers:

2.1 Scheduled Manufacturer:

A. Ives

2.2 Acceptable Manufacturers:

A. Trimco
B. Mckinney

PRODUCT DATA SHEET 1 - Requirements:

2.1 Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2.2 Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
2.3 At fire rated doors, provide protection plates over 16 inches high with UL label.

SCHEDULE 14 - EDGE GUARDS

PRODUCT DATA SHEET 0 - Manufacturers:

2.1 Scheduled Manufacturer:

A. Ives

2.2 Acceptable Manufacturers:

A. Trimco
B. McKinney

PRODUCT DATA SHEET 1 - Requirements:

2.1 Provide protection plates with a minimum of 0.050 inch (1 mm) thick.
2.2 Furnish with sheet metal or wood screws, finished to match plates.
2.3 At fire rated doors, edge guards with UL label.
2.4 Provide edge guards sized for the full height of the door and to suit door edge conditions.
2.5 Provide edge guards mortised for the edge mounted hardware specified in the associated hardware group.

SCHEDULE 15 - OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

PRODUCT DATA SHEET 0 - Manufacturers:

2.1 Scheduled Manufacturers:

A. Glynn-Johnson

2.2 Acceptable Manufacturers:

A. Sargent

PRODUCT DATA SHEET 1 - Requirements:

2.1 Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.
2.2 Provide friction type at doors without closer and positive type at doors with closer.

SCHEDULE 16 - DOOR STOPS AND HOLDERS

PRODUCT DATA SHEET 0 - Manufacturers:

2.1 Scheduled Manufacturer:

A. Ives

2.2 Acceptable Manufacturers:

A. Trimco
B. McKinney

PRODUCT DATA SHEET 1 - Provide door stops at each door leaf:

2.1 Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2.2 Where a wall stop cannot be used, provide universal floor stops.
2.3 Where wall or floor stop cannot be used, provide overhead stop.

2.4 Provide roller bumper where doors open into each other and overhead stop cannot be used.

SCHEDULE 17 - THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

PRODUCT DATA SHEET 0 - Manufacturers:

2.1 Scheduled Manufacturer:

A. Zero International

2.2 Acceptable Manufacturers:

A. McKinney
B. Reese

PRODUCT DATA SHEET 1 - Requirements:

2.1 Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2.2 Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
2.3 Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
2.4 Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

SCHEDULE 18 - SILENCERS

PRODUCT DATA SHEET 0 - Manufacturers:

2.1 Scheduled Manufacturer:

A. Ives

2.2 Acceptable Manufacturers:

A. Rockwood
B. Trimco

PRODUCT DATA SHEET 1 - Requirements:

2.1 Provide "push-in" type silencers for hollow metal or wood frames.
2.2 Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
2.3 Omit where gasketing is specified.

SCHEDULE 19 - FINISHES

PRODUCT DATA SHEET 0 - Finish: BHMA 626/652 (US26D); except:

2.1 Hinges at Exterior Doors: BHMA 630 (US32D)
2.2 Aluminum Geared Continuous Hinges: BHMA 628 (US28)
2.3 Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
2.4 Protection Plates: BHMA 630 (US32D)
2.5 Overhead Stops and Holders: BHMA 630 (US32D)
2.6 Door Closers: Powder Coat to Match
2.7 Wall Stops: BHMA 630 (US32D)
2.8 Latch Protectors: BHMA 630 (US32D)
2.9 Weatherstripping: Clear Anodized Aluminum
2.10 Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

SCHEDULE 0 - EXAMINATION

PRODUCT DATA SHEET 0 - Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

PRODUCT DATA SHEET 1 - Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.

PRODUCT DATA SHEET 2 - Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

PRODUCT DATA SHEET 3 - Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

SCHEDULE 1 - PREPARATION

PRODUCT DATA SHEET 0 - Where on-site modification of doors and frames is required:

3.1 Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
3.2 Field modify and prepare existing doors and frames for new hardware being installed.
3.3 When modifications are exposed to view, use concealed fasteners, when possible.

3.4 Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:

A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
B. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
C. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

SCHEDULE 2 - INSTALLATION

PRODUCT DATA SHEET 0 - Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

3.1 Standard Steel Doors and Frames: ANSI/SDI A250.8.
3.2 Custom Steel Doors and Frames: HMMA 831.
3.3 Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
3.4 Installation Guide for Doors and Hardware: DHI TDH-007-20

PRODUCT DATA SHEET 1 - Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

PRODUCT DATA SHEET 2 - Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

PRODUCT DATA SHEET 3 - Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

PRODUCT DATA SHEET 4 - Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

PRODUCT DATA SHEET 5 - Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

PRODUCT DATA SHEET 6 - Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

PRODUCT DATA SHEET 7 - Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

PRODUCT DATA SHEET 8 - Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:

3.1 Conduit, junction boxes and wire pulls.
3.2 Connections to and from power supplies to electrified hardware.
3.3 Connections to fire/smoke alarm system and smoke evacuation system.
3.4 Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
3.5 Connections to panel interface modules, controllers, and gateways.
3.6 Testing and labeling wires with Architect's opening number.

PRODUCT DATA SHEET 9 - Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

PRODUCT DATA SHEET 10 - Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

PRODUCT DATA SHEET 11 - Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

PRODUCT DATA SHEET 12 - Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.

PRODUCT DATA SHEET 13 - Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

PRODUCT DATA SHEET 14 - Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

PRODUCT DATA SHEET 15 - Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

PRODUCT DATA SHEET 16 - Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

PRODUCT DATA SHEET 17 - Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

SCHEDULE 3 - ADJUSTING

PRODUCT DATA SHEET 0 - Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.1 Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
3.2 Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
3.3 Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

PRODUCT DATA SHEET 1 - Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

SCHEDULE 4 - CLEANING AND PROTECTION

PRODUCT DATA SHEET 0 - Clean adjacent surfaces soiled by door hardware installation.

PRODUCT DATA SHEET 1 - Clean operating items per manufacturer's instructions to restore proper function and finish.

PRODUCT DATA SHEET 2 - Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

SCHEDULE 5 - DOOR HARDWARE SCHEDULE

PRODUCT DATA SHEET 0 - The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

PRODUCT DATA SHEET 1 - Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

PRODUCT DATA SHEET 2 - Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

PRODUCT DATA SHEET 3 - Hardware Sets:

Legend:
Link to catalog cut sheet
Electrified Opening

Hardware Group No. 00

For use on Door #(s):
T02-1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	FBB179 4.5" x 4.5"		626	STA
1	EA	CYLINDER DEAD LOCK W/ OUTSIDE INDICATOR	L9464BDC		626	SCH
1	EA	PUSH PLATE	8200 6" X 16" CFT		630	IVE
1	EA	PULL PLATE	8305 10" 6" X 16"		630	IVE
1	EA	SURFACE CLOSER	4111 RW/62A		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	MOP PLATE	8402 4" X 1" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV AS REQUIRED		630	IVE
3	EA	SILENCER	SR 64/65 AS REQUIRED		GRY	IVE

Hardware Group No. 00A

For use on Door #(s):
196-1 199-1

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
2	EA	CONTINUOUS HINGE	661HD			AL	STA
1	EA	PANIC HARDWARE	CD-24-C-C-718			626	FAL
1	EA	PANIC HARDWARE	CD-24-C-EO			626	FAL
2	EA	SFIC MORTISE CYL.	80-132			626	SCH
1	EA	SFIC RIM CYLINDER	80-159			626	SCH
3	EA	PERMANENT CORE	SFIC BEST - MATCH EXISTING SYSTEM			626	BES
2	EA	LONG DOOR PULL	9264F 36" 20" STD			630	IVE
1	EA	H-SEC SURFACE CLOSER	4211 CUSH			689	LCN
1	EA	SURF. AUTO OPERATOR	9531 MS AS REQ (120/240 VAC)			ANCL R	LCN
1	EA	WEATHER RING	8310-801				LCN
1	EA	SWITCH	8310-806R				LCN
2	EA	ACTUATOR, TOUCHLESS	8310-813WH			WH	LCN
1	EA	BOLLARD PART	8310-866				LCN
1	EA	MOUNT BOX	8310-867F				LCN
1	EA	PERIMETER GASKETING	BY ALUMINUM DOOR MANUFACTURER				
2	EA	DOOR SWEEP	8197AA			AA	ZER
1	EA	THRESHOLD	545A			A	ZER

DOOR OPERATION:
AFTER HOURS, DOORS ARE CLOSED AND LOCKED. ENTRY BY KEY ONLY.
DURING OPERATING HOURS, DOORS NORMALLY CLOSED AND DOGGED. OPERATOR IS SWITCHED ON.
ENTRY BY OUTSIDE ADA ACTUATOR OR MANUALLY PULLING DOOR HANDLE.
FREE EGRESS AT ALL TIMES.
BOTH ACTUATORS ALWAYS ACTIVE.
ROCKER SWITCH TOGGLES AUTO OPERATOR ON/OFF.

Hardware Group No. 00B

For use on Door #(s):
T01-1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	FBB179 4.5" x 4.5"		626	STA
1	EA	CYLINDER DEAD LOCK W/ OUTSIDE INDICATOR	L9464BDC		626	SCH
1	EA	PUSH PLATE	8200 6" X 16" CFT		630	IVE
1	EA	PULL PLATE	8305 10" 6" X 16"		630	IVE
1	EA	OH STOP	100S		630	GLY
1	EA	SURFACE CLOSER	4111 RW/62A		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	MOP PLATE	8402 4" X 1" LDW B-CS		630	IVE
3	EA	SILENCER	SR 64/65 AS REQUIRED		GRY	IVE

Hardware Group No. 01

For use on Door #(s):
ST1-1 ST1-2 ST2-1 ST2-2

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONTINUOUS HINGE	661HD		AL	STA
1	EA	FIRE EXIT HARDWARE	F-25-R-L-BE-AVA		630	FAL
1	EA	SURFACE CLOSER	4111 RW/62A		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV AS REQUIRED		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 02

For use on Door #(s):
B104-2 R01-1 R01-2 R02-1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	PADLOCK L/CYL-SFIC	KS21 SHACKLE AS REQUIRED			FAL
1	EA	PERMANENT CORE	SFIC BEST - MATCH EXISTING SYSTEM		626	BES
1	EA	HASP AND CANE BOLT	JANSEN SUPPLY LB124BX-KS			

Hardware Group No. 04

For use on Door #(s):
T03

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	FBB179 4.5" x 4.5"		626	STA
1	EA	PRIV W/DB COIN TURN W/ OUTSIDE INDICATOR	L9444 07A 09-544 OS-OCC		626	SCH
1	EA	PERMANENT CORE	SFIC BEST - MATCH EXISTING SYSTEM		626	BES
1	EA	SURFACE CLOSER	4111 RW/62A		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	MOP PLATE	8402 4" X 1" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV AS REQUIRED		630	IVE
3	EA	SILENCER	SR 64/65 AS REQUIRED		GRY	IVE

Hardware Group No. 04A

For use on Door #(s):
2T01-1 2T01-2

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	FBB179 4.5" x 4.5" NRP		626	STA
1	EA	PRIV W/DB COIN TURN W/ OUTSIDE INDICATOR	L9444 07A 09-544 OS-OCC		626	SCH
1	EA	PERMANENT CORE	SFIC BEST - MATCH EXISTING SYSTEM		626	BES
1	EA	SURFACE CLOSER	4111 RW/62A		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	MOP PLATE	8402 4" X 1" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV AS REQUIRED		630	IVE
3	EA	SILENCER	SR 64/65 AS REQUIRED		GRY	IVE

Hardware Group No. 05

For use on Door #(s):
103

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONTINUOUS HINGE	661HD		AL	STA
1	EA	ENTRY / OFFICE LOCK	MA541BDC AN		626	FAL
1	EA	PERMANENT CORE	SFIC BEST - MATCH EXISTING SYSTEM		626	BES
1	EA	H-SEC SURFACE CLOSER	4211 CUSH		689	LCN
1	EA	PERIMETER GASKETING	BY ALUMINUM DOOR MANUFACTURER			

Hardware Group No. 07

For use on Door #(s):
100C 100D 104 105 106 107

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	FBB179 4.5" x 4.5"		626	STA
1	EA	CLASSROOM LOCK	MA561BDC AN		626	FAL
1	EA	PERMANENT CORE	SFIC BEST - MATCH EXISTING SYSTEM		626	BES
1	EA	SURFACE CLOSER	4111 RW/62A		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV AS REQUIRED		630	IVE
3	EA	SILENCER	SR 64/65 AS REQUIRED		GRY	IVE

Hardware Group No. 07A

For use on Door #(s):
T01-2 T02-2

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONTINUOUS HINGE	661HD		AL	STA
1	EA	CLASSROOM LOCK	MA561BDC AN		626	FAL
2	EA	PERMANENT CORE	SFIC BEST - MATCH EXISTING SYSTEM		626	BES
1	EA	SURFACE CLOSER	4111 RW/62A		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	429AA		AA	ZER
1	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	545A		A	ZER

Hardware Group No. 07B

For use on Door #(s):
197-1

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	FBB179 4.5" x 4.5" NRP		626	STA
1	SET	CONST LATCHING BOLT	FB51P		630	IVE
1	EA	DUST PROOF STRIKE	DP2		626	IVE
1	EA	CLASSROOM LOCK	MA561BDC AN		626	FAL
1	EA	PERMANENT CORE	SFIC BEST - MATCH EXISTING SYSTEM		626	BES
2	EA	OH STOP	100S		630	GLY
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
2	EA	SILENCER	SR 64/65 AS REQUIRED		GRY	IVE

Hardware Group No. 07C

For use on Door #(s):
100-3 100-4 100B-2

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	FBB179 4.5" x 4.5" NRP		626	STA
1	SET	CONST LATCHING BOLT	FB51P		630	IVE
1	EA	DUST PROOF STRIKE	DP2		626	IVE
1	EA	CLASSROOM LOCK	MA561BDC AN		626	FAL
1	EA	PERMANENT CORE	SFIC BEST - MATCH EXISTING SYSTEM		626	BES
1	EA	OH STOP	100S		630	GLY
1	EA	H-SEC SURFACE CLOSER	4211 CUSH		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
1	EA	MEETIING STILE	8217SBK PSA		BK	ZER
2	EA	SILENCER	SR 64/65 AS REQUIRED		GRY	IVE

Hardware Group No. 08

For use on Door #(s):
101-1

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONTINUOUS HINGE	661HD		AL	STA
1	SET	CONST LATCHING BOLT	FB51P		630	IVE
1	EA	DUST PROOF STRIKE	DP2		626	IVE
1	EA	STOREROOM LOCK	MA581BDC AN		626	FAL
1	EA	PERMANENT CORE	SFIC BEST - MATCH EXISTING SYSTEM		626	BES
1	EA	COORDINATOR	COR X FL		628	IVE
2	EA	H-SEC SURFACE CLOSER	4211 CUSH		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	MEETIING STILE	8217SBK PSA		BK	ZER
2	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	545A		A	ZER

Hardware Group No. 08B

For use on Door #(s):
196B 198A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	FBB179 4.5" x 4.5"		626	STA
1	EA	STOREROOM LOCK	MA581BDC AN		626	FAL
1	EA	PERMANENT CORE	SFIC BEST - MATCH EXISTING SYSTEM		626	BES
1	EA	SURFACE CLOSER	4111 RW/62A		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV AS REQUIRED		630	IVE
3	EA	SILENCER	SR 64/65 AS REQUIRED		GRY	IVE

Hardware Group No. 08C

For use on Door #(s):

100A-1	100A-2	100A-3	101A-1	101A-2	102B
102C	102D	102E	105A-1	106A-1	107A-1
196A					

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	FBB179 4.5" x 4.5" NRP		626	STA
1	SET	CONST LATCHING BOLT	FB51P		630	IVE
1	EA	DUST PROOF STRIKE	DP2		626	IVE
1	EA	STOREROOM LOCK	MA581BDC AN		626	FAL
1	EA	PERMANENT CORE	SFIC BEST - MATCH EXISTING SYSTEM		626	BES
2	EA	OH STOP	100S		630	GLY
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
1	EA	MEETIING STILE	8217SBK PSA		BK	ZER
2	EA	SILENCER	SR 64/65 AS REQUIRED		GRY	IVE

Hardware Group No. 08D

For use on Door #(s):
102A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONTINUOUS HINGE	661HD		AL	STA
1	EA	STOREROOM LOCK	MA581BDC AN		626	FAL
1	EA	PERMANENT CORE	SFIC BEST - MATCH EXISTING SYSTEM		626	BES
1	EA	H-SEC SURFACE CLOSER	4211 CUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	429AA		AA	ZER
1	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	545A		A	ZER

Hardware Group No. 08E

For use on Door #(s):
B104-1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONTINUOUS HINGE	661HD		AL	STA
1	EA	STOREROOM LOCK	MA581BDC AN		626	FAL
1	EA	PERMANENT CORE	SFIC BEST - MATCH EXISTING SYSTEM		626	BES
1	EA	SURFACE CLOSER	4111 RW/62A		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 10

For use on Door #(s):
100-2 100B-1

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONTINUOUS HINGE	661HD		AL	STA
1	SET	CONST LATCHING BOLT	FB51P		630	IVE
1	EA	DUST PROOF STRIKE	DP2		626	IVE
1	EA	PANIC HARDWARE	LD-24-C-EO		630	FAL
2	EA	H-SEC SURFACE CLOSER	4211 CUSH		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	MEETIING STILE	8217SBK PSA		BK	ZER
2	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	545A		A	ZER

Hardware Group No. 11

For use on Door #(s):
100-1

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONTINUOUS HINGE	661HD		AL	STA
1	SET	CONST LATCHING BOLT	FB51P		630	IVE
1	EA	DUST PROOF STRIKE	DP2		626	IVE
1	EA	PANIC HARDWARE	LD-24-C-L-LBR-AVA		626	FAL
2	EA	H-SEC SURFACE CLOSER	4211 CUSH		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	MEETIING STILE	8217SBK PSA		BK	ZER

Hardware Group No. 11B

For use on Door #(s):
102-1

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONTINUOUS HINGE	661HD		AL	STA
1	EA	PANIC HARDWARE	CD-24-C-L-DT-LBR-AVA		626	FAL
1	EA	PANIC HARDWARE	CD-24-C-L-NL-LBR-AVA		626	FAL
2	EA	SFIC MORTISE CYL.	80-132		626	SCH
1	EA	SFIC RIM CYLINDER	80-159		626	SCH
3	EA	PERMANENT CORE	SFIC BEST - MATCH EXISTING SYSTEM		626	BES
2	EA	H-SEC SURFACE CLOSER	4211 CUSH		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	MEETIING STILE	8217SBK PSA		BK	ZER

Hardware Group No. 12

For use on Door #(s):
102-2

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONTINUOUS HINGE	661HD		AL	STA
1	EA	PANIC HARDWARE	LD-24-C-EO		630	FAL
1	EA	PANIC HARDWARE	LD-24-C-NL		626	FAL
1	EA	SFIC RIM CYLINDER	80-159		626	SCH
1	EA	PERMANENT CORE	SFIC BEST - MATCH EXISTING SYSTEM		626	BES
2	EA	H-SEC SURFACE CLOSER	4211 CUSH		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	MEETIING STILE	8217SBK PSA		BK	ZER
2	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	545A		A	ZER

Hardware Group No. 13

For use on Door #(s):
101-2 101-3

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONTINUOUS HINGE	661HD		AL	STA
1	EA	PANIC HARDWARE	LD-24-R-L-AVA		626	FAL
1	EA	SFIC MORTISE CYL.	80-132		626	SCH
1	EA	PERMANENT CORE	SFIC BEST - MATCH EXISTING SYSTEM		626	BES
1	EA	H-SEC SURFACE CLOSER	4211 CUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV AS REQUIRED		630	IVE
3	EA	SILENCER	SR 64/65 AS REQUIRED		GRY	IVE

Hardware Group No. 14

For use on Door #(s):
199-2

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
2	EA	CONTINUOUS HINGE	661HD			AL	STA
1	EA	PANIC HARDWARE	CD-24-C-C-718			626	FAL
1	EA	PANIC HARDWARE	CD-24-C-EO			626	FAL
2	EA	SFIC MORTISE CYL.	80-132			626	SCH
1	EA	SFIC RIM CYLINDER	80-159			626	SCH
3	EA	PERMANENT CORE	SFIC BEST - MATCH EXISTING SYSTEM			626	BES
2	EA	LONG DOOR PULL	9264F 36" 20" STD			630	IVE
1	EA	H-SEC SURFACE CLOSER	4211 CUSH			689	LCN
1	EA	SURF. AUTO OPERATOR	9531 MS AS REQ (120/240 VAC)			ANCL R	LCN
1	EA	SWITCH	8310-806R				LCN
2	EA	ACTUATOR, TOUCHLESS	8310-813WH			WH	LCN
2	EA	MOUNT BOX	8310-867F				LCN
1	EA	PERIMETER GASKETING	BY ALUMINUM DOOR MANUFACTURER				

DOOR OPERATION:
AFTER HOURS, DOORS ARE CLOSED AND LOCKED. ENTRY BY KEY ONLY.
DURING OPERATING HOURS, DOORS NORMALLY CLOSED AND DOGGED. OPERATOR IS SWITCHED ON.
ENTRY BY OUTSIDE ADA ACTUATOR OR MANUALLY PULLING DOOR HANDLE.
FREE EGRESS AT ALL TIMES.
BOTH ACTUATORS ALWAYS ACTIVE.
ROCKER SWITCH TOGGLES AUTO OPERATOR ON/OFF.

SECTION 088000

GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Exterior glazing at windows, curtainwall, storefront, and doors.
   2. Interior glazing.

B. Principal Products:
   1. Insulated glazing, clear.
   2. Monolithic glazing.
   3. Security glazing.

C. Related Requirements.
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 081113: Glazed lites in hollow metal doors and frames.
   5. Section 081416: Glazed lites in wood doors.
   6. Section 084113: Aluminum entrances and storefronts.
   7. Section 084413: Glazed aluminum curtain walls.
   8. Section 085113: Aluminum windows.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting Attendees and Procedures:
   1. Conduct meeting at project site in conjunction with preinstallation meetings for fenestration framing systems.
   2. Agenda Items:
      a. Coordinate schedules and material deliveries.
      b. Coordinate requirements for security glazing assemblies.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Each type of glass.
   2. Initial selection color charts:
      a. Butt glazing sealant.
      b. Interlayer for laminated glass.

B. Samples: 12- by 12-inch samples of each glass type except clear monolithic.

1.4 INFORMATIONAL SUBMITTALS

A. Test and Evaluation Reports: Independent testing agency test results showing:
   1. Fire performance.
   2. Heat soak test survival.

B. Sample warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Warranty Documentation: For insulating glass.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: NACC certified contractor, AGMT certified glazing technicians, or certified under National Glass Association Certified Glass Installer Program.

B. Mockups: Provide glass for fenestration in exterior wall mockups.

1.7 FIELD CONDITIONS

A. Ambient Conditions:
   1. Temperature: Minimum 40 degrees F and rising.
   2. Install glass only on when glazing frames are free of moisture, including condensation, frost, and ice.

1.8 WARRANTY

A. Manufacturer Warranty:
   1. Coated Glass: Warrant against peeling, cracking, or other coating deterioration.
      a. Warranty Period: 10 years.
   2. Laminated Glass: Warrant against edge separation, delamination, or other defects.
      a. Warranty Period: 10 years.
   3. Insulating Glass: Warrant against the following:
      a. Edge seal failure.
      b. Internal condensation that does not dissipate.
      c. Spacer delamination.
      d. Warranty Period: 10 years.

PART 2 - PRODUCTS

2.1 BASE GLASS

A. Clear Glass: ASTM C1036, Type I, Class 1, Quality-Q3.

2.2 HEAT TREATED GLASS

A. Heat Treated Glass: ASTM C1048, Type 1, Quality Q3; free of mosaic or pattern distortion visible from fixed viewpoint and other defects caused by roller pick.
   1. Heat Strengthened Glass: Kind HS.
   2. Tempered Glass: Kind FT.

B. Roll Ripple Surface Wave Tolerances:
   1. Heat Strengthened Glass: 0.002 inch, maximum.
   2. Tempered Glass: 0.005 inch, maximum.

C. Roll Ripple Orientation: Horizontal.

D. Fabricate heat-treated units with permanent label in consistent location at either lower corner.

E. Heat Soak Test: Test tempered glass for nickel sulfide inclusions per DIN EN 14179-1.

2.3 COATED GLASS

A. Vacuum Deposition Coated Glass: ASTM C1376.
   1. Insulating Glass: Delete or omit coating from glass edges where spacer sealant is applied.

B. Pyrolytic Coated Glass:
   1. Insulating Glass: Delete or omit coating from glass edges where spacer sealant is applied.

2.4 INSULATING GLASS

A. Insulating Glass Units: Factory assembled double-pane units tested per ASTM E2190 and certified by IGCC.

B. Spacer Strips: Aluminum, black with desiccant fill.

C. Warm Edge Spacer Strips: Rigid plastic or Stainless steel with desiccant fill.
   1. Manufacturers and Products:
      a. Quanex Building Products Duraseal.
      b. Technoform TGI-Spacer M.
      c. Viracon VTS.
      d. Vitro Intercept.

D. Space Fill: Dehydrated argon.

E. Edge Seals:
   1. Primary Seal: Polyisobutylene.
   2. Secondary Seal: Silicone.
   3. Structural Silicone Glazing: Edge seals tested for compatibility with silicone glazing sealant used on Project.

2.5 LAMINATED GLASS

A. Laminated Glass: ASTM C1172, two or more glass plies permanently bonded with interlayer.
   1. Glass Plies, Interlayer Types, Appearance and Performance Characteristics: See glass types.

B. Laminated Glass: ASTM C1172, two or more glass plies permanently bonded with interlayer.
   1. Glass Plies: Heat-strengthened glass.
   2. Glass Ply Thickness: 6 mm.
   3. Interlayer Type: ionomeric polymer cast-in-place cured resin.
   4. Interlayer Thickness:
      a. Vertical Applications: 0.060 inch.
   5. Interlayer Appearance: Clear.

C. Contractor Option: Where safety glazing is required or tempered glass shown, provide tempered glass or laminated glass matching tempered glass appearance.

2.6 SECURITY GLAZING

A. Security Glazing - Monolithic:
   1. Manufacturer and Product:
      a. IsoClima Specialty Glass; AccessGard Glazing.
      b. Global Security Glazing; AccessGard Glazing.
      c. Comparable product submitted and accepted prior to bidding.
   2. Product Characteristics:
      a. Description: Two outer plies of clear heat strengthened glass with a chemically bonded core designed for performance shown.
      b. Thickness: 3/8 inches.
   3. Security Resistance:
      a. ASTM F1233 Testing: Class 1.4 minimum, 6 minutes minimum of forced entry resistance testing.
      b. UL 972 and HP White 5aa-1 Testing: 6 minutes minimum of forced entry resistance testing.

2.7 GLASS TYPES

A. Glass Type GL-1: Clear Monolithic Glazing, Heat-Strengthened.
   1. 12 mm heat-strengthened clear glass.

B. Glass Type GL-2: Clear Monolithic Glazing, Tempered.
   1. 12 mm fully tempered clear glass.
   2. Safety glazing labeled.

C. Glass Type IGU-1: Insulating Low-E Glazing, Heat-Strengthened, Clear.
   1. Outer Lite: 6 mm heat-strengthened glass.
      a. Tint: Clear.

b. Vacuum Deposition Coating: Low-E, #2 surface.
1) Manufacturer and Product:
a) Vitro; Solarban 70 Clear.

2. Gas Fill: Argon, 1/2 inch.
3. Inner Lite: 6 mm heat-strengthened glass.
a. Tint: Clear.
4. Optical and Thermal Performance:
a. Visible Light Transmittance: 68 percent, minimum.
b. Exterior Reflectance: 11 percent, maximum.
c. Winter U-Factor: 0.24, maximum.
d. Solar Heat Gain Coefficient: 0.37, maximum.

D. Glass Type IGU-2: Insulating Low-E Glazing, Tempered, Clear.
1. Outer Lite: 6 mm fully tempered glass.
a. Tint: Clear.
b. Vacuum Deposition Coating: Low-E, #2 surface.
1) Manufacturer and Product:
a) Vitro; Solarban 70 Clear.

2. Gas Fill: Argon, 1/2 inch.
3. Inner Lite: 6 mm fully tempered glass.
a. Tint: Clear.
4. Optical and Thermal Performance:
a. Visible Light Transmittance: 68 percent, minimum.
b. Exterior Reflectance: 11 percent, maximum.
c. Winter U-Factor: 0.24, maximum.
d. Solar Heat Gain Coefficient: 0.37, maximum.

E. Glass Type IGU-3: Insulating Low-E Security Glazing, Clear.
1. Overall Unit Thickness: 1 inch or manufacturer recommended.
2. Outer Lite: 6 mm (1/4 inches) fully tempered glass.
a. Tint: Clear.
b. Vacuum Deposition Coating: Low-E, #2 surface.
1) Manufacturer and Product:
a) Vitro; Solarban 70 Clear.

3. Gas Fill: Argon, 3/8 inch.
4. Inner Lite: Security glazing.
a. Manufacturer and Product:
1) LTI Smart Glass; School Guard Glass; SG5.
2) IsoClima Specialty Glass; AccessGard Glazing.
3) Global Security Glazing; AccessGard Glazing.
4) Comparable product submitted and accepted prior to bidding.
b. Thickness: 3/8 inch.
5. Optical and Thermal Performance:
a. Visible Light Transmittance: 64 percent, minimum.
b. Solar Heat Gain Coefficient: 0.27, maximum.

6. Security Resistance:
    a. ASTM F1233 Testing: Class 1.4 minimum, 6 minutes minimum of forced entry resistance testing.
    b. UL 972 and HP White 5aa-1 Testing: 6 minutes minimum of forced entry resistance testing.

2.8 INSTALLATION MATERIALS

A. Setting Blocks: ASTM C864, neoprene or EPDM, or ASTM C1115, silicone; 80 to 90 Shore A durometer hardness.

B. Spacers: ASTM C864, neoprene or EPDM, or ASTM C1115, silicone; 50 to 60 Shore A durometer hardness.

C. Structural Silicone Sealant: Specified with framing system.

D. Glazing Gaskets: Specified with framing system.

E. Butt Joint Glazing Sealant: Medium modulus silicone sealant; single-component, neutral-curing; ASTM C920, Type S, Grade NS, Class 50, Use NT.
1. Manufacturers and Products:
    a. C.R. Laurence Water Clear Silicone WCS1.
    b. Dow DOWSIL 795.
    c. GE Construction Sealants SCS2000 SilPruf.
    d. Pecora Corporation PCS.
    e. Sika Corporation Sikasil WS-295.
    f. Tremco Spectrem 2.
2. Color: Architect selected.

F. Interior Glazing Tape: ASTM C1281 and AAMA 800; butyl based elastomeric tape with integral resilient tube spacer, 10 to 15 Shore A durometer hardness, coiled on release paper; widths required for installation.
1. Color: Black.
2. Supply preshimmed tape with continuous spacer for hollow metal glazing frames and other applications recommended by tape manufacturer.

G. Exterior Glazing Tape: AAMA 800; closed cell polyvinyl chloride foam, maximum 2 percent water absorption by volume, designed for 25 percent compression percent for air barrier and vapor retarder seal, black color, coiled on release paper over adhesive on two sides; widths required for installation.

H. Smoke Removal Targets: As required by local fire marshal.

2.9 PERFORMANCE

A. Delegate glazing system design to manufacturer licensed Professional Engineer.

B. Structural Design Criteria: See Structural Drawings.

C. Structural Loads: See Drawings.

D. Impact:
   1. Safety Glazing: 16 CFR 1201, Category II.

E. Security:
   1. Security Resistance: See Security Glazing Article above.

2.10 FABRICATION

A. Fabricate before delivering glass to site.

B. Provide code-required permanent labels in locations that will be visible but inconspicuous after installation.

C. Exposed Glass Edges and Corners: Grind smooth and polish.

D. Butt Glazed Lites: Grind edges flat with small 45 degree chamfers.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
   1. Framing is ready to receive glazing.
   2. Weep systems are unblocked and functional.
   3. Face and edge clearances are sufficient.
   4. Framing joints are properly sealed.

B. Examine glass lites for damage and defects before installation.

C. Do not install tempered glass with noticeable roller pick optical distortion.

3.2 PREPARATION

A. Clean glazing channels and rabbets; remove loose materials and moisture.

B. Remove protective coatings on metal surfaces.

C. Clean glass just before installation.

3.3 INSTALLATION - GENERAL

A. Install glass without direct contact on framing surfaces.

B. Maintain manufacturer recommended edge and face clearances between glass and frame members.

C. Set glass centered in openings on setting blocks.

D. Provide edge blocking needed to prevent sideways movement of glass in framing.

E. Set glass with correct orientation of exterior side.

3.4 INSTALLATION - GASKET GLAZING

A. Fabricate gaskets to fit openings.

B. Install gaskets in single pieces on each side of opening with joints only at corners.

C. Where recommended by framing system manufacturer, seal corners watertight.

D. Compress gaskets to produce weathertight seal without causing bending stresses in glass.

3.5 INSTALLATION - TAPE GLAZING

A. Install tape on fixed stop form continuous airtight seals. Do not stretch tapes to make them fit.

B. Butt tape corners with full contact.

C. Install tape projecting slightly above sight line.

D. Insert spacer shims between glass and applied stops at 24 inch intervals, but not less than 2 per side, and 1/4 inch below sight line.

E. Install removable glazing stops in full contact with tape.

F. Trim protruding tape edges flush with stops.

3.6 INSTALLATION - BUTT GLAZING

A. Set glass with uniform joint width and provide temporary spacers to maintain width.

B. Mask adjacent surfaces to control size of silicone bead and to prevent misapplications of sealant to framing and vision surfaces of glass.

C. Fill joints with sealant.

D. Extend sealant below sightline of framing and stops.

E. Tool sealant to ensure complete contact with joint surfaces and to form smooth, concave exposed surface. Remove masking immediately after tooling.

F. Provide temporary bracing as needed to maintain joint alignment during sealant curing period.

G. Finished Appearance: Smooth surfaces free of gaps, voids, bubbles, lumps, crevices, runs, drips, striations, and other irregularities.

3.7 CLEANING

A. Remove nonpermanent labels and clean surfaces after installation.

B. Clean glass on both sides shortly before inspection for Substantial Completion.

3.8 PROTECTION

A. Protect glass vulnerable to damage with streamers attached to framing.

B. Exterior Glass:
   1. Protect glass from contact with contaminating substances and overspray of water repellent on adjacent surfaces.
   2. Examine glass surfaces below concrete or masonry for alkaline deposits and dirt, and remove such soiling when observed.
   3. Provide new replacement units for damaged glass, including glass with stains or etching that cannot be removed.

END OF SECTION

SECTION 088300

MIRRORS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Full height mirrors at dance and fitness areas.

B. Principal Products:
   1. Mirrors with top and bottom channel trim.

C. Related Requirements.
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 088000: Glazing.
   5. Section 102800: Framed mirrors.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
   1. Coordinate work results of this Section with wood blocking locations.

B. Preinstallation Meeting Attendees and Procedures:
   1. Conduct meeting one week, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Mirror glass.
   2. Installation accessories.

B. Shop Drawings:
   1. Each custom mirror type and size.
   2. Mirror wall panels in Multi-Purpose Rooms; show joint locations.

C. Samples:
   1. Mirrors: 12 inches square.
      a. Demonstrate edge treatment.
   2. Mirror Trim: 12 inch lengths.

1.4 CLOSEOUT SUBMITTALS

A. Warranty Documentation: For mirrors.

1.5 FIELD CONDITIONS

A. Ambient Conditions: Perform Work within following limitations.
   1. Building enclosed and environmental systems maintaining design conditions for Owner occupancy.
   2. Installation Temperature: 50 degrees F, minimum.

1.6 WARRANTY

A. Manufacturer Warranty:
   1. Warrant against silver spoilage and delamination.
   2. Warranty Period: 10 years.

PART 2 - PRODUCTS

2.1 MIRRORS

A. Tempered Safety Mirrors: ASTM C1048, Kind FT and ASTM C1036 Class 1 Clear, Quality Q2; with copper and silver coating, and organic overcoating.
   1. Edges: Polished.
   2. Thickness: 6 mm.

2.2 INSTALLATION MATERIALS

A. Setting Blocks: Neoprene or EPDM; 80 to 90 Shore A durometer hardness.

B. Spacer Shims: Neoprene; 50 to 60 Shore A durometer hardness, self adhesive on one face.

C. Top and Bottom Channels: Extruded aluminum J-profile channels, supplied with stainless steel screws.
   1. Finish: Clear anodized.

D. Mirror Mastic: Adhesive setting compound manufactured specifically for mounting mirrors, compatible with mirror backing materials and substrate.
   1. VOC Content: 70 g/L, maximum.

2.3 PERFORMANCE

A. Safety Mirrors: 16 CFR 1201, Category II.
   1. Locations shown on Drawings, door mounted mirrors, and mirrors with bottom edges 36 inches or less above floor.

2.4 FABRICATION

A. Fabricate mirrors and mounting channels to size before delivery to site.

B. Fabricate mirrors for 1/8 inch clearance to adjacent construction.

C. Seal edges to prevent chemical or atmospheric penetration of reflective coating.

D. Tempered Safety Mirrors: Fabricate with horizontal roller wave.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that wall surfaces are in plane so mirrors can be installed without distortion.

3.2 PREPARATION

A. Adhesive Installation: Clean surfaces, remove adhesion inhibiting substances.

3.3 INSTALLATION

A. Follow GANA Glazing Manual for mirror installation methods.

B. Install mirrors plumb and level, and free of optical distortion.

C. Install mirrors with 1/4 inch edge clearance and 1/8 inch, minimum space behind mirror.

D. Frameless Mechanical Installation:
   1. Screw attach top and bottom channels to wall framing.
   2. Install setting blocks in thin bead of silicone sealant.
   3. Set mirrors without direct metal contact.

3.4 CLEANING

A. Remove labels, wash and polish mirror surfaces and metal supports.

END OF SECTION

SECTION 089119

FIXED LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Fixed louver and frame system.

B. Principal Products:
   1. Fixed extruded aluminum louvers.
   2. Blank-off panels for louvers.
   3. Installation accessories.

C. Related Requirements:
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 084113: Aluminum framed storefronts.
   5. Section 084413: Glazed aluminum curtain walls.
   6. Section 079200: Joint sealants.
   7. Division 23: Mechanical sections.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
   1. Coordinate louver installation with mechanical ductwork and wall flashing.

B. Preinstallation Meeting Attendees and Procedures:
   1. Conduct meeting one week, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Performance and Product Data, including AMCA Certified Ratings Seals.
   2. Initial selection color charts and Samples.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.
   1. Show mullion profiles and locations.

C. Samples: Finished metal, 6 by 6 inches in size.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates:
   1. Manufacturer certificate for performance.

B. Delegated Design Submittals: For fixed louvers, signed and sealed by a licensed professional.

C. Field Quality Control Submittals: Field test and inspection reports.

D. Manufacturer Reports: Field instruction, test, and inspection reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fixed louvers.

B. Warranty Documentation: For louvers and finishes.

1.6 QUALITY ASSURANCE

A. Qualifications:
   1. Welding: Provide copies of welder certificates as informational submittals if requested by Architect.
      a. Steel: AWS D1.1, Structural Welding Code - Steel.
      b. Aluminum: AWS D1.2, Structural Welding Code - Aluminum.
      c. Stainless Steel: AWS D1.6, Structural Welding Code - Stainless Steel.
   2. Installers: Manufacturer trained and certified.
   3. Testing Agencies: Acceptable to authorities having jurisdiction.
   4. Licensed Professional: Engineer experienced in designing louvers, licensed in Work specified in this Section, licensed in state of Pennsylvania.

1.7 FIELD CONDITIONS

A. Existing Conditions: Verify field measurements before fabrication. Show field measurements on Shop Drawings.

1.8 WARRANTY

A. Finish Warranty: Repair deteriorated finishes or replace components.
   1. Deterioration includes the following:
      a. Color Fading: More than 5 Hunter units per ASTM D2244.
      b. Chalking: More than No. 8 rating per ASTM D4214.
      c. Paint cracking, peeling or checking.
   2. Warranty Period: 20 years.

PART 2 - PRODUCTS

2.1 FIXED BLADE LOUVERS

A. Aluminum Louvers: Horizontal, sightproof,storm resistant, extruded aluminum frames and blades.
   1. Manufacturers and Products:
      a. Airline Louvers; Model AS4D45H, 4 inch Deep 45 deg Aluminum Drainable Blade Louver.
      b. Arrow United; Model EA445D, 4 inch Deep 45 deg Aluminum Drainable Blade Louver.
      c. Comparable product submitted and accepted prior to bidding.
   2. Certifications:
      a. AMCA 500-L Air Performance + Water Penetration.
      b. AMCA 500-L Wind Driven Rain Resistance.
   3. Louver Depth: 4 inches.
   4. Frame and Blade Nominal Thickness: 0.080 inch, minimum.
   5. Mullion Type: Fully recessed.
   6. Louver Performance Ratings:
      a. Free Area: 8.0 sq. ft. for 48 by 48 inch louver, minimum.
      b. Point of Beginning Water Penetration: 950 fpm, minimum.
      c. Air Performance: 0.10 inch wg static pressure drop at 700 fpm free area intake velocity, maximum.
   7. Finish: Mica coating.
      a. Color: Custom to match adjacent storefront, Architect selected.

2.2 LOUVER SCREENS

A. General: Provide screens at each exterior louver.
   1. Screen Location: Interior face of louver.
   2. Screening Type: Insect screening.
   3. Screen Frame: Same material and finish as louver, corners mitered.

B. Insect Screens: 18 x 16 stainless steel mesh.

C. Secure screen frames to louver frames with machine screws with heads finished to match louver, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

2.3 BLANK-OFF PANELS

A. Insulated, Blank-Off Panels: Metal sheets laminated to insulating core.
   1. Thickness: 2 inches.
   2. Thermal: R- 8, minimum.
   3. Sheet Metal: Same material as louver blades.
   4. Insulation: Rigid, mineral fiber board insulation.

5. Edge Treatment: Prefinished metal channels or sheets, pan in pan design, corners mitered, finished to match blank-off panels.
6. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
7. Panel Finish: Same type of finish applied to louvers, but black color.

2.4 PERFORMANCE

A. Delegate fixed louver design to manufacturer licensed Professional Engineer.

B. Structural Design Criteria: See Structural Drawings.

C. Structural Loads: See Drawings.

D. Allowable Deflection: 1/360, maximum.

E. Seismic Movement: ASCE/SEI 7.

F. Environmental Performance:
1. Expansion and Contraction: Withstand 120 degree F ambient and 180 degree F surface thermal cycling without failure.

2.5 MATERIALS

A. Aluminum Extrusions: ASTM B221, manufacturer standard alloy and temper.

B. Aluminum Sheet: ASTM B209, manufacturer standard alloy and temper.

C. Stainless Steel Sheet: ASTM A666, Type 304 or 316.

D. Separation Coating: Bituminous paint; SSPC Paint 12.

E. Fasteners: Stainless steel, types and sizes suitable for installation conditions.
1. Where exposed or semi exposed, use countersunk flathead screws finished to match adjacent surface.

F. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

2.6 FABRICATION

A. Factory Assembly:
1. Assemble louvers in largest units practical for shipping and handling.
2. Fabricate to fit in openings of sizes shown on approved Shop Drawings, with allowances for fabrication tolerances and perimeter joints.

B. Include supports, anchorages, and accessories required for complete assembly.

C. Recessed Louvers: Provide subsills made of same material as louvers.

2.7 ALUMINUM FINISHES

A. Anodizing: AAMA 611 Class I or AAMA 612 with electro deposition organic seal.
   1. Color: See Drawings.

B. Metallic Coating: Three coat fluoropolymer finish with minimum 70 percent PVDF resin by weight in color coat and clear coat; AAMA 2605.
   1. Color: Custom to match adjacent storefront, Architect selected.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify prepared openings and flashings are ready to receive Work and opening dimensions are as shown on Shop Drawings.

3.2 INSTALLATION

A. Install louvers level, plumb, and parallel to wall.

B. Install flashing and align louver assembly to drain moisture to exterior.

C. Secure louvers in opening framing with concealed fasteners.

D. Install insect screens and frames.

E. Install blank-off panels. Coordinate with ductwork sizes and locations.

F. Install backer rod and perimeter sealant per Section 079200.

3.3 CLEANING

A. Remove protective finish coverings.

B. Clean surfaces and components.

END OF SECTION

SECTION 090561

COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Test concrete floor slabs for moisture and alkalinity.
   2. Prepare existing concrete slabs for the following flooring types:
      a. Resilient flooring.
      b. Carpet flooring.
   3. Remediate concrete floor slabs due to unsatisfactory moisture or alkalinity conditions.

B. Principal Products:
   1. Testing apparatus.
   2. Patching and self-leveling compounds.
   3. Remedial floor coatings.

C. Related Requirements:
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 035400: Cast underlayment.
   5. Section 096500: Resilient flooring.
   6. Section 096813: Tile carpeting.
   7. Section 096816: Sheet carpeting.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting Attendees and Procedures:
   1. Conduct meeting one week, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
      a. Moisture and alkalinity limits and test methods.
      b. Manufacturer required bond/compatibility test procedure.
   2. Remedial Materials:
      a. Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.

1.4 INFORMATIONAL SUBMITTALS

A. Visual Observation Report: For existing floor coverings to be removed.

B. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and alkalinity test reports.
   4. Copies of specified test methods.
   5. Recommendations for remediation of unsatisfactory surfaces.
   6. Include certification of accuracy by authorized official of testing agency.
   7. Submit report to Architect and Owner two business days, maximum after conclusion of testing.

C. Adhesive Bond and Compatibility Test Report.

D. Specimen Warranty: Issued by remedial material manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Warranty Documentation: For remedial floor coatings.

1.6 QUALITY ASSURANCE

A. Testing Agency: Employ and pay for an independent testing agency to perform moisture and alkalinity testing.
   1. Qualifications: Experienced in specified testing methods.
   2. Contractor's Responsibility Relating to Independent Agency Testing:
      a. Provide access for and cooperate with testing agency.
      b. Confirm date of start of testing at least 10 days before actual start.
      c. Allow at least 4 business days on site for testing agency activities.
      d. Achieve and maintain specified ambient conditions.
      e. Notify Owner when specified ambient conditions have been achieved and when testing will start.

B. Mockup: Construct and test mockup per ASTM F3010.

C. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store materials in manufacturer packaging; include installation instructions.

B. Keep materials from freezing.

1.8 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours before testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours before testing, at not less than 40 percent and not more than 60 percent.

PART 2 - PRODUCTS

2.1 FLOORING PREPARATION MATERIALS

A. Patching and Self-Leveling Compound:
   1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, capable of being installed to thicknesses shown, and feathered to nothing at edges.
   2. Compressive Strength: 4000 psi, minimum after 28 days per ASTM C109/C109M or ASTM C472, whichever is appropriate.

B. Alternate Flooring Adhesive: Floor covering or adhesive manufacturer recommended product, suitable for the moisture and pH conditions present.
   1. VOC Content: 50 g/L, maximum.

C. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination.
   1. Manufacturers and Products: Testing agency recommended or one of the following:
      a. ARDEX Engineered Cements; ARDEX MC ULTRA with ARDEX V 1000.
      b. Custom Building Products; CustomTech Tech MVC with TechLevel 100.
      c. Dependable Floor Products; VAPORSEAL-HM with Dependable SKIMFLOW ES.
      d. Koster American Corporation; Koster VAP I 2000 with Koster SL Premium overlay.
      e. LATICRETE International, Inc; LATICRETE SUPERCAP Moisture Vapor Control with LATICRETE SUPERCAP Underlayment or NXT Vapor Reduction Coating with NXT Level.
      f. MAPEI Planiseal VS with Mapei PlaniLevel 560.
      g. UZIN; UZIN PE 460 with UZIN PE 280 and UZIN NC 150.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Follow ASTM F3010.

3.2 CONCRETE SLAB PREPARATION - NORMAL WEIGHT CONCRETE

A. Follow recommendations of testing agency and ASTM F3010.

B. Perform following operations in this order:
   1. Existing on-grade and elevated concrete slabs with existing floor coverings:

a. Observe existing floor covering for adhesion, water damage, alkaline deposits, and other defects.
b. Remove existing floor covering.

2. Existing concrete slabs with coatings or penetrating sealers/hardeners/dustproofers:
   a. Do not attempt to remove coating or penetrating material.
   b. Do not abrade surface.
3. Perform preliminary cleaning.
4. Internal Relative Humidity Testing: Three tests in the first 1000 square feet and one test in each additional 1000 square feet, or flooring manufacturer recommended frequency.
5. Alkalinity Tests: Relative humidity test locations.
6. Specified remediation, if required due to relative humidity test result.
7. Patching, smoothing, and leveling.
8. Other preparation specified in finish flooring sections.
9. Adhesive bond and compatibility test.
10. Apply protection.

C. Remediations:
   1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct before doing any other remediation; re-test after correction.
   2. Excessive Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating over entire suspect floor area.
   3. Excessive Alkalinity:
      a. If remedial floor coating is necessary to address excessive moisture, no additional remediation is required for pH.
      b. If an adhesive that is resistant to the pH level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.3 EXISTING FLOOR COVERINGS REMOVAL

A. Follow local, State, and federal regulations and RFCI "Recommended Work Practices for Removal of Resilient Floor Coverings," applicable to floor covering being removed.

3.4 PRELIMINARY CLEANING

A. Clean floors, remove adhesion-inhibiting substances.

B. Do not use solvents for cleaning.

3.5 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer requirements conflict with either the referenced test method or this specification, follow the manufacturer requirements.

B. Testing: ASTM F2170 Procedure A. Calcium Chloride and electrical impedance or resistance testing may not be substituted.

C. If test values exceed floor covering manufacturer limits, perform remediation. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

D. Report the information required by the test method.

3.6 ALKALINITY TESTING

A. Where the floor covering manufacturer requirements conflict with either the referenced test method or this specification, follow the manufacturer requirements.

B. Use a wide range alkalinity test paper, its associated chart, and distilled or deionized water.

C. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity test paper into the water, remove it, and compare immediately to chart to determine alkalinity reading.

D. In the event that test values exceed floor covering manufacturer limits, perform remediation. In the absence of manufacturer limits, perform remediation if alkalinity test value exceeds 10.

3.7 PREPARATION

A. See individual floor covering sections for additional requirements.

B. Follow recommendations of testing agency.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.8 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Follow requirements and recommendations of floor covering manufacturer.

3.9 APPLICATION OF REMEDIAL FLOOR COATING

A. Mix and apply remedial floor coating.
   1. Prohibit traffic during application.
   2. Honor substrate control, isolation and expansion joints.
   3. Prime substrate, and apply floor coating in layers as recommended by manufacturer.
   4. Allow coating to cure before applying finish flooring.

3.10 PROTECTION

A. Cover prepared floors with building paper or other durable covering until finish flooring is installed.

END OF SECTION

SECTION 092116

GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Gypsum board assemblies for interior walls and ceilings.

B. Principal Products:
1. Gypsum board, high impact and high moisture.
2. Partition framing.
3. Decorative aluminum trim.
4. Sound attenuation blanket.
5. Installation components.

C. Related Requirements.
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 054000: Additional requirements for delegated design areas.
5. Section 099000: Painting and coating.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
1. Coordinate concealed framing for supports and anchorage of other work.

B. Preinstallation Meeting:
1. Conduct meeting one week, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data.
1. Steel studs, furring, and accessories.
2. Suspension system for gypsum board ceilings.
3. Each type of gypsum board.
4. Cementitious tile backer board.
5. Trim accessories.
6. Sound attenuation blankets.

B. Shop Drawings:
   1. Grid suspension system.

C. Samples:
   1. Trim Accessories: 12-inch lengths of trim other than edge beads and control joints.

1.4 INFORMATIONAL SUBMITTALS

A. Delegated Design Submittals:
   1. Non-structural metal framing, for deflection limits under horizontal loading. Indicate the following for each partition type and height:
      a. Stud size.
      b. Stud thickness.
      c. Spacing.

1.5 QUALITY ASSURANCE

A. Field Samples: Apply textured finish on 4 feet wide by full wall height. Demonstrate texture, color, and pattern.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements: ASTM C840.

PART 2 - PRODUCTS

2.1 FRAMING - GENERAL

A. Framing Members and Components - General: AISI S220.
   1. Protective Coating: ASTM A653/A653M, G60, hot-dip galvanized. EQ coatings following AISI S220 that have ICC-ES Evaluation Reports are acceptable.

2.2 PARTITION FRAMING

A. Contractor Option: Use standard steel studs and tracks, high-strength embossed steel studs and tracks, or adjustable-height steel framing system.

B. Standard Studs and Tracks:
   1. Depth: See Drawings.
   2. Thickness: As required by horizontal deflection performance and 33 mils minimum.

C. High-Strength Embossed Steel Studs and Tracks:
   1. Manufacturers and Products:
      a. ClarkDietrich ProSTUD Framing.
      b. Marino\WARE ViperStud.
      c. Comparable product submitted and accepted prior to bidding.
   2. Yield Strength: 50 ksi, minimum; as required by horizontal deflection performance.

3. Depth: See Drawings.
4. Thickness: As required by horizontal deflection performance and 19 mils minimum.

D. Adjustable-Height Steel Framing: Telescoping, twist-in-place steel stud and track system accommodating vertical deflection.
1. Manufacturers and Products:
   a. ClarkDietrich TRAKLOC TLD Deflection Stud.
   b. Comparable product submitted and accepted prior to bidding.
2. Depth: See Drawings.
3. Thickness: As required by horizontal deflection performance and 33 mils minimum.
4. Length: Stud telescopes to 12 inches longer than total length.

E. Factory-Cutout Steel Framing:
1. Manufacturers and Products:
   a. Marino\Ware StudRite.
2. Overall Depth: See Drawings.
3. Thickness: As required by horizontal deflection performance and 33 mils minimum.

F. Deflection Top Track: Not required with adjustable-height deflection studs.Provide one of the following:
1. Single Long-Leg Track: Steel top track with 2-1/2 inch deep flanges; studs friction fit.
2. Single Slotted Track: Steel top track with 2-1/2 inch deep slotted flanges; studs fastened through slots.
3. Double Track: Steel top track system with inside track fastened to studs and outside track fastened to structure.
   a. Outside Track: 2-1/2 inch flanges.
   b. Inside Track: Flanges 1/2 inch shorter than outside track.
4. Steel Thickness: Match studs.

G. Hat-Shaped Furring Channels:
1. Minimum Thickness: 33 mils.
2. Depth: See Drawings.

H. Bridging: Cold-rolled steel channels, 54 mil thick, with minimum 1/2 inch wide flanges.
1. Depth: 1-1/2 inches.

2.3 SUSPENSION SYSTEMS

A. Anchorage Devices: Power-actuated fasteners, fabricated with loops for attaching wire hangers.

B. Wire Hangers: ASTM A641, zinc coated, 0.16 inch minimum diameter.

C. Rigid Hangers: One of the following types.
1. Rods: Mild steel, minimum 1/4 inch diameter, hot-dip galvanized per ASTM A153.
2. Flat Strap: Mild steel, minimum 1 by 1/8 inch size, hot-dip galvanized per ASTM A153.

3. Angles: Formed steel sheet, minimum 7/8 inch legs and 0.040 thickness, G90 hot-dip galvanized per ASTM A653.

D. Cold-Rolled Carrying Channels:
1. Minimum Thickness: 54 mils.
2. Depth: 2-1/2 inches.

E. Hat-Shaped Furring Channels:
1. Minimum Thickness: 33 mils.
2. Depth: See Drawings.

F. Grid Suspension System: Direct-hung, pre-engineered ceiling suspension system.
1. Manufacturers and Products:
a. Armstrong World Industries Drywall Grid Systems.
b. Rockfon Chicago Metallic Drywall Grid.
c. USG Drywall Grid.

2.4 GYPSUM BOARD

A. Impact-Resistant Gypsum Board: ASTM C1629.
1. Manufacturers and Products:
a. CertainTeed Extreme Impact Resistant Gypsum Board.
b. Georgia-Pacific Gypsum DenArmor Plus Fireguard Impact-Resistant.
c. National Gypsum Gold Bond Hi-Impact XP Gypsum Board.
d. USG Corp Sheetrock Mold Tough VHI Firecode X.
2. Core: 5/8 inch, Type X.
3. Surface Abrasion: Level 3 requirements.
4. Surface Indentation: Level 1.
5. Single-Drop Soft-Body Impact: Level 3.
6. Hard-Body Impact: Level 3, minimum, per test in Annex A1.
7. Mold Resistance: 10 per ASTM D3273.

2.5 BACKING

A. Contractor Option: Use manufactured, preformed sheet steel backing, manufactured flexible wood backing system, or flat strap backing plates.

B. Manufactured, Preformed Sheet Steel Backing: 6 inch wide, 68 mil steel, formed to fit stud spacing.
1. Manufacturers and Products:
a. Perfect Wall, Inc. Flush-Mount Flat Reinforced Backing.
b. Comparable product submitted and accepted prior to bidding.

C. Wood Backing System: Fire-retardant treated wood and predrilled steel clips.
1. Manufacturers and Products:
a. ClarkDietrich Danback.

b. SCAFCO Kwik-Back.
c. Comparable product submitted and accepted prior to bidding.

D. Flat Strap Backing Plates: Steel sheet screwed to studs.
1. Width: 6 inches minimum or as needed for secure anchorage of wall-mounted items.
2. Thickness: 63 mils minimum where supporting the following items.
a. Handrails, grab bars, and other items that support live loads.
b. Fireplace mantles.
c. Curtains and drapery track.
d. Headboards.
e. Wall-supported counter tops and cabinets.
f. Ladders.
g. Electrical panels.
h. Electrically-operated fixtures, furnishings, or equipment.
i. Large lighting fixtures.
j. Wall mounted televisions and monitor screens.
k. Mirrors.
l. Large artwork.
3. Thickness: 33 mils minimum where supporting the following items.
a. Wood trim.
b. Toilet and bath accessories, other than grab bars.
c. Small lighting fixtures.
d. Anchorage for base cabinets.
e. Small artwork.

2.6 PERFORMANCE

A. Delegate stud framing to manufacturer licensed Professional Engineer.
1. Select stud thicknesses and spacing from manufacturer load and deflection tables to meet performance requirements, including wall-mounted element supports such as handrails and wall cabinets.

B. Structural Design Criteria:
1. Horizontal Partition Load: 5 psf.
2. Vertical Ceiling Load: Supported material dead load.
3. Partition Horizontal Deflection Limits:
a. Tile and Stone Finished Partitions: 1/360 of wall height.
b. Other Partitions: 1/240 of wall height.
4. Ceiling Vertical Deflection Limits: 1/360 of span.

C. Fire Resistance: Assemblies tested per ASTM E119.
1. Fire Ratings: See Drawings.

2.7 FIRESTOPPING COMPONENTS

A. Wall Head Joint Firestopping: Section 078400.

B. Firestop Track: One of the following types.
   1. Top track manufactured to accommodate structural deflection while maintaining fire-resistance-rated assembly continuity.
      a. Manufacturers and Products:
         1) CEMCO FAS-Track.
         2) ClarkDietrich BlazeFrame DL 2.
         3) Fire Trak Corp Fire Trak System.
         4) Metal-Lite The System.
   2. Intumescent Firestop Seal: One-piece, pre-formed foam seal fitting over top tracks.
      a. Manufacturers and Products:
         1) Hilti, Inc. Model CFS-TTS, Firestop Top Track Seal.
      b. Width: Accommodating track depth.

2.8 INSTALLATION COMPONENTS

A. Framing Installation:
   1. Anchors: Framing manufacturer recommended types for substrates.
   2. Fasteners: ASTM C1002; Type S and GA-216; length to suit application.
   3. Tie Wire: ASTM A641, zinc coated, 0.062 inch diameter, minimum.
   4. Acoustic Gaskets: Closed-cell foam self-adhesive strips allowing fastener penetration without foam displacement, 1/8 inch thick minimum, widths to match stud sizes.
   5. Exterior Wall Isolation Strips:
      a. Asphalt-Saturated Organic Felt: ASTM D226, Type I, #15 asphalt felt, nonperforated.
      b. Foam Gaskets: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, stud-appropriate width.

B. Interior Trim: ASTM C1047.
   1. Material: Galvanized or aluminum-coated steel sheet.
   2. Shapes: Cornerbead, U-bead, and LC-bead.

C. PVC Trim: ASTM C1047 and ASTM D3678.
   1. Manufacturers:
      a. ClarkDietrich.
      b. Plastic Components, Inc.
      c. Trim-Tex Inc.
   2. Shapes: See Drawings.

D. Aluminum Trim: Extruded units.
   1. Manufacturers:
      a. Fry Reglet Corp.
      b. Gordon, Inc.

c. Pittcon Industries.
2. Finish: See Drawings.
3. Profiles: See Drawings.

E. Sound Attenuation Blankets: ASTM C665, Type I, unfaced semi rigid mineral wool, thickness shown on Drawings, sized for friction fit.
1. Surface Burning Characteristics: ASTM E84.
a. Flame Spread: 25 maximum.
b. Smoke Developed: 50 maximum.
2. Fire Rated Partitions: Insulation type required by fire resistance designs referenced on Drawings.
3. Thickness:
a. Walls: 3 1/2 inches.
b. Ceilings: 3 1/2 inches.

F. Acoustic Sealant: ASTM C834; nonsag, paintable, nonstaining, butyl-free, latex sealant.
1. Manufacturers and Products:
a. Accumetric LLC BOSS 824 Acoustical Sound Sealant.
b. GE Construction Sealants RCS20.
c. Grabber Construction Products Acoustical Sealant GSC.
d. Hilti, Inc. CP509 Smoke and Acoustical Sealant.
e. Pecora Corporation AC-20 FTR.
f. Specified Technologies, Inc. Smoke N Sound Acoustical Sealant.
g. USG Corporation SHEETROCK Acoustical Sealant.
2. Fire Rated Partitions: Acoustical sealant type required or permitted by fire resistance designs shown on Drawings.

G. Electrical Box Pads: Moldable non-curing one component, intumescent, fire-rated material for through-penetration fire stop systems and sound attenuation systems; self-adhering; 1/8 inch thick, minimum.
1. Manufacturers and Products:
a. Kinetics Noise Control Fire-Rated Isobacker.
b. Specified Technologies, Inc. SpecSeal Firestop Putty Pads.
c. Comparable product submitted and accepted prior to bidding.

H. Gypsum Board Fasteners:
1. Metal Framing 33 mils Thick and Less: ASTM C1002, Type S.
2. Metal Framing Greater than 33 mils Thick: ASTM C954.

I. Tile Backer Board Fasteners: Board manufacturer standard, corrosion resistant steel.

J. Laminating Adhesive: Recommended type for directly adhering gypsum panels to continuous substrate.

K. Joint Materials:
1. Interior Gypsum Board: ASTM C475/C475M; products compatible with substrate and other coatings applied to surface.
a. Skim Coat For Final Coat of Level 5 Finish: Spray-applied high-build coating.
2. Tile Backer Board: Product recommended by backer unit manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify rough-in utilities in are proper locations.

B. Examine panels for moisture and mold; discard damaged panels.

3.2 PREPARATION

A. Remove sprayed fireproofing to the extent required to install gypsum assemblies. Patch damaged fireproofing.

3.3 INSTALLATION - PARTITION FRAMING

A. Framing to Structure: Extend partition framing to underside of structure. Attach ceiling track to structure.

B. Framing to Ceiling: Extend framing to ceiling. Attach ceiling track to ceiling framing.

C. Brace stud framing system rigid; attach bridging to prevent stud rotation.

D. Orient stud flanges the same direction within wall assembly.

E. Stud Spacing:
1. Single-Layer Applications: 16 inches.
2. Multi-Layer Applications: 16 inches.
3. Tile Backer Applications: 16 inches.

F. Install backing where shown and where supporting wall-mounted fixtures, furniture, equipment, or other construction.

G. Fire-Resistance-Rated Partitions: Tested assembly requirements.

H. Firestop Track: Tested assembly requirements.

I. Acoustic Accessories and STC-Rated Assemblies: Follow tested assembly requirements.
1. Acoustical Sealant Beads: ASTM C919. Close off sound-flanking paths.
2. Electrical Box Seals:
a. Install seals before installing gypsum board.

b. Overlap front edge of box so that seals will be compressed around edges of box as gypsum panels are installed.

3. Sound Attenuation Blankets:
   a. Install after one side of gypsum is installed and mechanical and electrical work is complete in framing spaces.
   b. Fit tight around cut openings and penetrations, and behind and around electrical and mechanical items.
   c. Pack around door and window frames, between jamb studs, in boxed headers, and in other voids.

J. Deflection Accommodation: Where framing extends to overhead structure, install deflection top track systems to prevent axial loading of finished assemblies.

K. Framed Openings:
1. Install two studs at each jamb or as shown on Drawings.
2. Headers: Install track on top of header for installation of cripple studs.

L. Direct Furring:
1. Anchor furring channels spaced 16 inches to substrate.
   a. Exterior Walls: Install isolation strip between furring and exterior walls.

3.4 INSTALLATION - SUSPENSION SYSTEMS

A. Suspension System Spacings:
1. Hangers: 48 inches.
2. Main Runners: 48 inches.
3. Furring Channels: 16 inches.

B. Isolate suspension systems from building structure and other objects within ceiling plenum.

C. Wire Hangers: Install plumb.
1. Splay hangers where required to avoid contact with obstructions.
2. Attach securely to building structural elements.
3. Do not attach to steel roof deck and permanent metal forms.
4. Do not connect or suspend from ducts, pipes, or conduit.

D. Large Obstructions: Install supplemental suspension members and hangers, sized to span across objections and support ceiling loads.

E. Grid Suspension Systems: Install per ASTM C636.
1. Install additional hanger wires or metal supports at lighting fixtures air vents, and other ceiling-mounted equipment.

3.5 INSTALLATION - FRAMING TOLERANCES

A. Deviation from Indicated Position: 1/8 inch in 10 feet, maximum.

B. Deviation from Plumb and Level: 1/8 inch in 12 feet, maximum.

3.6 INSTALLATION - ELECTRICAL BOX SEALS

A. Install seals before installing gypsum board.

B. Overlap front edge of box so that seals will be compressed around edges of box as gypsum panels are installed.

C. Applications:
1. Electrical boxes in fire barriers, smoke barriers, and STC-rated walls.
2. Electrical boxes at interior gypsum board faces of exterior walls.

3.7 INSTALLATION - INTERIOR GYPSUM BOARD

A. Follow ASTM C840.
1. Fire-Rated Partitions: Install per tested designs referenced on Drawings.
2. Acoustically-Rated Partitions: Install per tested designs referenced on Drawings.

B. Cut panels to fit obstructions and openings without tearing face paper or cracking core.

C. Install panels with face side out with lightly butted joints.

D. Stagger joints on opposite sides of partitions.

E. Locate panel ends over support framing.

F. Fit panels to ducts, pipes, conduit, and other penetrations and obstructions with maximum 1/4 inch joints.

G. Attach gypsum board to framing and to supplementary framing and blocking provided for additional support at openings and cutouts.

H. Form control joints and expansion joints with space between edges of boards, prepared to receive trim accessories.

I. Isolate perimeter of non-loadbearing drywall partitions from structural members. Provide 1/4 to 1/2-inch space and trim edge with edge bead. Seal joints with acoustical sealant.

J. Single Layer Installation:
1. Install panels vertically with long edges on continuous supports.
2. Attach panels to framing with screws.

K. Double Layer Installation:
1. Attach base layer to framing with screws.
2. Offset second layer joints and attach panels with screws.

3. At walls taller than 9 feet, install panels horizontally and provide control joints at floor lines.

3.8 INSTALLATION - TRIM

A. Vertical Trim: Install in single pieces where length is 9 feet or less.

B. Control Joints: Install where shown on Drawings and per ASTM C840 and as follows.
   1. Locations of control and expansion joints in substrate or framing.
   2. Walls:
      a. At changes in backup material.
      b. Above one jamb of doors.
      c. Maximum 30 feet on center.
   3. Ceilings:
      a. At locations where ceiling framing or furring changes direction.
      b. Maximum 50 feet on center.

C. Corner Bead: Outside corners.

D. Casings: Install at termination joints with other construction or where edges are exposed.

E. Reveals: Install trim plumb, level, accurately aligned, and fitted neatly with hairline joints.
   1. Cut trim with sharp power saw and file cut edges to remove burrs.
   2. Miter joint at changes in direction or plane, except that inside corners may be coped.
   3. Apply masking tape or other protection to reveal surfaces before starting drywall finishing.
   4. Rated Fire and Smoke Barriers and Non-Rated Smoke Partitions: Install reveals to maintain rating.
   5. Routing of gypsum board to create reveals is not acceptable.

3.9 GYPSUM BOARD FINISHING

A. Reference Standard: ASTM C840.

B. Finish panel joints, inside corners, trim flanges, fastener heads, and surface defects to provide smooth, continuous surfaces of monolithic appearance that are suitable for applied finishes.

C. Do not fill spaces around penetrations through fire resistive assemblies with joint compound. Leave space for firestopping.

D. Finish Levels:
   1. Level 1: Surfaces in plenums and other concealed areas.
   2. Level 2: Surfaces that receive tile.
   3. Level 3: Not used.
   4. Level 4: Surfaces that receive flat or low sheen paint and wall coverings.

5. Level 5: See Drawings, Surfaces that receive semigloss or gloss paint, and surfaces that are in edge-lit locations.

3.10 IDENTIFICATION

A. Identify fire and smoke rated walls and partitions and other walls required to have protected openings or penetrations.
   1. Locations: Within 4 ft of corners and maximum 12 feet between on both sides.
      a. In spaces without ceilings, locate signs minimum 10 ft above finish floor and not blocked from view by ducts, structure, or other elements.
   2. Signs: Painted stencil signs with minimum 4-inch high letters and 1/2-inch strokes, or as required by authorities having jurisdiction, or approved self-adhesive signs.
   3. Text: Use following or as required by authorities having jurisdiction.
      a. 1-HOUR FIRE AND SMOKE BARRIER – FIRESTOP ALL PENETRATIONS.
      b. 2-HOUR FIRE AND SMOKE BARRIER – FIRESTOP ALL PENETRATIONS.
      c. 3-HOUR FIRE WALL – PENETRATIONS NOT PERMITTED.
      d. NON-RATED SMOKE PARTITION – SEAL ALL PENETRATIONS.

3.11 ADJUSTING

A. Water-Exposed Products: Remove entire panels; do not cut and patch gypsum board.

3.12 CLEANING

A. Remove spills, spatters, and misapplications of finishing materials as they occur.

B. Repair other finish surfaces damaged during drywall operations.

3.13 PROTECTION

A. Protect adjacent surfaces from gypsum panel compounds, adhesives, and sealants.

B. Protect finished gypsum panels from being marred from ongoing work.

END OF SECTION

SECTION 096400

WOOD FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Wood athletic flooring in gymnasium, WF-1.
2. Refinishing of existing wood flooring, WF-2.

B. Principal Products:
1. Wood athletic flooring system.
2. Flooring support system.
3. Resilient padding.
4. Vapor retarder.
5. Vented wall base, RB-1.
6. Wood finishing.
7. Metal transition strips.

C. Related Requirements.
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 033000: Cast-in-place concrete floor tolerances.
5. Section 090561: Concrete floor moisture testing and mitigation.
6. Section 096500: Vented wall base.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
1. Coordinate finishing of wood flooring with installation of gymnasium equipment.

B. Preinstallation Meeting Attendees and Procedures:
1. Conduct meeting one week, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data: Wood flooring and installation materials.
1. Initial selection color charts and samples.

B. Shop Drawings:
1. Show floor joint pattern, grain direction, and termination details.

2. Show provisions for expansion and contraction, base, and base corner details,.
3. Athletic Floors:
   a. Dimensioned plan showing game line layout, colors, and line widths.
   b. Installation details.

C. Samples:
1. Wood flooring, Each Type: 12 inch long section.
   a. Illustrate grain, finish, color, and sheen.
2. Resilient Base - Vented: 12 inch length of each product.
3. Metal Transitions Strips: 12 inch length of each product.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Statements: installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For athletic wood flooring.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Materials:
1. Wood Flooring: 1 percent of installed materials, but not less than 100 square feet.

1.7 QUALITY ASSURANCE

A. Qualifications:
1. Installers: MFMA Mill Accredited Installation Company with MFMA Accredited Installers on site.

B. Field Samples: Install each type of wood flooring; 100 square feet, minimum area. Demonstrate texture, color, and pattern.
1. Approved samples establish work results standard.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Acclimation: Open, spread out, and store materials in area of installation for 24 hours, minimum, prior to installation.

1.9 FIELD CONDITIONS

A. Ambient Conditions: Perform work within following limitations:
1. Building enclosed and environmental systems maintaining design conditions for Owner occupancy.

PART 2 - PRODUCTS

2.1 ATHLETIC WOOD FLOORING

A. System Type: Anchored resilient.

B. Strip Flooring, WF-1:
1. WF-1 - Manufacturer and Product:
a. Robbins Sports Surfaces; Bio Cushion Classic.
b. Comparable products submitted and accepted prior to bidding.
2. Species: Hard Maple.
3. Grade: MFMA-RL; Second and Better.
4. Cut: Edge grain.
5. Moisture Content: 6 to 9 percent.
6. Thickness: 25/32 inch.
7. Face Width: 2-1/4 inches.
8. Edges: Tongue and Groove.
9. Ends: End matched.

2.2 INSTALLATION MATERIALS

A. Plywood Subflooring: APA Rated Sheathing, Exposure 1, 15/32 inch thick.

B. Underlayment: Veneer plywood, 1/4 inch thick.

C. Vapor Retarder: Polyethylene sheeting, 6 mil thick, minimum, self adhesive, with reinforced joint tape.

D. Resilient Wall Base - Vented, RB-1:
1. Description: Molded, vented, rubber cove base, premolded outside corners.
2. Dimensions: 4 by 3 inches.
3. Color: Black.

E. Metal Transition Strip:
1. Manufacturer and Product:
a. Schluter, basis of design.
b. Comparable product submitted and accepted prior to bidding.
2. Color: Architect selected.
3. Profile: See Drawings and Architect selected.
a. Wood Athletic Flooring to Resinous Flooring Transition: Manufacturer recommended, Architect selected.
b. Wood Athletic Flooring to VCT Transition: Manufacturer recommended, Architect selected.

F. Sleepers and Shims: Softwood lumber, pressure treated for moisture protection, 2 x 3 inches; 4 feet long.

G. Cushion Blocks: Rubber resilient pads.
   1. Basis of Design: Robbins; Bio Pad.
      a. Comparable products submitted and accepted prior to bidding.
   2. Thickness: 7/16 inch.

H. Thresholds: Match wood flooring.

I. Fasteners: Type recommended by flooring manufacturer.

J. Adhesive: Flooring manufacturer recommended type.
   1. VOC Content: 50 g/L, maximum.

2.3 FINISHES

A. Finish Materials:
   1. Urethane Finish: Water-based type recommended by flooring manufacturer.
   2. Stain: Penetrating and nonfading type.
   3. Sealer and Wax: Types recommended by flooring manufacturer.

B. Game Lines: Paints recommended by flooring manufacturer; compatible with floor finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Concrete Subfloors:
   1. Verify that concrete floors have cured minimum 28 days.
   2. Verify that substrate is smooth and flat to plus or minus 1/8 inch in 10 feet.
   3. Moisture and Alkalinity Testing: Section 090561.

B. Verify floor-mounted utilities are correctly located.

3.2 PREPARATION

A. Surface Preparation:
   1. Grind and modify concrete slab suitable for application of the new finish flooring.
   2. Broom clean substrate of dust, dirt, and construction debris before starting installation.

B. Concrete Substrates: Section 090561.

C. Conditioning:
   1. Condition product per NWFA's "Installation Guidelines: Wood Flooring."

D. Wood Substrates: Install per Flooring manufacturer recommendations.

E. Existing Wood Subflooring:
   1. Sand to remove ridges and high areas.

2. Vacuum clean.
3. Apply underlayment panels in straight rows with staggered end joints.
4. Glue and screw underlayment to wood subflooring.

3.3 INSTALLATION - ATHLETIC FLOORING

A. Follow MFMA instructions.

B. Vapor Retarder: NOFMA's "Installing Hardwood Flooring" and as follows:
1. Wood Flooring Nailed to Subfloor: Asphalt-saturated felt.
2. Wood Flooring Nailed to Sleepers over Concrete: One layer polyethylene sheet.
3. Installed Directly to Concrete: One layer polyethylene sheet.

C. Secure cushion blocks to underside of sleepers.

D. Over Vapor Retarder:
1. Lay sleepers end to end across short dimension of room at 12 inch centers, with joints staggered 24 inches, minimum.
2. Shim sleepers to level line.
3. Fireblock sleeper spaces creating maximum 100 sf open areas under finished flooring and filling spaces under partitions to separate adjacent rooms.

E. Provide expansion space at walls and other interruptions.

F. Place one layer of plywood subflooring over the sleepers. Lay at right angles to the sleepers and fasten at 12 inches oc.

G. Lay flooring parallel to length of room areas, set joints flush and tight. Verify alignment as work progresses.

H. Arrange flooring with end matched grain set flush and tight.

I. Install flooring tight to floor access covers.

J. Accessories Installation:
1. Provide threshold at centerline of door openings and where flooring terminates with other floor areas.
2. Install base at floor perimeter to cover expansion space. Miter inside and outside corners.
3. Install floor sockets and inserts to a depth sufficient to ensure flush top surface with sanded floor surface.

3.4 FINISHING

A. Sand flooring to smooth even finish with no evidence of sander marks. Contain and remove dust by vacuum.

B. Mask off adjacent surfaces.

C. Apply filler, stain or paint, and three finish coats.

D. Game Lines: Paint before applying final clear finish coat.

3.5 CLEANING

A. Clean and polish surfaces.

3.6 PROTECTION

A. Protection: Prohibit traffic for 48 hours after installation.

END OF SECTION

SECTION 096500

RESILIENT FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Resilient flooring.
   2. Resilient moldings.

B. Principal Products:
   1. Vinyl composition tile flooring, VCT-1, VCT-2, VCT-3, VCT-4, VCT-5, VCT-6, VCT-7.
   2. Rubber transition strips.
   3. Installation materials.

C. Related Requirements.
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 035400: Cast underlayment.
   5. Section 055000: Metal stair nosings.
   6. Section 090561: Flooring preparations.
   7. Section 096500: Vented resilient wall base at wood flooring.
   8. Section 096813: Tile carpeting.
   9. Section 096816: Sheet carpeting.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting Attendees and Procedures:
   1. Conduct meeting one week, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Resilient flooring products.
   2. Resilient accessories.
   3. Installation materials.
   4. Initial selection color samples.

B. Shop Drawings.
   1. Special patterns.

C. Product Schedule: Resilient flooring products.

D. Samples:
1. Resilient Tile Flooring: Full sized samples of each product.
2. Resilient Base: 12 inch length of each product.
3. Resilient Moldings: 12 inch length of each product.
4. Cap Strips: 12-inch samples.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For resilient flooring.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Materials:
1. Resilient Tile Flooring: One box per every 50 boxes installed.
2. Stair Accessories: 10 linear feet minimum per every 500 linear feet installed.

1.6 QUALITY ASSURANCE

A. Field Samples: Construct field samples of each type of resilient floor, 100 sq. ft.
1. Approved samples establish work results standard.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
1. Store resilient flooring indoors and within ambient temperature range recommended by manufacturer.
2. Store resilient sheet flooring rolls upright.
3. Store resilient tile flooring on flat surfaces.

1.8 FIELD CONDITIONS

A. Ambient Conditions: Perform work within following limitations.
1. Building enclosed and environmental systems maintaining design conditions for Owner occupancy.
2. Establish ambient conditions 48 hours, minimum before and maintain conditions during and 48 hours, minimum after installation.

PART 2 - PRODUCTS

2.1 RESILIENT TILE FLOORING

A. Vinyl Composition Floor Tile, VCT-1, VCT-2, VCT-3, VCT-4, VCT-5, VCT-6, VCT-7: ASTM F1066.
1. Manufacturers and Products:
a. Armstrong; Standard Excelon Imperial Texture.
b. Comparable product submitted and accepted prior to bidding.

2. Wearing Surface: Smooth.
3. Class: 2.
4. Thickness: 0.125 inch.
5. Size: 12 by 12 inches.
6. Color: Architect selected.
    a. VCT-1 - Basis of Design: 57546 Lime Zest by Armstrong.
    b. VCT-2 - Basis of Design: 57510 Kickin Kiwi by Armstrong.
    c. VCT-3 - Basis of Design: 57532 Grayson by Armstrong.
    d. VCT-4 - Basis of Design: 57539 Shoreline by Armstrong.
    e. VCT-5 - Basis of Design: 57541 Bay Blue by Armstrong.
    f. VCT-6 - Basis of Design: 57535 Blue Moon by Armstrong.
    g. VCT-7 - Basis of Design: 57517 Bodacious Blue by Armstrong.

2.2 RESILIENT BASE

A. Resilient Wall Base - Vented, RB-1: See Section 096400.

2.3 RESILIENT MOLDINGS

A. Rubber Transition Strips:
    1. Manufacturers and Products:
        a. Tarkett; Johnsonite.
        b. Roppe.
        c. Comparable product submitted and accepted prior to bidding.
    2. Color: Architect selected.
    3. Profiles: See Drawings.
        a. Resinous Flooring to VCT Transition: Manufacturer recommended, Architect selected.

2.4 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:
    1. Class I per ASTM E648 or NFPA 253, Critical Radiant Flux Classification.

2.5 INSTALLATION MATERIALS

A. Patching and Leveling Materials: Flooring manufacturer recommended products for applicable substrates.

B. Edge Strips: Rubber; profiles shown on Drawings.
    1. Colors: Architect selected.

C. Adhesives: Flooring manufacturer recommended water-based product.
    1. VOC Content: 50 g/L, maximum.

D. Floor Polish: Flooring manufacturer recommended product.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that concrete floors have cured 28 days, minimum.

B. Moisture and Alkalinity Testing: See Section 090561.

3.2 PREPARATION

A. Preparing Concrete Substrates: See Section 090561.

3.3 TILE FLOORING INSTALLATION

A. Mix materials from multiple containers for consistent blend of colors.

B. Lay out tiles so that units at opposite walls are equal width and more than half size.

C. Install tiles in pattern on Drawings, on approved shop drawings, and directed by Architect.

D. Extend tile into recesses and under equipment.

E. Terminate tile flooring at centerline of doors where adjacent floor finish is dissimilar.

F. Scribe and cut tile for close fit at vertical surfaces so that cut edge will be concealed by wall base or other trim.

G. Install tile with full adhesive coverage.

H. Roll tile to eliminate entrapped air and ensure full adhesion.

I. Install edge strips where tile terminates against dissimilar flooring. Butt end seams tight.

3.4 BASE INSTALLATION

A. Installation:
   1. Form tight joints.
   2. Align the tops of bases with adjacent units.
   3. Ensure continuous contact between base and substrate. Fill voids between base and substrate with manufacturer recommended filler material.
   4. Do not stretch base.

B. Preformed Corners: Install formed pieces before straight pieces.

C. Job-Formed Corners:
   1. Outside Corners: Form bends without discoloration in corners.
   2. Inside Corners: Miter.

3.5 CLEANING AND PROTECTION

A. Remove excess adhesive.

B. Do not allow traffic on flooring until adhesives have fully set.

C. Provide surface protection during construction period.

D. Floor Polish: Apply two coats.

END OF SECTION

SECTION 096723

RESINOUS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Fluid-applied resinous flooring.

B. Principal Products:
   1. Decorative epoxy flooring system, RN-1, RN-2.

C. Related Requirements:
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 090561: Floor preparation.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting Attendees and Procedures:
   1. Conduct meeting one week, minimum, before starting Work of this Section.
   2. Additional Attendees: Manufacturer technical representative.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Resinous flooring system components, including performance characteristics.
   2. Initial selection color samples.

B. Schedule: List products and installation areas.

C. Samples:
   1. Resinous Flooring: 6- by 6-inch samples of each system and color. Apply to plywood backing. Step back coats.
   2. Metal Termination Trim: 6-inch lengths of each profile.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer Reports: Field inspection reports certification that installation conforms to specifications.

B. Qualification Statements:
   1. Installer: Manufacturer authorization.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For resinous flooring systems.

B. Warranty Documentation: For resinous flooring systems.

1.6 QUALITY ASSURANCE

A. Qualifications:
   1. Installers: Manufacturer trained and approved.
   2. Field Technical Representatives: Employed by manufacturer.

B. Field Samples: Construct 8 by 8 foot sample with one inside corner. Demonstrate color, texture, pattern, and integral cove base.
   1. Simulate final lighting conditions if luminaires have not been installed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
   1. Store products in installation areas for 3 days before installation to achieve temperature stability.

1.8 FIELD CONDITIONS

A. Ambient Conditions: Perform work within following limitations.
   1. Building enclosed and environmental systems maintaining design conditions for Owner occupancy.
   2. Maintain material and temperature between 65 and 85 deg F during application and curing periods.

PART 2 - PRODUCTS

2.1 DECORATIVE URETHANE FLOORING SYSTEM

A. Urethane Quartz Granule Flooring, RN-1, RN-2: Seamless flooring system with integral cove base; 100 percent solids urethane resin body coat with vinyl flakes and clear urethane wear coat.
   1. Manufacturers and Products:
      a. Stonhard, Inc. Stontec UTF.
      b. Comparable product submitted and accepted prior to bidding.
   2. Performance: Chemical resistance and thermal cycling resistance.
   3. Color Blend: Architect selected.
   4. Finish Texture: Slip resistant.
   5. Thickness: 1/4 inch.

2.2 PERFORMANCE REQUIREMENTS

A. Fire Performance:
   1. Surface Burning Performance: ASTM E84 Class A.
   2. Flame Spread Index: 25, maximum.
   3. Smoke Developed Index: 50, maximum.

B. Dynamic Coefficient of Friction: Tested per ANSI A137.1 DCOF AcuTest.
   1. Level Floor Surfaces: 0.42 minimum.
   2. Stair Treads: 0.60 minimum.
   3. Ramp Surfaces: 0.80 minimum.

C. Accessibility Requirements: Applicable provisions in Department of Justice publication 2010 ADA Standards for Accessible Design, ICC/ANSI A117.1, and state accessibility code.

2.3 INSTALLATION MATERIALS

A. Substrate Patching Material: Resinous product approved by flooring manufacturer and recommended by manufacturer for Project applications.

B. System Components: Supply primers, reinforcement, aggregate, and cove base material by resinous flooring manufacturer.

C. Wall Base Receiver Trim: Formed stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that concrete floors have cured minimum 28 days, minimum.

B. Moisture and Alkalinity Testing: See Section 090561.

3.2 PREPARATION

A. Concrete Substrates: Section 090561.

B. Fill cracks, voids, and surface irregularities flush and smooth.

C. Grind ridges and high spots flush and smooth.

D. Clean substrate of dirt, dust, and substances that impede adhesive bond per ASTM D4258.

3.3 INSTALLATION

A. Apply system components to form seamless, waterproof system of uniform thickness, texture, and appearance.

B. Penetrations: Provide cove transition and extend flooring to height of wall base.

C. Provide waterproof seal to floor drain terminations.

D. Cove Base Installation:
   1. Provide integral 3/4-inch cove transitions to wall surfaces and cove profile at inside corners.
   2. Apply system to walls to uniform height above floor with level, straight termination lines.
   3. Install wall receiver trim level. Anchor trim with screws.

3.4 FIELD QUALITY CONTROL

A. Manufacturer Services: Arrange for manufacturer technical representative to inspect installations and provide written reports.

3.5 CLEANING

A. Cleaning: Clean spills and misapplications immediately as they occur.

3.6 PROTECTION

A. Do not allow traffic on flooring until fully cured.

B. Provide temporary protection where exposed to wheeled traffic or frequent foot traffic.

END OF SECTION

SECTION 099000

PAINTING AND COATING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Exterior painting.
2. Interior painting.

B. Principal Products:
1. Exterior paint products.
2. Interior paint products.
3. High performance coating products.

C. Related Requirements.
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 055000: Metal fabrications.
5. Section 055100: Metal stairs.
6. Section 055213: Pipe and tube railings.
7. Section 064000: Architectural woodwork.
8. Section 081113: Hollow metal doors and frames.
9. Section 081416: Glazed lite frames in wood doors.
10. Section 083113: Access doors and panels.
11. Section 092116: Gypsum board assemblies.

1.2 REFERENCES

A. Definitions:
1. Sheen Levels: ASTM D523.
a. Flat: Five gloss units at 60 degrees and 10 gloss units at 85 degrees, maximum.
b. Eggshell: 10 to 25 gloss units at 60 degrees and 10 to 35 gloss units at 85 degrees.
c. Satin: 20 to 35 gloss units at 60 degrees and 35 gloss units minimum at 85 degrees.
d. Semigloss: 35 to 70 gloss units at 60 degrees.
e. Gloss: 70 gloss units at 60 degrees, minimum.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting:
   1. Conduct meeting one week and one month, minimum, before starting Work of this Section.

1.4 ACTION SUBMITTALS

A. Product Data:
   1. Initial selection color charts and Samples.

B. Samples:
   1. Draw Down Samples: Each type of paint system and each topcoat color and gloss.
      a. Label each Sample for paint type, location, and substrate.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data:
   1. Cleaning, touch up, and repair instructions for painted and coated surfaces.
   2. Area summary with finish schedule and color Samples, designating where each product, color and finish was used.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Materials:
   1. Paint from same product run as installed materials.
      a. Quantity: 5 percent, but not less than 1 gallon of each material and color.

1.7 QUALITY ASSURANCE

A. Field Samples: Apply each paint systems to substrates shown on Dawings, as directed by Architect, and 100 square feet, minimum. Demonstrate texture, color, and pattern.
   1. Approved Samples establish Work results standard.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
   1. Store paint products in sealed containers until ready for use.

1.9 FIELD CONDITIONS

A. Apply materials only when surface and ambient temperatures are within temperature ranges required by paint product manufacturer.

B. Apply exterior coatings when rain or snow are not occurring or forecasted, and when relative humidity is inside humidity ranges, and moisture content of surfaces is within acceptable levels required by paint product manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS [AND PRODUCTS]

A. Colors by Basis of Design Manufacturer Designations: See Finish Schedule on Drawings.

B. Manufacturers:
1. BEHR.
2. Benjamin Moore.
3. PPG Paints.
4. Sherwin-Williams.
5. Tnemec.

C. Products: Scheduled in this Section.

2.2 PAINT, GENERAL

A. Paint Systems: Primers, intermediate coats and topcoats compatible with substrates and one another.

B. Coatings: Ready mixed or field catalyzed.

C. Preparation:
1. Mix to soft paste consistency, capable of being readily and uniformly dispersed to homogenous coating.
2. Blend tints and catalyzers to uniform consistency and color, capable of drying or curing free of streaks or sags.

2.3 SUSTAINABILITY CHARACTERISTICS

A. VOC Content: Follow VOC limits of authorities having jurisdiction and as follows:
1. Flat Paints and Coatings: 50 g/L, maximum.
2. Nonflat Paints and Coatings: 50 g/L, maximum.
3. Dry Fog Coatings: 50 g/L, maximum.
4. Primers, Sealers, and Undercoaters: 100 g/L, maximum.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L, maximum.
6. Zinc Rich Industrial Maintenance Primers: 340 g/L, maximum.
7. Pretreatment Wash Primers: 420 g/L, maximum.
8. Floor Coatings: 100 g/L, maximum.
9. Clear Shellacs: 730 g/L, maximum.
10. Pigmented Shellacs: 550 g/L, maximum.

B. Low Emitting Materials: Follow California Department of Public Health, Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers.

2.4 SOURCE QUALITY CONTROL

A. Tests:
   1. Testing: Owner may engage a qualified testing agency to Sample paint materials delivered to Project site or taken from Supplier facility.
   2. Acceptance Criteria: Products follow specified requirements.

B. Non Conforming Work: Remove materials from substrates, pay for testing of replacement products, and repaint surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Verify substrates are ready to receive Work.

B. Preinstallation Testing: Test moisture content of substrate does not exceed the following:
   1. Concrete: 12 percent.
   2. Masonry: 12 percent.
   3. Wood: 15 percent.
   4. Portland Cement Plaster: 12 percent.
   5. Gypsum Board and Plaster: 12 percent.

C. Gypsum Board: Verify that finishing compound is dried and sanded smooth.

D. Plaster: Verify plaster is cured.

E. Concrete and Masonry: Verify surface has cured at least 30 days and that the pH of the surface is between 6 and 9.

3.2 PREPARATION

A. Surface Preparation: Remove electrical plates, hardware, trim, escutcheons, and fittings. Correct defects in substrates capable of affecting Work.

B. Cleaning: Remove substances that could impair paint bond, including dust, oil, grease, and incompatible coatings.
   1. Impervious Surfaces: Remove mildew by scrubbing with cleaning solution recommended by finish coating manufacturer. Rinse with clean water and allow surface to dry.
   2. Aluminum Surfaces: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.
   3. Asphalt, Creosote, or Bituminous Surfaces: Remove foreign particles to permit adhesion of finishing materials. Apply compatible sealer or primer.
   4. Concrete Floors: Follow manufacturer recommendations and See Section 090561.

5. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.
6. Plaster Surfaces: Fill cracks, holes, and other imperfections with latex patching plaster. Blend texture with adjacent surfaces. Clean and allow to dry.
7. Concrete and CMU Surfaces: Remove dirt, loose mortar, scale, efflorescence and chalk. Remove oil and grease by scrubbing with cleaning solution recommended by finish coating manufacturer. Rinse with clean water and allow surface to dry.
8. Non Passivated Galvanized Surfaces: Smooth and hand or power tool clean per ASTM D6386.
9. Passivated Galvanized Surfaces: Remove soluble and insoluble contaminants and corrosion. Sweep blast per ASTM D6386 to achieve uniform 1.0 to 2.0 mil anchor profile.
10. Uncoated Steel: Remove rust and loose mill scale. Clean per SSPC-SP2 Hand Tool Cleaning, SSPC-SP3 Power Tool Cleaning, and SSPC-SP6/NACE No. 3 Commercial Blast Cleaning.
11. Primed Steel: Clean field welds, fasteners, and abraded shop primer.
12. Wood Surfaces:
    a. Wipe off dust and grit. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried.
    b. Backprime concealed surfaces.

3.3 APPLICATION

A. Follow manufacturer instructions for application method, thickness of coatings, and number of coats.
   1. Apply finishes when surfaces are dry. Allow applied coats to dry before next coat is applied.
   2. Apply each coat of paint slightly darker than preceding coat.
   3. Apply coatings to uniform appearance.
   4. Sand wood and metal surfaces lightly between coats.
   5. Leave testing agency, equipment identification, and performance labels unpainted.

B. Appearance:
   1. Apply paints without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, or other imperfections.
   2. Edges and Color Breaks: Produce sharp edges.

3.4 PAINTING MECHANICAL EQUIPMENT

A. Paint the following equipment when exposed in equipment rooms and occupied spaces:
   1. Electrical panelboards and switchgear.
   2. Piping.
   3. Ductwork.
   4. Pipe hangers.
   5. Conduit.
   6. Unfinished tanks.
   7. Shop primed equipment.

B. Paint interior surfaces of air ducts visible through grilles with one coat of flat black paint.

3.5 FIELD QUALITY CONTROL

A. Field Tests and Inspections: Engage inspectors to perform tests and inspections and prepare reports. Allow inspectors access to Work areas.
   1. Failed Test Retest Cost: Contractor responsibility.

B. Testing: Dry film thickness.

C. Non Conforming Work: Remove and replace or apply additional coats, and retest.

3.6 CLEANING

A. Cleaning:
   1. Remove rubbish, empty cans, rags, and other discarded materials.
   2. Remove splattered paints. Protect adjacent surfaces from damage.

3.7 PROTECTION

A. Protection: Protect painted surfaces from subsequent construction Work. Touch up and restore damaged painted surfaces.

3.8 PAINT COLOR SCHEDULE

A. See Finish Legend on Drawings for colors.

3.9 INTERIOR PAINTING SCHEDULE

A. Concrete Walls and Ceilings, Dry Environments:
   1. Latex primer:
      a. BEHR: Multi-Surface Interior/Exterior Primer & Sealer 436.
      b. Benjamin Moore: Ultra Spec Masonry 100% Acrylic Sealer 608.
      c. PPG Paints: Perma-Crete Interior/Exterior Alkali Resistant Primer 4-603XI.
      d. Sherwin-Williams: Loxon Concrete & Masonry Primer, LX02 Series.
      e. Tnemec: Series 151 Elasto-Grip.
   2. Acrylic Latex Enamel: Eggshell finish.
      a. BEHR: Behr Pro i300 Interior.
      b. Benjamin Moore; Ultra Spec 500 Series.
      c. PPG Paints: SPEEDHIDE Zero Interior Latex.
      d. Sherwin-Williams: ProMar 200 Zero VOC Interior Latex.
      e. Tnemec: Series 1026 matte.
   3. Water Based Epoxy Topcoat (Moisture Resistant Locations): Eggshell finish.
      a. BEHR: Behr Pro Pre-Catalyzed Waterborne Epoxy.
      b. Benjamin Moore: COROTECH WB Pre-Cat Epoxy Coating.
      c. PPG Paints: Pitt-Glaze WB1 Interior Pre-Catalyzed Acrylic Epoxy.

d. Sherwin-Williams: Pro Industrial Pre Catalyzed Epoxy, K45/K46 Series.
e. Tnemec: Series 113/114 H.B. Tneme-Tufcoat.

B. Concrete Walls and Ceilings, Wet Environments:
1. Primer:
a. BEHR: Multi-Surface Interior/Exterior Primer & Sealer 436.
b. Benjamin Moore: Ultra Spec 500 Series.
c. PPG Paints: PERMA-CRETE Concrete Block & Masonry Surfacer/Filler 4-100XI.
d. Sherwin-Williams: Loxon Concrete and Masonry Primer/Sealer LX02 Series.
e. Tnemec: Series N69 High Build Epoxoloine II.
2. Epoxy Topcoat: Eggshell finish.
a. BEHR: Pro Pre-Catalyzed Waterborne Epoxy.
b. Benjamin Moore: Corotech Waterborne Acrylic Epoxy V450.
c. PPG Paints; Aquapon WB EP Epoxy.
d. Sherwin-Williams: Pro Industrial Water Based Catalyzed Epoxy B73 Series.
e. Tnemec: Series N69 High Build Epoxoline II.

C. CMU Substrates, Dry Environments:
1. Latex Block Filler:
a. BEHR: Behr Pro Block Filler Primer, PR50.
b. Benjamin Moore: Ultra Spec Masonry Hi-Build Block Filler 571.
c. PPG Paints: 6-7 Speedhide Latex Block Filler.
d. Sherwin-Williams: PrepRite Latex Block Filler, B25W25.
e. Tnemec: Series 54 Masonry Riller.
2. Acrylic Latex Enamel: Eggshell finish.
a. BEHR: Behr Pro i300 Interior.
b. Benjamin Moore: Ultra Spec 500 Series.
c. PPG Paints: SPEEDHIDE Zero Interior Latex.
d. Sherwin-Williams: ProMar 200 Zero VOC Interior Latex.
e. Tnemec: Series 1026 matte.

D. CMU Substrates, Wet Environments:
1. Block Filler:
a. BEHR: Behr Pro Block Filler Primer, PR50.
b. Benjamin Moore: Corotech Waterborne Epoxy Block Filler 163.
c. PPG Paints: Amerlock 400 BF or Perma-Crete Concrete Block & Masonry Surfacer/Filler.
d. Sherwin-Williams: Pro Industrial Heavy Duty Block Filler, B42W00150 or Kem Cati-Coat HS Epoxy Filler/Sealer, B42W400 Series.
e. Tnemec: Series 130 Envirofill.
2. Epoxy Topcoat: Eggshell finish.
a. BEHR: US Coatings EpoxyGrip 2000 VOC Epoxy Mastic Coating.
b. Benjamin Moore: Corotech Surface Tolerant Epoxy Mastic V160.
c. PPG Paints: Amerlock 600.
d. Sherwin-Williams: Macropoxy 646-100.
e. Tnemec: Series N69 High Build Epoxoline II.

E. Gypsum Board and Plaster Walls:
   1. Latex Primer:
      a. BEHR: Drywall Plus Interior Primer & Sealer 73.
      b. Benjamin Moore: Ultra Spec 500 Interior Latex Primer N534.
      c. PPG Paints: SPEEDHIDE zero Interior Latex Sealer 6-4900XI.
      d. Sherwin-Williams: ProMar 200 Zero VOC Interior Latex Primer B28W02600.
      e. Tnemec: Series 151 Elasto-Grip.
   2. Acrylic Latex Enamel: Eggshell finish.
      a. BEHR: Behr Pro i300 Interior.
      b. Benjamin Moore: Ultra Spec 500 Series.
      c. PPG Paints: SPEEDHIDE Zero Interior Latex.
      d. Sherwin-Williams: ProMar 200 Zero VOC Interior Latex.
      e. Tnemec: Series 1026 matte.
   3. Epoxy Topcoat (Moisture Resistant Locations): Eggshell finish.
      a. BEHR: Behr Pro Pre-Catalyzed Waterborne Epoxy.
      b. Benjamin Moore: Corotech Pre Catalyzed Epoxy.
      c. PPG Paints; PITT-GLAZE WB1 Interior Pre-Catalyzed Water-Borne Acrylic Epoxy.
      d. Sherwin-Williams: Pro Industrial Pre-Catalyzed Water Based Epoxy.
      e. Tnemec: Series 113/114 H.B. Tneme-Tufcoat.

F. Gypsum Board and Plaster Ceilings:
   1. Latex Primer:
      a. BEHR: Drywall Plus Interior Primer & Sealer 73.
      b. Benjamin Moore: Ultra Spec 500 Interior Latex Primer N534.
      c. PPG Paints: SPEEDHIDE zero Interior Latex Sealer 6-4900XI.
      d. Sherwin-Williams: ProMar 200 Zero VOC Interior Latex Primer B28W02600.
      e. Tnemec: Series 151 Elasto-Grip.
   2. Acrylic Latex Enamel: Flat finish.
      a. BEHR: Behr Pro i300 Interior.
      b. Benjamin Moore: Ultra Spec 500 Series.
      c. PPG Paints: SPEEDHIDE Zero Interior Latex.
      d. Sherwin-Williams: ProMar 200 Zero VOC Interior Latex.

G. Steel Doors and Frames:
   1. Pre Primed Metal: Touch up with same shop primer product used by manufacturer.
   2. Latex Primer:
      a. BEHR: Multi-Surface Interior/Exterior Primer & Sealer 436.
      b. Benjamin Moore: Ultra Spec HP Acrylic Metal Primer HP04.
      c. PPG Paints: Pitt-Tech Plus DTM 4020PF.
      d. Sherwin-Williams: Pro Industrial Pro-Cryl Universal Primer B66-1310 Series.
      e. Tnemec: Series 115 UniBond DF.
   3. Waterbased Alkyd Enamel: Semigloss finish.
      a. BEHR: Urethane Alkyd Enamel.
      b. Benjamin Moore: ADVANCE Waterborne Interior Alkyd.
      c. PPG Paints: SPEEDHIDE Interior/Exterior WB Alkyd.

d. Sherwin-Williams: ProClassic Interior Waterbased Acrylic Alkyd Enamel.
e. Tnemec: Series 2H Hi-Build Tneme-Gloss.

H. Steel Railings:
1. Pre Primed Metal: Touch up with same shop primer product used by manufacturer.
2. Latex Primer:
a. BEHR: Interior/Exterior Metal Primer, 435.
b. Benjamin Moore: Ultra Spec HP Acrylic Metal Primer HP04.
c. PPG Paints: Pitt-Tech Plus DTM 4020PF.
d. Sherwin-Williams: Pro Industrial Pro-Cryl Universal Primer B66-1310 Series.
e. Tnemec: Series 115 UniBond DF.
3. Waterbased Alkyd Enamel: Semigloss finish.
a. BEHR: Urethane Alkyd Enamel.
b. Benjamin Moore: ADVANCE Waterborne Interior Alkyd.
c. PPG Paints: SPEEDHIDE Interior/Exterior WB Alkyd.
d. Sherwin-Williams: ProClassic Interior Waterbased Acrylic Alkyd Enamel.
e. Tnemec: Series 2H High Build Tneme-Gloss.

I. Galvanized Steel Substrates:
1. Latex Primer:
a. BEHR: Multi-Surface Interior/Exterior Primer & Sealer 436.
b. Benjamin Moore: Ultra Spec HP Acrylic Metal Primer HP04.
c. PPG Paints: Pitt-Tech Plus DTM 4020PF.
d. Sherwin-Williams: Pro Industrial Pro-Cryl Universal Primer B66-1310 Series.
e. Tnemec: Series 115 UniBond DF.
2. Acrylic Latex Enamel: Semi gloss finish.
a. BEHR: PREMIUM Interior/Exterior Direct to Metal Paint.
b. Benjamin Moore: Ultra Spec HP D.T.M Acrylic Enamel.
c. PPG Paints: Pitt-Tech Plus EP DTM.
d. Sherwin-Williams: Pro Industrial Acrylic.
e. Tnemec: Series 115 UniBond DF.

J. Overhead Construction:
1. Water Based Interior Dry Fog: Flat finish.
a. BEHR: Pro HPC Waterborne Dryfall HP210.
b. Benjamin Moore: Latex Dry Fall.
c. PPG Paints: Speedhide SuperTech Interior Latex Dry-Fog.
d. Sherwin-Williams: Pro Industrial Waterborne Acrylic Dryfall.
e. Tnemec: Series 115 UniBond DF.

K. Wood Doors and Trim:
1. Latex Primer:
a. BEHR: Drywall Plus Interior Primer & Sealer 73.
b. Benjamin Moore: Advance Waterborne Interior Alkyd Primer 790.
c. PPG Paints: Seal-Grip Interior/Exterior Universal Primer/Sealer 17-921XI.

d. Sherwin-Williams: PrepRite ProBlock Interior/Exterior Latex Primer/Sealer B51-600.
e. Tnemec: Series 151 Elasto-Grip.

2. Acrylic Latex Enamel: Eggshell finish.
a. BEHR: Behr Pro i300 Interior.
b. Benjamin Moore: Ultra Spec 500 Series.
c. PPG Paints: SPEEDHIDE Zero Interior Latex.
d. Sherwin-Williams: ProMar 200 Zero VOC Interior Latex.
e. Tnemec: Series 1026 matte.

3.10 EXTERIOR PAINTING SCHEDULE

A. Concrete Nontraffic Surfaces:
1. Primer:
a. BEHR: Multi-Surface Interior/Exterior Primer & Sealer 436.
b. Benjamin Moore: Ultra Spec Int/Ext Masonry sealer, 608.
c. PPG Paints: PERMA-CRETE Interior/Exterior Alkali Resistant Primer.
d. Sherwin-Williams: Loxon Concrete and Masonry Primer/Sealer LX02.
e. Tnemec: Series 180 W.B. TnemeCrete.
2. Exterior Acrylic Latex Topcoat: Eggshell finish.
a. BEHR: PRO e600 Exterior Paint.
b. Benjamin Moore: Ultra Spec Exterior Enamel.
c. PPG Paints: SPEEDHIDE Exterior Latex.
d. Sherwin-Williams: Pro Industrial Acrylic B66-600 Series.
e. Tnemec: Series 180 W.B. TnemeCrete.

B. CMU Substrates:
1. Latex Block Filler:
a. BEHR: Behr Pro Block Filler Primer, PR50.
b. Benjamin Moore: Ultra Spec Masonry Hi-Build Block Filler 571.
c. PPG Paints; Perma-Crete Concrete Block & Masonry Surfacer/Filler.
d. Sherwin-Williams: Conflex XL Block Filler, CF01W50.
e. Tnemec: Series 54 Masonry Filler.
2. Exterior Latex Topcoat: Eggshell finish.
a. BEHR: PRO e600 Exterior Paint.
b. Benjamin Moore: Ultra Spec Exterior Enamel.
c. PPG Paints: SPEEDHIDE Exterior Latex.
d. Sherwin-Williams: A100 Series Exterior Latex.
e. Tnemec: Series 1029 semigloss.

C. Unprimed Ferrous Metal:
1. Rust Inhibitive Alkyd Primer:
a. BEHR: Interior/Exterior Metal Primer 435.
b. Benjamin Moore: Super Spec HP Alkyd Metal Primer P06.
c. PPG Paints: Multiprime 4360.
d. Sherwin-Williams: Kem Bond HS, B50 Series.

e. Tnemec: Series V10 Tnemec Primer.

2. Latex Topcoat: Semigloss finish.
   a. BEHR: PREMIUM Direct to Metal Semi-Gloss Paint 3200.
   b. Benjamin Moore: Ultra Spec HP D.T.M. Acrylic HP29.
   c. PPG Paints: Pitt-Tech Plus EP DTM 90-1610.
   d. Sherwin-Williams: Pro Industrial Acrylic B66-600 Series.
   e. Tnemec: Series 1029 semigloss.

D. Galvanized Steel:
   1. Primer:
      a. BEHR: Multi-Surface Interior/Exterior Primer & Sealer 436.
      b. Benjamin Moore: Ultra Spec HP D.T.M. Acrylic HP29.
      c. PPG Paints: Pitt-Tech Plus DTM Primer 4020PF.
      d. Sherwin-Williams: Pro Industrial ProCryl Universal Primer B66-1300 Series.
      e. Tnemec: Series 115 UniBond DF.
   2. Latex Topcoat: Semigloss finish.
      a. BEHR: PREMIUM Direct to Metal Semi-Gloss Paint 3200.
      b. Benjamin Moore: Ultra Spec HP D.T.M. Acrylic HP29.
      c. PPG Paints: Pitt-Tech Plus EP DTM 90-1610.
      d. Sherwin-Williams: Pro Industrial Acrylic B66-600 Series.
      e. Tnemec: Series 1029 Enduratone.

E. Aluminum:
   1. Primer:
      a. BEHR: Interior/Exterior Bonding Primer 432.
      b. Benjamin Moore: Corotech Waterborne Bonding Primer, V175.
      c. PPG Paints: Pitt-Tech Plus 4020PF.
      d. Sherwin-Williams: Pro Industrial ProCryl Universal Primer B66-1310 Series.
      e. Tnemec: Series N69 High Build Epoxoline II.
   2. Latex Topcoat: Semigloss finish.
      a. BEHR: Interior/Exterior Direct To Metal Semi-Gloss Paint 3200.
      b. Benjamin Moore: Ultra Spec HP D.T.M. Acrylic HP29.
      c. PPG Paints: Pitt-Tech Plus EP DTM 90-1610.
      d. Sherwin-Williams: Pro Industrial Acrylic B66-600 Series.
      e. Tnemec: Series 1028 Enduratone.

3.11 HIGH PERFORMANCE EXTERIOR PAINTING SCHEDULE

A. Shop Primed and Unprimed Ferrous Metal: Pigmented polyurethane over high build epoxy system.
   1. Epoxy Primer:
      a. BEHR: US Coatings EpoxyGrip 2000 VOC Epoxy Mastic.
      b. Benjamin Moore: Corotech Surface Tolerant Epoxy Mastic, V160.
      c. PPG Paints: Amerlock 600.
      d. Sherwin-Williams: Macropoxy 646-100 Fast Cure Epoxy.
      e. Tnemec Series 135 Chembuild.

2. Polyurethane Topcoat: Semigloss finish.
    a. BEHR: US Coatings UreGrip 3010 VOC HS Polyester Polyurethane.
    b. Benjamin Moore: Corotech Aliphatic Acrylic Urethane.
    c. PPG Paints: Pitthane Ultra LS.
    d. Sherwin-Williams: Hi-Solids Polyurethane B65-300.
    e. Tnemec: Series 73 Endura-Shield.

B. Galvanized Ferrous Metal: Pigmented polyurethane over high build epoxy system.
1. Epoxy Primer:
    a. BEHR: US Coatings EpoxyGrip 2000 VOC Epoxy Mastic.
    b. Benjamin Moore: Corotech Surface Tolerant Epoxy Mastic, V160.
    c. PPG Paints: Amerlock 600.
    d. Sherwin-Williams: Macropoxy 646-100 Fast Cure Epoxy.
    e. Tnemec: Series N69 High Build Epoxoline II.
2. Two Component Polyurethane Topcoat: Gloss finish.
    a. BEHR: US Coatings UreGrip 3010 HS Polyester Polyurethane.
    b. Benjamin Moore: Corotech Aliphatic Acrylic Urethane.
    c. PPG Paints: Pitthane Ultra.
    d. Sherwin-Williams: Acrolon Ultra.
    e. Tnemec: Series 1074 Endura-Shield II.

END OF SECTION

SECTION 099733

CONCRETE FLOOR SEALER

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Concrete floor sealer.

B. Principal Products:
   1. Concrete floor sealer.

C. Related Requirements.
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 033000: Cast in place concrete.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
   1. Coordinate application of floor sealers with concrete curing processes and installation of floor-mounted items.

B. Preinstallation Meeting Attendees and Procedures:
   1. Conduct meeting one week, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data: Describe physical and performance characteristics.

B. Shop Drawings: Floor plan showing locations receiving sealers.

1.4 QUALITY ASSURANCE

A. Certifications: From Contractor for specified performance.

B. Field Samples: Apply floor sealer, 10 by 10 feet, minimum size. Demonstrate appearance.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
   1. Store concrete sealer in manufacturer's original unopened containers.
   2. Protect from freezing.

PART 2 - PRODUCTS

2.1 CONCRETE FLOOR SEALER

A. Concrete Sealer: Clear, penetrating, VOC compliant, waterborne siliconate compound designed to densify and seal concrete surfaces.
   1. Manufacturers and Products:
      a. Curecrete Chemical Company Ashford Formula.
      b. Euclid Chemical Company Euco Diamond Hard.
      c. H&C ENDURAPOLISH.
      d. LATICRETE L&M Seal hard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Cured Application:
   1. Verify floor surfaces are free of substances that may impair concrete sealer penetration.

3.2 PREPARATION

A. Remove membrane forming curing compounds and other surface contaminates capable of impairing concrete sealer penetration into concrete.

B. Broom clean floor surface to remove loose dust and dirt.

3.3 INSTALLATION - CURED CONCRETE APPLICATION

A. Apply concrete sealer.

B. Keep floor surface wet with concrete sealer for 20 minutes, minimum.

C. Broom concrete sealer to prevent puddling; achieve uniform coverage on floor surface.

D. Scrub concrete sealer into concrete surface with mechanical scrubbers.

E. Remove excess liquid material and residue from floor surface.

F. Rinse floor.

3.4 PROTECTION

A. Prohibit traffic on floor finish for eight hours after installation.

END OF SECTION

SECTION 100610

EXTERIOR SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes exterior site signage.

1.3 REFERENCES

A. Philadelphia Parks and Recreation (PPR) Signage Standard Manual.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference the Project Site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of sign.

1. Include plans, elevations, sections, and large-scale details of sign construction, wording, and lettering layout. Show anchorages and accessory items. Provide graphic layouts of each individual sign face and message for each sign location. Show fabrication and installation details, including all sign components such as: extrusions, brackets, bracing, hardware, internal framing, etc. Alphabet of each type style required by the contract documents; upper and lowercase, with numerals, punctuation and accents. Shop drawings MUST include all field verified conditions and dimensions. Show installation and mounting heights.

C. Samples: Samples shall be clearly labeled on the back (where possible), designating item number, name of manufacturer, sign type and location. Fabricator shall submit a minimum of two (2) samples of each color and finish applied on each material type as indicated in the

drawing package. Samples should represent the final finish of each element and will be used as control samples for production approval. Samples should represent extreme variations in color and texture that might occur during fabrication. Please submit the following samples as specified in the drawing package:

1. Color Samples for each specified color, process, and finish per PPR Signage Standard Manual. Color submittals shall be submitted on each relevant substrate.
2. Material Samples of each specified Material in each color and finish specified per PPR Signage Standard Manual & per FLP Identity Guidelines. Submit manufacturer's standard color palette for color and finish selection.
3. Custom High-Pressure Laminate (CHPL) manufacturer must supply project-specific electronic PDF proof for content approval and minimum 8" x 10" x .060" actual material lab samples for color and finish approval from production-ready digital artwork and specifications as provided by PPR Signage Standards Manual.
4. Paper Templates: Templates should be fully assembled or have complete registration marks for assembly. Fabricator shall provide to PPR and Landscape Architect full-size paper templates for review and approval in the field of the following sign types:
   a. VID.1
5. FLP and Landscape Architect reserves the right to reject any submittal that does not satisfy the requirements. Fabricator shall submit additional drawings/samples as required to obtain final approval.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Fabricator and Installer.

B. Material Certificates: For the following items:

1. Shop finishes.

1.7 QUALITY ASSURANCE

A. The Fabricator is required to submit as part of the submittal process additional qualifications for any subcontractors, including but not limited to, installers, electrician, specialty sub-contractor and/or project managers not included or accepted with the bid award of the project. FLP reserves the right to accept or reject any sub-contractor and/or project manager submitted for review. Qualifications should include: a minimum of 5-10 years relevant experience and shall provide information that illustrates the following:

1. Fabricator and Installer Qualifications: A firm with a minimum of 5 years relevant experience. Fabricator must be approved by PPR. See Part 2 for approved vendors. At a minimum, submit the following:
2. Firm/Personnel qualifications
3. Projects of similar size and complexity
4. Demonstration of high-quality craftsmanship
5. Project management team and experience.

B. Work done and materials furnished shall meet the highest industry standards in every respect and, unless otherwise specified, materials and equipment shall be new and of the latest design.

C. In the event of conflict or omission, the Fabricator shall consult the Landscape Architect for resolution. All clarifications are to be made in writing in the form of an RFI from the Fabricator to the Landscape Architect.

D. Use only personnel thoroughly skilled and experienced with the products and method for fabrication and installation of signage specified.

E. FLP reserves the right to reject any shop drawings, samples or other submittals, as well as any finished product or installation, that cannot meet the standard of quality established. Any such decision will be considered final and not subject to recourse.

F. Materials and hardware not specified, but necessary to the complete functioning of the sign, shall conform to the quality level established.

G. Substitutions of items specifically indicated in this specifications package that serve the same function with equal performance will be considered upon submission of substitution.

1.8 WARRANTY

A. Warrant all products (including, but not limited to materials, hardware and finishes) against any and all defects based on manufacturers' supplied warranties from date of installation. All manufacturer warranties should be submitted to the Landscape Architect and FLP for review.

1. Vinyl die-cut letters: warranted against delimitation from substrate.
2. Paint finishes: warranted against fading or chalking, corrosion developing beneath paint surfaces of the support systems (except for obvious vandalism or other external damage to the paint surfaces).
3. Corrosion of the fastenings.
4. The signs not remaining true and plumb on their supports during normal wear.
5. Fading of the colors when matched against a sample of the original color and material.
6. Discoloration of metal finishes.
7. Adhesives, e.g., tape and epoxy
8. Paneling not remaining true and plumb on their supports during normal wear.
9. CHPL
    a. Manufacturer warrants that under normal wear and use the workmanship and materials used in the CHPL product purchased from the Manufacturer will meet the standards set forth on the applicable specification materials and that the product will not delaminate, peel, blister, crack, or fade for a period ten (10) full years from the date of purchase.
    b. In the event that the product does not perform as warranted:

1) Manufacturer shall be allowed to conduct an on-site inspection and investigation, or be provided digital images of defects
2) Manufacturer shall work directly with the end-user to resolve any warranty matter,
3) The sole remedy will be the repair or replacement of the defective product at the sole discretion of the Manufacturer, and/ or
4) The repair or replacement by Manufacturer shall be limited to the re-manufacture and shipment of the replacement or repaired product to the site of the end-user's product.

c. This warranty only applies to the manufacture and material used in the manufacture of the CHPL product. Manufacturer shall not be liable for any other costs, including but not limited to installation, labor or other costs or expenses. Any repair or replacement shall be warranted for a period up to the remaining life of the original warranty. Further the repair or replacement costs incurred by Manufacturer shall not exceed the purchase price paid for the product.

B. The Fabricator shall correct any and all material and/ or workmanship defects which may appear during the warranty period by restoring defective work to the standard of the contract documents at no cost to the Owner and to the Owner's satisfaction. Corrections include but are not limited to: disfiguring of any surface due to chalking, rusting, bubbling, or other disintegration of the sign face or of the messages or of the edge finish of the sign inserts or panel.

C. Manufacturer warrants that under normal wear and use the installation and sign posts will not crack or fail for a period of one (10) years from the date of substantial completion.

D. Installer shall provide labor and material warranty for a period of (1) full year from the date of substantial completion.

PART 2 - PRODUCTS

2.1 FABRICATORS

A. Source Limitations: Subject to compliance with requirements, approved Fabricator’s include:

1. Urban Sign Company, Inc.
   527 E. Chestnut Avenue
   Vineland, NJ 08360
   856.691.8388
   www.urbansigncompany.com

2. MS Sign, Inc.
   280 North Midland Avenue, Building C-1, Postal Unit 128

Saddle Brook, NJ 07663
973.569.1111
www.mssign.com

3. L&H Sign Companies Sign Development
   425 North 3rd Street
   Reading, PA 19601
   610.898.9600
   www.lhsigns.com

4. Compass Sign Company
   1505 Ford Road
   Bensalem, PA 19020
   215.639.677
   www.compass-sign.com

5. Allied Signage
   69 Megill Road
   Farmingdale, NJ 07727
   732.751.1818
   www.allied-signs.com

2.2 EXTERIOR SITE SIGNAGE

A. See Signage Schedule on Drawings for designations.

2.3 MATERIALS

A. ALUMINUM
   1. Aluminum shall be of best commercial quality and the various forms shall be straight and true. There shall be no scratches, scars, or buckles. Size thickness and finish of aluminum shall be per NAAMM "Metal Finishes Manual". Comply with the following industry standards.
   2. Aluminum sheets shall conform to ASTM B209 6061-T6
   3. Aluminum extrusions shall conform to ASTM B241 6063 T6. Wall thickness shall be a minimum of 1/8" thick unless otherwise shown.
   4. Brushed Finishes-Brush with abrasive of increasing grit# in a linear directional pattern.
   5. Final surface shall have visible grain pattern to match sample approved by Landscape Architect. Spray with clear protective finish.
   6. Polished Finish-Brush with abrasive of increasing grit #. Buff to a mirror finish with no visible grain. Match sample approved by Landscape Architect. Spray with clear protective finish.
   7. Non-Directional Finish-Brush with abrasive mounted in a random orbital sander. Match sample approved by Landscape Architect. Spray with clear protective finish.

B. STAINLESS STEEL
   1. Structural stainless steel shapes to be rolled or laser fused, as manufactured by Stainless Structurals, LLC. (936-538- 7600, www.stainless-structurals.com)
   2. Chromium stainless steel sheet. Use type 304 or type 316 stainless steel with 16% chromium and 10% nickel.
   3. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness. Stainless Steel Plate, Sheet and Strip: Provide stainless steel plate, sheet, or strip, AISI Type 302, complying with requirements of ASTM A 167.
   4. Stainless Steel Finishes: Finish designations prefixed by "AISI" conform to the system established by the American Iron and Steel Institute for designating finishes.
   5. Finish: Bead blasted & Pickled.

C. CUSTOM HIGH PRESSURE LAMINATE
   1. Provide Custom High Pressure Laminate as manufacturer by iZone, or approved equal.
   2. Custom High Pressure Laminate material composed of required layers of phenolic resin impregnated brown kraft filler paper to produce specified thicknesses, surfaced by a layers of melamine overlay, graphics imaged on saturation grade paper with UV resistant pigment based process color inks, and with an optically clear UV overlay that will resist no less than 99% of all sunlight and UV rays, as well as provide a graffiti resistant surface that allows for removal with standard cleaners.
   3. Layers of material are to be assembled, and heat/ pressure consolidated at approximately 1200 PSI at temperatures exceeding 275° Fahrenheit at manufacturer's prescribed time frames.
   4. All manufacturing processes of printing, pressing, machining, finishing, and crating to be accomplished within a single standalone manufacturing facility to ensure consistent quality control and providing standard product delivery times of three weeks.

D. WOOD
   1. #1 grade black locust lumber. Sustainably harvested. Eased edges. Apply a UV clear coat to enhance the wood grain and provide additional protection.

E. REFLECTIVE GRAPHICS
   1. Provide 3M Scotchlite enclosed lens reflective sheeting or approved equal.

F. VHB FOAM TAPES
   1. Provide 3M Scotch VHB 4930
   2. Adhesive shall be Acrylic VHB
   3. Carrier shall be closed cell foam

G. ACCESSORRIES ANCHORS AND FASTENINGS
   1. Provide anchors and fasteners required to secure work in place. Do not expose fastenings on surface of sign panels unless specifically noted otherwise. Do not deform, distort, or discolor sign face surfaces by attachment of concealed fastenings.

2. All fastenings shall be non-corrosive and resistant to oxidation or other corrosive action, of the same composition completely through their cross sections, particularly when used below grade. Use highest quality stainless steel hardware and fasteners.
3. Anchors, inserts or fasteners shall be compatible with sign materials, shall not result in galvanic action or chemical interaction of adhesives and shall have demonstrable and sufficient strength for intended use.
4. Steel anchors and fastenings for exterior use shall be galvanized in accordance with ASTM A153.
5. Fabricate and install signs with fastenings to withstand all actions imposed by use; 30 psf wind perpendicular to surfaces, water, ice, snow loads and similar forces.
6. Anchor bolts in concrete shall be cast in place. Fabricator shall furnish instructions for the setting of anchors and bearing plates. Fabricator shall ascertain that the items are properly set during the process of the work.
7. Secure work with fastenings of same color and finish as the components they secure where they are exposed to view, unless noted otherwise. All exposed fasteners must be vandal resistant and have vandal-proof "spanner" type slots to be removed only with a special driver head.

H. SELF HEALING TACK SURFACE
1. Provide tack surface as manufactured by Rubber Flooring Inc. or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sign units and components with concealed fasteners unless otherwise shown. Refer to Drawings and PPR Signage Manual for general method of installation. Verify each surface in field to determine appropriate mounting hardware. Fabricator is responsible for determining where below ground or in-wall structural tie-ins may be required. All elements should be installed true and plumb in accordance with the design intent of this document. Sign location drawings show approximate locations of signs. Fabricator, Landscape Architect, and FLP shall conduct a pre-install mark out walk through to confirm all locations and identify areas of conflict. Fabricator is responsible for determining the location of underground structures and utilities on ground-mounted signs. Any conflicts should be brought to the attention of the FLP and Landscape Architect.

3.3 REGULATORY REQUIREMENTS

A. All installation work shall comply with applicable municipal, state and federal codes, sign ordinances and ADA guidelines for handicapped and fire/life safety signing.

B. All OSHA safety requirements will be implemented during fabrication and installation as needed or required to comply with safety regulations.

C. All field/site work shall be conducted in compliance with the Owner/Construction Manager's requirements/ regulations for the site, particularly areas open and accessible to the public. Work area protection shall be required as needed and all site-specific rules should be reviewed and outlined during the project kick-off meeting.

3.4 CLEAN UP

A. Daily and upon completion of installation remove all waste, dirt, wrappings and excess materials, tools and equipment, and thoroughly clean all surfaces to the satisfaction of FLP.

3.5 REORDERING

A. Reordering all items specified in this package shall be available to FLP in additional quantities for a period of 10 years after completion of all work called for in this specification.

END OF SECTION 100610

SECTION 101100

VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Visual display surfaces.

B. Principal Products:
   1. Tackable resilient surfaced bulletin boards, LIN-1.

C. Related Requirements:
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 064000: Architectural woodwork.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting Attendees and Procedures:
   1. Conduct meeting one week, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data: Each product and accessory.
   1. Initial selection color charts and samples.

B. Shop Drawings:
   1. Include plans, elevations, sections, details, and attachment to other work.

C. Samples:
   1. Tack Panels: 12 by 12 inches, full thickness.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For visual display units.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Installers: Manufacturer approved.

B. Field Samples: Install visual display units, full size, each type. Demonstrate texture or color.

1.6 FIELD CONDITIONS

A. Ambient Conditions: Perform work within following limitations:
   1. Building enclosed and environmental systems maintaining design conditions for Owner occupancy.

B. Existing Conditions: Verify field measurements before fabrication. Show field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 TACKBOARDS

A. Tackboards, LIN-1:
   1. Manufacturers and Products:
      a. Forbo; Bulletin Board.
      b. Comparable product submitted and accepted prior to bidding.
   2. Tack Surface: Resilient.
   3. Core: Manufacturer standard.
   4. Frame: None.
   5. Mounting: Manufacturer standard concealed system.
   6. Size: See Drawings.

2.2 PERFORMANCE

A. Impact:
   1. Safety Glazing: 16 CFR 1201, Category II.

B. Surface Burning: ASTM E84 Class A.
   1. Flame Spread Index: 25, maximum.
   2. Smoke Developed Index: 450, maximum.

2.3 MATERIALS

A. Glass: ASTM C1048, Type 1, Quality Q3, Kind FT.

B. Aluminum: ASTM B221, manufacturer recommended alloy and temper.

C. Wood Panel Products:
   1. Particleboard: ANSI A208.1 Grade M-2 or better.

D. Adhesives: Recommended by visual display unit manufacturers, complying with VOC limitations.

E. Fasteners: Type, size, and material to suit each application.

2.4 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify substrate surfaces are prime painted and ready to receive work.

B. Mechanically-Fastened Panels: Verify backing is installed and capable of supporting visual display boards.

3.2 INSTALLATION

A. Wall-Mounted Units: Install visual display units level, and plumb. Provide anchors and accessories necessary for complete installation.

3.3 CLEANING AND PROTECTION

A. Clean visual display units.

B. Cover and protect visual display units after installation and cleaning.

END OF SECTION

SECTION 101423

PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Interior room signs identifying each permanent room or space.
   2. Code required signs.

B. Principal Products:
   1. Acrylic signage.

C. Related Requirements.
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting Attendees and Procedures:
   1. Conduct meeting one week, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Each type of sign.
   2. Initial Selection: Sign styles, color charts, color samples, and character styles and character colors.

B. Shop Drawings: Sign styles, lettering font, foreground and background colors, overall dimensions of each sign.

C. Schedule: Locations of each sign type, description of graphics, and message text.

D. Samples: Each sign type. Acceptable samples may be installed in the Work.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Materials:
   1. Blank Signs: Two percent of amount installed.
   2. Changeable Slide Strips: three per sign.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Package signs labeled in name groups.

B. Store adhesive attachment tape at ambient room temperatures.

1.7 FIELD CONDITIONS

A. Ambient Conditions: Perform work within following limitations:
   1. Building enclosed and environmental systems maintaining design conditions for Owner occupancy.

PART 2 - PRODUCTS

2.1 INTERIOR ROOM IDENTIFICATION AND CODE-REQUIRED SIGNS

A. Room Identification and Code-Required Signs: Raised character acrylic plastic signs with changeable slide strip.
   1. Manufacturers:
      a. Alco Products, Inc.
      b. APCO Graphics, Inc.
      c. A. R. K. Ramos Signage Systems.
      d. ASI Sign Systems, Inc.
      e. Gemini Incorporated.
      f. Poblocki Sign Company, LLC.
   2. Total Thickness: 1/4 inch minimum.
   3. Sizes, Shapes: See Drawings.
   4. Edges: Radius.
   5. Character Style: Architect selected ADA-compliant characters.
   6. Colors: Architect selected.
   7. Graphics: Owner will supply electronic files and color requirements for sign graphics.
   8. Mounting: Double-side foam core adhesive tape.

2.2 DESIGN CRITERIA

A. Accessibility Requirements: Applicable provisions in Department of Justice publication 2010 ADA Standards for Accessible Design, ICC/ANSI A117.1, and state accessibility code.

2.3 MATERIALS

A. Acrylic Sheet: ASTM D4802, manufacturer standard, Type UVF (UV filtering).

B. Adhesive Tape: Zero VOC.

2.4 FABRICATION

A. Factory assemble signs.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates to ensure secure adhesive mounting.

3.2 INSTALLATION

A. Install signs after doors and wall surfaces are finished.

B. Follow accessibility requirements.

C. Install signs plumb and level.

D. Install signs with adhesive to lay flat against wall.

E. Clean signs after installation.

3.3 SIGN LOCATIONS

A. Locate room identification signs on wall surfaces adjacent to strike side of door, 5 feet above finished floor to center line of sign and 3 inches from door jamb trim.

B. Locate unit entry identification signs on wall surfaces adjacent to strike side of door, 5 feet above finished floor to center line of sign and 3 inches from door jamb trim.

C. Locate informational signs on wall surfaces, 5 feet above finished floor to center line of sign at scheduled locations.

END OF SECTION

SECTION 102113

TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Toilet compartments and screens, T-10, T-13.

B. Principal Products:
1. Solid polymer toilet compartments.

C. Related Requirements.
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 102800: Toilet accessories.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
1. Coordination: Coordinate locations of concealed blocking and support framing in walls.

B. Preinstallation Meeting Attendees and Procedures:
1. Conduct meeting one week, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data:
1. Initial selection color samples.
2. Construction details.
3. Dimensions.

B. Shop Drawings.
1. Plans, elevations, sections, and attachment details.
2. Show toilet accessory cutouts and blocking.
3. Show floor drain locations.
4. Show ceiling grids, ceiling mounted items, and overhead supports.

C. Samples:
1. Hardware and Accessories: Full-sized samples of each type and color. Approved samples may be incorporated into Work.

2. Panel Material: 6 by 6 inch samples of same thickness and material as finished work in each required color.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For toilet compartments.

1.5 FIELD CONDITIONS

A. Existing Conditions: Verify field measurements before fabrication. Show field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 SOLID-PLASTIC TOILET COMPARTMENTS

A. Plastic Toilet Compartments, T-10, T-13: Solid, homogenous high-density polyethylene (HDPE).
1. Manufacturers and Products:
a. Bradley; Bradmar Sentinel Series 400 No-Site.
b. Bobrick; Comparable product.
c. Santana Products; Comparable product.

B. Configurations:
1. Toilet-Enclosure Style: Overhead braced, no sightline.
2. Entrance-Screen Style: Overhead braced.
3. Urinal-Screen Style: Wall hung and Floor anchored.

C. Doors, Panels, Screens, and Pilasters:
1. Doors, Panels and Pilasters: 1 inch thick; edges radiused and finished smooth.
2. Hinge Type: Integral.
3. Heat-Sink Strips: Manufacturer standard; continuous stainless steel strip fastened to exposed bottom edges of panels.
4. Pilasters Shoes and Sleeves: Manufacturer standard design; stainless steel.

D. Urinal-Screen Post: Manufacturer standard post design of material matching the thickness and construction of pilasters; with shoe and sleeve matching that on the pilaster.

E. Panel Colors: Architect selected.

2.2 HARDWARE AND INSTALLATION ACCESSORIES

A. Hardware: Panel manufacturer heavy duty operating hardware and accessories.
1. Material: Stainless steel.
2. Hinges: See compartments articles.
3. Latches and Keepers: recessed or surface-mounted latch unit with combination rubber-faced door strikes and keepers, occupancy indicating.
4. Coat Hooks: Combination hook and rubber-tipped bumpers.

5. Door Bumpers: Manufacturer heavy duty rubber-tipped bumper at out-swinging doors and entrance-screen doors. Mount with through-bolts.
6. Door Pulls: Manufacturer heavy-duty cast-stainless-steel pull unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.

B. Mounting Brackets:
1. Stirrup Brackets: U-brackets, stainless steel.
2. Continuous Brackets: Manufacturer standard design; stainless steel.

C. Overhead Bracing: Extruded aluminum rail with antigrip profile; manufacturer standard finish.

D. Anchorages and Fasteners: Stainless steel, finished to match the items they are securing, with tamper-resistant heads.
1. Through-Bolts: Sex-head type.
2. Concealed Anchors: Stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.3 PERFORMANCE

A. Surface Burning Performance: ASTM E84 Class B.
1. Flame Spread Index: 75, maximum.
2. Smoke Developed Index: 450, maximum.

B. Accessibility Requirements: Applicable provisions in Department of Justice publication 2010 ADA Standards for Accessible Design, ICC/ANSI A117.1, and state accessibility code.

2.4 MATERIALS

A. Stainless Steel Sheet: ASTM A666, Type 304.

B. Stainless Steel Castings: ASTM A743/A743M.

C. Aluminum Extrusions: ASTM B221/B221M.

D. Aluminum Castings: ASTM B26/B26M.

E. Adhesive: Manufacturer standard product.

2.5 FABRICATION

A. General: Fabricate compartments to sizes shown on Drawings and approved shop drawings.

B. Door Sizes and Swings:
1. In-Swinging Doors: 24 inches wide.
2. Out-Swinging Doors: 36 inches wide.

2.6 FINISHES

A. Stainless-Steel Finish: No. 4 bright, directional polish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

3.2 INSTALLATION

A. Install units plumb, level, straight, and with tops of panels aligned.

B. Install components with following maximum clearances:
   1. Pilasters and Panels: 1/2 inch.
   2. Panels and Walls: 1 inch.

C. Brackets: Secure panels to walls and pilasters with three stirrup brackets.
   1. Locate stirrup wall brackets or full height continuous bracket fasteners so holes occur at masonry or tile joints.
   2. Secure panels to walls and pilasters with brackets.

D. Overhead-Braced and Floor-Anchored Units: Secure pilasters with anchors penetrating 2 inches, minimum into floor. Secure continuous head rail to each pilaster. Hang doors to align with tops of adjoining panels and parallel to overhead braces when closed.

E. Urinal Screens: Attach with anchoring devices to supporting structure. Secure screen to resist lateral impact.

F. Erection Tolerances:
   1. Correct Position Variation: 1/4 inch, maximum.
   2. Plumb Variation: 1/8 inch, maximum.

3.3 ADJUSTING

A. Adjust and lubricate hardware for smooth, accurate operation.

B. Set hinges on in-swinging doors to hold doors open 30 degrees from closed position while unlatched. For out-swinging doors, set hinges to return doors to fully closed position.

C. Touch up minor scratches and abrasions to match factory finish.

END OF SECTION

SECTION 102239

FOLDING PANEL PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Folding panel partition at multipurpose.

B. Principal Products:
   1. Single panel, manual, operable partitions.

C. Related Requirements.
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 055000: Steel supports.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting Attendees and Procedures:
   1. Conduct meeting one week and one month, minimum, before starting Work of this Section.

B. Sequencing Procedures:
   1. Do not install folding panel partitions until painting, flooring, and other finishes are complete at installation area.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Folding panel partition system and components.
   2. Initial selection color charts and samples.

B. Shop Drawings: Sealed by Engineer responsible for delegated design.
   1. Plans, elevations, sections, and details.
   2. Track support beam and column details.
   3. Stacking and operating clearances and storage pocket door details.
   4. Electrical controls and wiring diagrams.
   5. Work surface locations and details.
   6. Pass door locations and details.

C. Samples:
   1. Fabric Facing: Full width by 36 inches.
   2. Vinyl Wallcovering: 8 by 8 inches minimum.
   3. Steel Edge Trim: 12 inches long in required color.
   4. Chair Rail: 12 inches long in required color.
   5. Marker Board: 8 by 8 inches minumum.

1.4 INFORMATIONAL SUBMITTALS

A. Delegated Design Submittals:
   1. Track support and seismic restraint design calculations.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Folding panel partitions and facings.

B. Warranty documentation.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Materials: Finish wallcovering and fabric; sufficient quantity to re-cover two panels on both sides.

1.7 QUALITY ASSURANCE

A. Qualifications:
   1. Installers: Trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
   1. Store system components inside building.

1.9 FIELD CONDITIONS

A. Ambient Conditions: Perform work within following limitations:
   1. Building enclosed and environmental systems maintaining design conditions for Owner occupancy.

B. Existing Conditions: Verify field measurements before fabrication. Show field measurements on Shop Drawings.

1.10 WARRANTY

A. Manufacturer Warranties:
   1. Partition System Components: Repair or replacement of defective components.
      a. Warranty Period: 2 years.

2. Acoustical Performance: Retention of specified acoustical properties, providing that proper maintenance has been performed on the installation.
    a. Warranty Period: 10 years.

PART 2 - PRODUCTS

2.1 HORIZONTALLY OPERATING PANEL PARTITIONS

A. Single Panel Partitions: Manually operated individual panels.
1. Manufacturers and Products:
    a. Modernfold, Inc. Acousti-Seal Legacy.
    b. Comparable product submitted and accepted.
2. Surface Burning Characteristics: Tested per ASTM E84 or UL 723.
    a. Flame Spread: 25 maximum.
    b. Smoke Developed: 450 maximum.
3. Fire Resistance: NFPA 80 based on UL 10B test.
    a. Rating: 1 hour.
4. Acoustical Rating: 52 STC, minimum.
5. Panel Construction: Welded steel frame; nominal 3 inches thick.
6. Panel Skin:
    a. Roll-formed steel sheet.
7. Acoustical Seals:
    a. Panel Top: Fixed.
    b. Floor: Retractable.
    c. Vertical Edges: Interlocking tongue-and-groove.
8. Final Closure: Removable crank operated; horizontally expanding edge with hinged panel closure.
9. Panel Finish Materials: Custom fabric listed on Drawings.
    a. Colors, Patterns: Architect selected.
10. Trim Color: Architect selected.
11. Hardware Finish: Architect selected.
12. Suspension System: Heavy duty roll-formed steel track.
13. Work Surfaces:
    a. Markerboard: White enamel steel bonded to panel face without trim.
    b. Tackboard: 1/4 inch natural cork covered with fabric.
14. Pocket Doors: Match adjacent wall.

2.2 PERFORMANCE

A. Delegate partition structural support system design to manufacturer Professional Engineer registered in Project jurisdiction.

B. Allowable Deflection: 1/8 inch per 12 feet of length, or as required by partition manufacturer.

C. Seismic Movement: Brace top support beam per seismic design criteria on Structural Drawings.

D. Accessibility Requirements: Applicable provisions in Department of Justice publication 2010 ADA Standards for Accessible Design, ICC/ANSI A117.1, and state accessibility code.

2.3 FABRICATION

A. Fabricate folding partition components on basis of field measurements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that floor flatness and levelness below path of folding partition is within manufacturer recommended limits.

B. Verify completeness and levelness of overhead structural supports.

C. Verify that acoustical partition above support beam is complete and acoustically sealed.

3.2 PREPARATION

A. Verify that there are no discontinuities in panel acoustical seals.

3.3 INSTALLATION

A. Follow ASTM E557.

B. Install partition system plumb and level.

C. Install panels in numbered sequence.

D. Adjust partitions and pocket doors for smooth, accurate movement and optimum acoustical seal compression.

E. Adjust pass doors for secure closure and ADA compliance.

3.4 FIELD QUALITY CONTROL

A. Field Tests and Inspections: Engage testing agency to perform testing to determine noise isolation class (NIC) per ASTM E336 and rated per ASTM E413.
   1. Failed Test Retest Cost: Contractor responsibility.

B. Illuminate one side of partitions and observe top, bottom, and edge seals for light leaks. Replace defective seals or readjust and re-test until no light leaks are observed.

C. Verify that safety devices are functioning correctly.

D. Non-Conforming Work: Make corrections or replace, and re-test.

3.5 CLEANING

A. Clean finish surfaces and partition accessories.

3.6 CLOSEOUT ACTIVITIES

A. Arrange for factory-authorized service representative to demonstrate partition operation and safety features to Owner's staff.

3.7 MAINTENANCE

A. Service and maintain folding panel partitions for one year from Date of Substantial Completion.
   1. Include service call approximately 2 weeks before end of maintenance period.

END OF SECTION

SECTION 102800

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Restroom accessories.

B. Principal Products:
1. Hand Dryers, T-1.
2. Soap dispenser, T-2.
3. Toilet tissue dispenser, T-3.
4. Sanitary napkin disposals, T-4.
5. Waste receptacle, T-5.
6. Towel pin, T-6.
7. Diaper changing stations, T-7.
8. Grab bars, T-8A, T-8B, T-8C.
9. Mirror unit, T-12.
10. Custodial Accessories: Mop and broom holder, shelf, T-9.

C. Related Requirements.
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 061053: Miscellaneous rough carpentry.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
1. Coordinate size and location of wall backing and toilet partition reinforcement for support of accessories.

B. Preinstallation Meeting Attendees and Procedures:
1. Conduct meeting one week, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data:
1. Each accessory type.
2. Initial selection color charts and samples.
3. Powered Accessories: Submit electrical characteristics.

B. Schedules: List product types, quantities, sizes, and installation locations. Use room numbers and accessory numbers in schedule.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For electric powered accessories.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Spare Parts: Manufacturer recommended parts and quantities.

1.6 FIELD CONDITIONS

A. Existing Conditions: Verify field measurements before fabrication. Show field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 ACCESSORIES - GENERAL

A. Manufacturers and Products: See Toilet Accessory Schedule on Drawings.

2.2 PUBLIC-USE TOILET ROOM ACCESSORIES

A. Accessories - General: Provide accessories of each type from single manufacturer.
   1. Accessories with Locking Panels: Tumbler cam locks; all accessories keyed alike.

B. Soap Dispensers, T-2: Wall mounted, manual operation.
   1. Manufacturers and Products:
      a. T-2: Bradley; Model 6542.
      b. Comparable product submitted and accepted prior to bidding.

C. Toilet Tissue Dispenser, T-3: Dual roll-in-reserve type.
   1. Manufacturers and Products:
      a. T-3; Bradley; Model 5402.
      b. Comparable product submitted and accepted prior to bidding.
   2. Mounting: Surface and Through-partition.
   3. Material and Finish: #4 Stainless steel.

D. Waste Receptacle, T-5:
   1. Manufacturers and Products:
      a. T-5; Bradley; Model 3565.
      b. Comparable product submitted and accepted prior to bidding.
   2. Mounting: Surface.
   3. Receptacle Capacity: 12 gallons, minimum.
   4. Material and Finish: 4 Stainless steel.

E. Sanitary Napkin Disposal, T-4:
   1. Manufacturers and Products:
      a. T-4: Bradley; 4722-15.
      b. Comparable product submitted and accepted prior to bidding.
   2. Mounting: Surface.
   3. Material and Finish: 4 Stainless steel.

F. Baby Changing Stations, T-7: Horizontal type.
   1. Manufacturers and Products:
      a. T-7: Bobrick; Koala Kare KB200-05SS.
      b. Comparable product submitted and accepted prior to bidding.
   2. Mounting: Surface.
   3. Exterior Material: Stainless steel.
   4. Interior Materials: High-density polyethylene liner with child strap anchored to shell.
   5. Capacity: 250 pound static load, minimum on opened bed.

G. Grab Bars, T-8A, T-8B, T-8C:
   1. Manufacturers and Products:
      a. T-8A:Bradley; 812-001-18.
      b. T-8B: Bradley; 812-001-42.
      c. T-8C: Bradley; 812-001-36.
   2. Mounting: Flanges with concealed fasteners.
   3. Material and Finish: 4 Stainless steel, slip-resistant texture.
   4. Configuration and Length: See Drawings.
   5. Diameter: 1-1/2 inches.

H. Framed Mirrors, T-12: Non-tilt type.
   1. Manufacturers and Products:
      a. T-12: Bradley; 780.
      b. Comparable product submitted and accepted prior to bidding.
   2. Frame: Stainless steel, 1/2 inch wide.
   3. Size: See Drawings.

I. Air Dryers, T-1: High-speed, rapid-dry type.
   1. Manufacturers and Products:
      a. Dyson; Airblade V.
      b. Comparable product submitted and accepted prior to bidding.
   2. Mounting: Surface.
   3. Material and Finish: #4 Stainless steel.
   4. Operation: Electronic sensor.

J. Towel Pin, T-6:
   1. Manufacturers and Products:
      a. T-6: Bobrick, B677.
      b. Comparable product submitted and accepted prior to bidding.
   2. Material and Finish: Architect selected.

2.3 CUSTODIAL ACCESSORIES

A. Mop and Broom Holders, T-9: Units with hooks, mop clips, and shelf.
   1. Manufacturers and Products:
      a. T-9: Bobrick; B-293x34.
   2. Length: 34 inches.
   3. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
   4. Material and Finish: 4 Stainless steel.

2.4 PERFORMANCE

A. Accessibility Requirements: Applicable provisions in Department of Justice publication 2010 ADA Standards for Accessible Design, ICC/ANSI A117.1, and state accessibility code.

B. Electrical Components:
   1. UL Listed and labeled.

2.5 MATERIALS

A. Stainless Steel Sheet: ASTM A480, Type 304, 0.031-inch minimum nominal thickness.

B. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.

C. Galvanized-Steel Sheet: ASTM A653/A653M, G60 hot-dip zinc coating.

D. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices, same material as accessory.
   1. Exposed Fasteners: Tamper resistant.

F. Keys: Provide for locked accessories.
   1. Quantity: 4 keys, minimum.

G. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.6 FABRICATION

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate sheet metal of seamless sheets with flat surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify backing supports are in place and adequate.

B. Powered Accessories: Verify electrical power is correctly located and is of proper characteristics.

3.2 INSTALLATION

A. Install accessories level, plumb, and firmly anchored.

B. Install using fasteners appropriate to substrate.

C. Grab Bars: Install to withstand 250 lbf minimum load, when tested per ASTM F446.

D. Powered Accessories: See Division 26 for wiring requirements.

E. Battery-Powered Accessories: Install fresh batteries before Substantial Completion.

3.3 CLEANING AND PROTECTION

A. Clean exposed surfaces of compartments, hardware, and fittings using methods acceptable to the manufacturer.

B. Touch-up, repair or replace damaged products until Substantial Completion.

END OF SECTION

SECTION 104300

EMERGENCY AID SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Automated External Defibrillators and cabinets with alarms.

B. Principal Products:
   1. Defibrillators.
   2. Defibrillator cabinets.

C. Related Requirements:
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 061053: Miscellaneous rough carpentry.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
   1. Coordinate installation of emergency aid cabinets with electrical supply and wiring connections for cabinets integrated into external security system.

B. Preinstallation Meeting:
   1. Conduct meeting one month, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Initial selection color samples and finish.
   2. Defibrillator operational features.
   3. Bracket type.
   4. Cabinet type, trim, panel style including hardware.

B. Shop Drawings.
   1. Include plans, elevations, sections, details and attachments to other work.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates.

B. Manufacturer instructions.

C. Manufacturer instructions on replacement parts acquisition.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For defibrillators and cabinets.

B. Warranty Documentation: For defibrillators and cabinets.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Spare Parts: Manufacturer recommended parts and quantities.

B. Extra Stock Materials:
   1. Adult defibrillator pad, 1 minimum for each defibrillator provided.
   2. CPR Feedback pad, 1 minimum for each defibrillator provided.

1.7 QUALTIY ASSURANCE

A. Electrical Components, Devices and Accessories: Listed and labeled as defined in NFPA 70 by a qualified testing agency, Marked for intended location and application.

B. Coordinate device mounting locations with authorities having jurisdiction and obtain approval in writing prior to installation.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements:
   1. Deliver emergency aid specialties in manufacturer undamaged packaging.
   2. Obtain bill of lading. Verify delivery is complete and products are undamaged.

1.9 WARRANTY

A. Manufacturer Warranty:
   1. Defibrillators: Warrant against product failure.
      a. Failure includes material and workmanship.
      b. Warranty Period: 8 years.

PART 2 - PRODUCTS

2.1 EMERGENCY AID SPECIALTIES

A. Defibrillator: Automated external defibrillator with CPR metronome.
   1. Manufacturers and Products:
      a. Cardiac Science Powerheart G3 Plus; as basis of design.

B. Defibrillator: Automated external defibrillator.
   1. Manufacturers and Products:
      a. Cardiac Science Powerheart G5; as basis of design.

C. Defibrillator Cabinet: Cabinet with alarm and strobe light.
   1. Manufacturers and Products:
      a. Cardiac Science standard size; as basis of design.
   2. Mounting type:
      a. Surface mounted: Stobe light mounted on top of cabinet.
      b. Semi Recessed and Recessed mounted: Strobe light mounted on wall above cabinet.
      c. Mounting height: See Drawings.

2.2 ACCESSORIES

A. In cabinet Mounting Brackets: Steel, sized for specified defibrillators.

B. Cabinet Signs:
   1. Lettering: Architect selected.
   2. Arrangement: Architect selected.
   3. Color: Red.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
   1. Verify rough openings and blocking for cabinet are correctly sized and located.

3.2 PREPARATION

A. Prepare recesses for recessed cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install AED cabinets in strict accordance with manufacturer's printed instructions and recommendations in locations at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

B. Secure cabinets to structure, square and plumb.

C. Place defibrillators and accessories in cabinets and on in cabinet brackets.

D. Apply signage.

3.4 ADJUSTING

A. Adjust emergency aid cabinet doors for smooth operation.

B. Touch up finishes or replace cabinets that cannot be restored to factory finish.

3.5 CLEANING

A. Remove temporary protective coverings.

B. Clean interior and exterior surfaces.

END OF SECTION

SECTION 104400

FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Portable fire extinguishers in cabinets and mounted on brackets.

B. Principal Products:
   1. Fire extinguisher cabinet.
   2. Mounting brackets.
   3. Fire extinguishers.

C. Related Requirements.
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 061053: Miscellaneous rough carpentry.
   5. Section 078400: Firestopping.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting:
   1. Conduct meeting one week, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Initial selection color Samples and finish.
   2. Extinguisher operational features.
   3. Bracket type.

B. Shop Drawings.
   1. Show cabinet dimensions, details, fire ratings, and wall bracket mounting.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements:
   1. Deliver fire protection specialties in manufacturers undamaged packaging.
   2. Obtain bill of lading. Verify delivery is complete and products are undamaged.

1.6 WARRANTY

A. Manufacturer Warranty:
   1. Fire Extinguishers: Warrant against product failure.
      a. Failure includes material and workmanship.
      b. Warranty Period: 5 years.

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHERS

A. Fire Extinguishers, General:
   1. Fire Extinguisher Fabrication and Labeling: NFPA 10.
   2. FM Global approved.

B. Multipurpose Dry Chemical:
   1. Manufacturers and Products:
      a. Amerex Model B424.
      b. J.L. Industries Cosmic 5E.
      c. Larsen's Manufacturing Company MP5.
      d. Potter Roemer 3005.
   2. UL Rating: 2A:10-B:C.
   3. Nominal Capacity: 5 pounds.
   4. Container: Enameled steel container with chrome plated brass valve.

2.2 FIRE EXTINGUISHER CABINETS

A. Cabinet Construction:
   1. Nonrated.

B. Flush Framed Door Fire Extinguisher Cabinets:
   1. Manufacturers and Products:
      a. Larsen's Manufacturing Company 2409 Series Architectural.
      b. J.L. Industries Ambassador.
      c. Potter-Roemer Alta 7000 Series.
      d. Safety One Industries Murano Series.
   2. Cabinet: Cold rolled steel, sized for extinguisher; semirecessed and surface mountedtypes.
      a. Interior Finish: White baked enamel.
   3. Door: Clear anodized aluminum, 0.048 inch thick.

4. Frames: Hollow metal, 1/2 inch thick.
5. Glazing: Vertical duo.
6. Glass Type: Acrylic.
   a. Glass Color: Clear.
7. Hardware: Piano hinge.
8. Trim: Material to match door, rolled edge, depth to suit mounting conditions.

2.3 MATERIALS

A. Steel Sheet: Cold rolled steel, ASTM A1008.

B. Aluminum Extrusions: ASTM B221.

C. Aluminum Sheet: ASTM B221, Alloy 6063-T5 minimum strength and durability.

D. Stainless Steel: ASTM A666, Type 304.

2.4 FABRICATION

A. Shop Fabrication: Provide cabinets with trim, frame, door, and hardware.

2.5 FINISHES

A. Shop Finishing Methods: Follow NAAMM AMP 500.

B. Anodizing: AAMA 611 Class I or AAMA 612 with electrodeposition organic seal.
   1. Color: Clear.

2.6 ACCESSORIES

A. Mounting Brackets: Steel, red enamel finish, sized for specified fire extinguishers.

B. Cabinet Signs:
   1. Lettering: Vinyl adhesive.
   2. Arrangement: Horizontal.
   3. Color: Red.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
   1. Verify rough openings and blocking for cabinets are correctly sized and located.

3.2 INSTALLATION - GENERAL

A. General: NFPA 10.

B. Secure cabinets in place.

C. Place extinguishers and accessories in cabinets and on wall brackets.

D. Apply signage.

3.3 ADJUSTING

A. Adjust fire protection cabinet doors for smooth operation.

3.4 CLEANING

A. Clean interior and exterior surfaces.

END OF SECTION

SECTION 116623

GYMNASIUM EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Basketball equipment.
2. Volleyball equipment.
3. Wall padding.

B. Principal Products:
1. Volleyball standards and netting.
2. Basketball backstop, winch, operator, safety device, backboard, goal, nets, and accessories.
3. Wall padding system, WP-1.

C. Related Requirements:
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 055000: Steel supports.
5. Section 096400: Wood flooring.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
1. Coordinate work results of this Section with other athletic equipment work.

B. Preinstallation Meeting Attendees and Procedures:
1. Conduct meeting one week and one month, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data:
1. Initial selection color charts and samples.
2. Provide data describing fabricated equipment construction, sizes, and installation details.
3. Provide data indicating wall pad construction materials, thicknesses, colors available.

B. Shop Drawings:
1. Indicate size and location of wall pads, mounting details, required cutouts.

2. Indicate game and equipment locations, power and utility requirements.
3. Indicate location of floor anchors.
4. Indicate logos or special designs.

C. Samples:
1. Wall Pad Cover Materials: 12 inches square in size.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates:
1. Each type of gymnasium equipment.

B. Manufacturers' Instructions.

C. Manufacturer Reports: Field instruction, test, and inspection reports.

D. Qualification Statements: Installer.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For gymnasium equipment to include emergency, operation, and maintenance manual.

B. Warranty Documentation: For gymnasium equipment.

1.6 QUALITY ASSURANCE

A. Qualifications:
1. Installers: A qualified installer employing workers trained and approved by manufacturer.

B. Electrical Components, Devices, and Accessories: NFPA 70, listed and labeled, by a qualified testing agency, marked for intended location and application.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
1. Store products indoors, protected from elements and secured from theft.
2. Store products elevated above grade, protected from precipitation and stormwater runoff.
3. Handle products to prevent soiling and damage.

1.8 FIELD CONDITIONS

A. Ambient Conditions: Perform work within following limitations:
1. Building enclosed and environmental systems maintaining design conditions for Owner occupancy.

B. Existing Conditions: Verify field measurements before fabrication. Show field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 BASKETBALL EQUIPMENT

A. Manufacturers:
   1. Porter Athletic, Inc. as basis of design.
   2. Institutional Products, Inc.
   3. Jaypro Sports Construction Group.

B. General: Provide equipment complying with requirements in FIBA's "FIBA Basketball Rule Book."

C. Provide manufacturer's recommended connections complying with Section 055000 "Metal Fabrications" of size and type required to transfer loads to building structure.

D. Fixed and Up-Fold Wall Mount Backstops: Complete assembly spanning height shown on Drawings.
   1. Manufacturer and Product:
      a. Porter Athletic; Forward Fold Backstop, Motorized Retractable, Model 90917000.
   2. Framing: Steel pipe, tubing, and shapes. Design framing to minimize vibration during play.
   3. Folding Type 1 (Gym Addition): Provide manufacturer's standard assembly for fold up backstop, with hardware and fittings to permit folding.
   4. Goal Height Adjuster: Adjustable from 8 to 10 feet with gear-drive mechanism, locking in any position within adjustment range, with visible height scale attached to side of framing.
      a. Operation: Electric with integral gear-drive motor, with limit switches preset to goal heights.

E. Backstop/Backboard Safety Device: Designed to limit free fall if support cable, support chain, pulleys, fittings, winch, or related components fail; with mechanical automatic reset; 6000-lb load capacity; one per folding backstop.
   1. Retractor Device: Manufacturer's standard device designed to retract both support and safety cables, chains, and straps away from play of the basketball when backstop is in playing position; one per folding backstop.

F. Winch: Hoist, consisting of heavy-duty, fully enclosed worm gear, brake, cable drum, cable, and fittings, for mounting on wall with equipment mounting pad; designed to move and hold backstop in any raised or lowered position.
   1. Operation: Electric operation.

G. Electric Operator: Factory-assembled electric operator for backstop designed for lifting and lowering basketball equipment of type, size, weight, construction, use, and operation frequency indicated. Provide operation system, of size and capacity and with features,

characteristics, and accessories suitable for Project conditions, recommended by gymnasium equipment manufacturer; complete with winch or hoist designed to move and hold backstop in any raised or lowered position, electric motor and factory-prewired motor controls with limit controls, remote-control stations, remote-control devices, power disconnect switch, enclosures protecting controls and all operating parts, and accessories required for proper operation. Include wiring from motor controls to motor. Coordinate operator wiring requirements and electrical characteristics with the building electrical system.

1. Basis of Design Product: Manufacturer recommend product.
2. Comply with NFPA 70.
3. Winch: Heavy-duty, fully enclosed worm gear reducer, belt and sprocket drive, cable drum, cable, and fittings.
4. Electric Motor: UL-approved or -recognized, totally enclosed, insulated, capacitor-start motor, complying with NEMA MG 1, with thermal-overload protection, brake, and permanently lubricated bearings; sized to start and operate size and weight of basketball equipment considering Project's service conditions without exceeding nameplate ratings or considering service factor.
    a. Motor Characteristics: Single phase, 3/4 hp; 115 V, 60 Hz.
5. Operator Mounting: Ceiling, on equipment support pipes.
6. Remote Controls: Master equipment controller.
7. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop basketball equipment at fully retracted and fully lowered positions.

H. Basketball Backboards: Provide predrilled holes or preset inserts for mounting goals.
1. Manufacturer and Product:
    a. Bison; Single Backboard, Model BA873U-BK.
    b. JayPro Sports; Single Backboard, Model LS-200.
    c. Comparable product submitted and accepted prior to bidding.
2. Description: Rectangular, not less than 1/2 inch thick, acrylic glazing. Provide manufacturer recommended welded steel frame with steel subframe, reinforcement, and bracing including center-strut frame reinforcement, and with mounting slots for mounting backboard frame to backstop support framing.
3. Target Area and Border Markings: Permanently etched.

I. Goal Mounting Assembly: Compatible with goal, backboard, and support framing; with hole pattern that is manufacturer's standard for goal attachment.
1. Glass Backboard Goal Mounting Assembly: Goal support framing and reinforcement designed to transmit load from goal to backboard frame and to minimize stresses on glass backboard.

J. Basketball Goals: Complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
1. Manufacturer and Product:
    a. Porter Athletic; Pro Strut Moveable Rim Goal, Torq-Flex, Model 00252-500.
    b. Comparable product submitted and accepted prior to bidding.
2. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication per manufacturer's standard design.

3. Type: Movable, breakaway design with manufacturer's standard breakaway mechanism and rebound characteristics identical to those of fixed, nonmovable ring.
4. Mount: Front.
5. Net Attachment: No-tie loops for attaching net to rim without tying.
6. Finish: Manufacturer's standard powder-coat finish.

K. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches long, sized to fit rim diameter.

L. Safety Pads: Provide safety pads designed for backboard thickness indicated and extending continuously along bottom and up sides of backboard and over goal mounting and backboard supports.

2.2 VOLLEYBALL EQUIPMENT

A. Manufacturers:
1. Porter Athletic, Inc. as basis of design.
2. Jaypro Sports LLC.
3. Performance Sports Systems.

B. General: Provide equipment complying with requirements in FIVB's "Official Volleyball Rules NFHS's "NFHS Volleyball Rules Book and USAV's "USA Volleyball Rule Book." No part of the overhead system shall touch the floor.

C. Floor Insert: Brass floor plate; and steel pipe sleeve, concealed by floor plate, with capped bottom end, sized with ID to fit post standards, not less than length required to securely anchor pipe sleeve as indicated on Drawings; with anchors designed for securing floor insert to floor substrate indicated.
1. Manufacturer and Product:
   a. Porter Athletic; Indoor Anchors with 5-1/4 inch Brass Coverplates, Model 00249-100.
   b. Comparable product submitted and accepted prior to bidding.
2. Finish: Architect selected.
3. Floor Plate: Hinged access cover, designed to be flush with adjacent flooring. Provide two tools for lifting access covers.

D. Post Standards: Removable, paired volleyball post standards as indicated on Drawings. Adjustable, telescoping height. Designed for easy removal from permanently placed floor insert supports. Fabricated from extruded-aluminum pipe or tubing, with nonmarking plastic or rubber end cap or floor bumper to protect permanent flooring. Finished with manufacturer's standard factory-applied, baked powder-coating finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness or plated metal finish.
1. Basis of Design Product:
   a. Porter Athletic; Composite International Volleyball Package.
   b. Comparable product submitted and accepted prior to bidding.
2. Nominal Pipe or Tubing Diameter: 3-1/2-inch OD at base.

a. Coordinate post standard diameter with floor insert requirements.

3. Net Height Adjuster: Manufacturer's standard mechanism for infinite height adjustment, complete with fittings.

E. Net: Black nylon, 4 inch square mesh, 32 feet long x 39 inches high with 2 inch wide vinyl coated fabric border around entire perimeter of net. Provide 1/8 inch nylon coated galvanized steel aircraft cable within top border, 1/4 inch diameter nylon rope in bottom border, and manufacturer's standard hardware for attaching net to posts.

2.3 WALL MOUNTED SAFETY PADS

A. Safety Pads, WP-1: Vinyl covered, shock absorbing, protective wall pads, nominal 2 feet wide and 7 feet high with factory made cutouts with sewn edge closures for access to wall mounted fixtures and devices. Adjust width of panels to suit wall configuration for continuous coverage.
1. Manufacturer and Product:
a. AK Athletic Equipment.
b. Comparable product submitted and accepted prior to bidding.
2. Assembly fire rating, ASTM E84 Class A.
3. Custom Graphic Artwork: Owner provided.

B. Backing Material: 3/8 inch thick fire retardant treated plywood.

C. Padding Material: 2 inch thick, 3.7 pcf density, fire retardant, foam.

D. Covering Material: 14 ounce non-tear vinyl coated nylon material, anti-fungal, anti-bacterial, color as selected. Cover padding and backing material attachment strips.

E. Installation Method: Manufacturer's standard concealed fastening.

2.4 PERFORMANCE

A. Seismic Movement: ASCE/SEI 7.

B. Surface Burning: ASTM E84 Class A.
1. Flame Spread Index: 25, maximum.
2. Smoke Developed Index: 450, maximum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Condition: Verify that wall surfaces are ready to receive work.

3.2 INSTALLATION - GYM EQUIPMENT

A. Install product. Follow manufacturer's instructions.

B. Attach equipment to heights as indicated or as suitable to elementary school, high school, and college use. Coordinate heights with Owner prior to installation.

C. Adjust equipment for proper operation.

3.3 INSTALLATION - SAFETY PADS

A. Install product. Follow manufacturer's instructions.

B. Align pads level and plumb.

END OF SECTION

SECTION 116800

PLAY EQUIPMENT AND STRUCTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes equipment as follows:

1. Playground Equipment manufactured by KOMPAN and Landscape Structures, Inc.

2. Athletic Equipment manufactured by Bison, Inc., JayPro Sports, LLC, and Kwik Goal.

1.3 DEFINITIONS

A. Definitions in ASTM F1487 apply to Work of this Section.

B. IPEMA: International Play Equipment Manufacturers Association.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at the Project Site.

1. Attendees to include KOMPAN Representative, General Contractor, and Equipment Installer.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of Play and Athletic Equipment.

1. Include plans, elevations, sections, and attachment details.

2. Include fall heights and use zones for playground equipment, coordinated with the critical-height values of protective surfacing specified in Section 321816.13 "Playground Protective Surfacing."

C. Samples for Initial Selection: For each type of exposed finish.

D. Product Schedules: For Play and Athletic Equipment, use same designations as indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Product Certificates: For each type of Play and Athletic Equipment.

C. Material Certificates: For the following items:

1. Shop finishes.

D. Field quality-control reports.

E. Sample Warranty: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For Play and Athletic Equipment and finishes to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm whose Equipment components have been certified by IPEMA's third-party product certification service.

1. Play and Athletic Equipment manufacturers must be approved by Philadelphia Parks and Recreation (PPR).

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by the manufacturer.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of Play and Athletic Equipment that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures.

    b. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain Play and Athletic Equipment from the following approved manufacturers:

1. KOMPAN Inc.
   Matt Burns, Principal Sales Representative
   Phone: 310-775-5082
   Email: MatBur@Kompan.com
   www.kompan.us

2. Landscape Structures, Inc.
   Garry Helmuth, Sales Consultant
   General Recreation, Inc.
   P.O. Box 440, Newtown Square, PA 19073
   Phone: 800-726-4793
   Email: gary@gen-rec.com
   www.generalrecreationinc.com

3. Bison, Inc.
   603 L Street, Lincoln, NE 68508
   Phone: 1-800-247-7668
   ww.bisoninc.com

4. JayPro Sports, LLC
   976 Hartford Turnpike, Waterford, CT 06385
   Phone: 1-800-243-0533
   www.jayprosports.com

5. Kwik Goal
   140 Pacific Drive, Quakertown, PA 18951
   Phone: 1-800-531-4252
   www.kwikgoal.com

B. Equipment and components shall have the IPEMA Certification Seal.

2.2 PERFORMANCE REQUIREMENTS

A. Safety Standard: Provide playground equipment according to ASTM F1487.

2.3 PLAY EQUIPMENT

A. See Play Equipment Schedule on Drawings for product information.

2.4 ATHLETIC EQUIPMENT

A. See Athletic Equipment Schedule on Drawings for product information.

2.5 CAST-IN-PLACE CONCRETE

A. Concrete Materials and Properties: Dry-packaged concrete mix complying with ASTM C387/C387M and mixed at site with potable water, according to manufacturer's written instructions, for normal-weight concrete with minimum 28-day compressive strength, slump, and aggregate size per manufacturer's instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for earthwork, subgrade elevations, surface and subgrade drainage, and other conditions affecting performance of the Work.

1. Do not begin installation before final grading required for placing playground and fitness equipment and protective surfacing is completed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written installation instructions for each piece of equipment unless more stringent requirements are indicated on Drawings. Anchor equipment securely, positioned at locations and elevations indicated.

1. Maximum Equipment Height: Coordinate installed fall heights of Play Equipment with finished elevations and critical-height values of protective surfacing. Set equipment so fall heights and elevation requirements for age group use and accessibility are within

required limits. Verify that equipment elevations comply with requirements for each type and component of equipment.

B. Post and Footing Excavation: Excavate holes for posts and footings as indicated in firm, undisturbed or compacted subgrade soil.

C. Post Set on Subgrade: Level bearing surfaces with drainage fill to required elevation.

D. Post Set with Concrete Footing: Comply with ACI 301, dry-packaged concrete-mix manufacturer's written instructions for measuring, batching, mixing, transporting, forming, and placing concrete.

1. Set equipment posts in or on concrete footing per equipment manufacturer's instructions. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at the correct angle, alignment, height, and spacing.

a. Place concrete around posts and vibrate or tamp for consolidation. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.

2. Embedded Items: Follow manufacturer's written instructions and drawings to ensure correct installation of anchorages for equipment.

3. Finishing Footings: Smooth top, and shape to shed water.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: CSPI-certified representative, or another qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:

1. Perform inspection and testing for each type of installed Play and Athletic Equipment according to ASTM F1487.

C. Play and Athletic Equipment items will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

E. Notify Landscape Architect forty-eight (48) hours in advance of date(s) and time(s) of testing and inspection.

END OF SECTION 116800

SECTION 122413

ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Vertical manual roller window shades.

B. Principal Products:
   1. Roller window shades.
   2. Shade materials.
   3. Manual operator.

C. Related Requirements.
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 061053: Miscellaneous rough carpentry.
   5. Section 084113: Aluminum framed entrances and storefronts.
   6. Section 084413: Glazed aluminum curtain walls.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting Attendees and Procedures:
   1. Conduct meeting one week and one month, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Each roller shade type.
   2. Initial selection color charts and samples for shadeband fabric and metal finish.

B. Shop Drawings: Show shades on floor plans or reflected ceiling plans.
   1. Each installation area; include anchorage details.
   2. Locations of control stations and units included in control zones.

C. Schedules:
   1. Types by location. Include operation and appearance attributes.

D. Samples:
   1. Shadeband Fabrics: 8- by 8-inch samples of each type.
   2. Fascia: 8-inch samples in required colors.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Include full parts list; shadeband fabric cleaning precautions.

B. Warranty documentation.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Installer: Manufacturer trained.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
   1. Store roller shades inside building after enclosure.
   2. Mark packaging with installation location using Drawing room designations.

1.7 FIELD CONDITIONS

A. Ambient Conditions: Perform work within following limitations:
   1. Building enclosed and environmental systems maintaining design conditions for Owner occupancy.

B. Existing Conditions: Verify field measurements before fabrication. Show field measurements on Shop Drawings.

1.8 WARRANTY

A. Manufacturer Warranties:
   1. Warrant against product failure.
      a. Hardware: 10 years.
      b. Shadeband Fabric: 10 years.
      c. Motor Operators and Controls: 5 years.

PART 2 - PRODUCTS

2.1 MANUAL OPERATION SHADES

A. Manually Operated Roller Shades:
   1. Manufacturers and Products:
      a. Draper, Inc. FlexShade
      b. MechoShade Systems, Inc. Mecho /5.

c. Comparable products submitted and accepted prior to bidding for one of the following:
   1) Hunter Douglas Contract.
   2) Lutron.

B. Shade Type: Single roller.

C. Drop Position: Regular roll.

D. Mounting: See Drawings.

E. Shade Fabrics: Color-fast, impervious to heat and moisture, and able to retain shape under exposure to sunlight through windows; NFPA 701 and WCMA A100.1.
   1. Mold Resistance: 'No Growth' per ASTM G21 results for fungi ATCC9642, ATCC9644, and ATCC9645.
   2. Fire Test Response Characteristics: Passes NFPA 701 small and large-scale vertical burn tests.
   3. Solar Control Shade Fabric:
      a. Openness: 3 percent.
      b. Weave Pattern: Architect selected.
      c. Color: Architect selected.

F. Shade Fabric Attachment: Replaceable without disassembly.

G. Hembars: Maintain bottom edge straight and flat.
   1. Style: Wrapped.

H. Clutch Operator: Permanently lubricated, continuous loop chain operation.
   1. Reduced Operating Force: 8.5 pounds maximum.

I. Accessories:
   1. Fascia: Extruded aluminum; conceals shade mounting and roller without exposed fasteners.
      a. Finish: Architect selected.
   2. Ceiling Recess: Enclosure for mounting in suspended acoustical ceiling.

2.2 FABRICATION

A. Height: Fill openings from head to within 1/2 inch of stool.

B. Width - Between Jambs: Uniform 1/4 gaps.

C. Width - Outside Mount: Lap jambs 3/4 inch.

D. Continuous Windows With Separate Rollers: Butt rollers end to end centered on window mullions.

2.3 FINISHES

A. Anodizing: AAMA 611 Class I or AAMA 612 with electro-deposition organic seal.
   1. Color: Architect selected.

B. Powder Coating: Thermoset polyester; AAMA 2603.
   1. Color: Architect selected.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify concealed support locations for attachment.

3.2 ERECTION

A. Install roller shades level, aligned with adjacent units, and centered on openings.

B. Install jamb guides plumb and aligned with shadeband drop.

3.3 CLEANING

A. Clean metal and fabric surfaces.

3.4 CLOSEOUT ACTIVITIES

A. Demonstration: Train Owner staff on operation and maintenance.

END OF SECTION

SECTION 123600

COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
1. Countertops, QC-1.

B. Principal Products:
1. Quartz agglomerate countertop.
2. Installation accessories.

C. Related Requirements.
1. Section 018113: Sustainable design requirements.
2. Section 018114: VOC limits and product emission requirements.
3. Section 018119: Construction indoor air quality management.
4. Section 064000: Architectural woodwork.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
1. Coordinate locations of utilities and accessories penetrating countertops.

B. Preinstallation Meeting Attendees and Procedures:
1. Conduct meeting one week, minimum, before starting Work of this Section.

1.3 ACTION SUBMITTALS

A. Submittals - General: AWI 100.

B. Product Data:
1. Countertop materials.
2. Adhesives.
3. Initial selection color charts and samples.

C. Shop Drawings:
1. Dimensioned plans and elevations showing countertop locations.
2. Show materials, profiles, assembly methods, joint details, fastening methods, hardware locations, cutout sizes and locations, and finishes.

D. Samples:
1. Countertop Material: 6 inches square.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Fabricator: AWI Quality Certification Program participant.
   2. Installer: Woodwork fabricator.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements: AWI 200.

1.6 FIELD CONDITIONS

A. Ambient Conditions: Perform work within following limitations.
   1. Building enclosed and environmental systems maintaining design conditions for Owner occupancy.

B. Existing Conditions: Verify field measurements before fabrication. Show field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 COUNTERTOP GENERAL REQUIREMENTS

A. Quality Standard: AWI 300 - Materials and ANSI AWI 620 - Installation for aesthetic grades.

B. Grade: Premium.

2.2 QUARTZ AGGLOMERATE COUNTERTOPS

A. Quartz Agglomerate Countertops, QC-1: IFSA 3-01, Manufactured quartz sheets.
   1. Grade: Premium.
   2. QC-1 - Manufacturer and Products:
      a. Caesarstone; Quartz Countertop.
      b. Comparable product submitted and accepted prior to bidding.
   3. Configuration: See Drawings.
   4. Thickness: 3 cm.

B. Installation Materials:
   1. Adhesives: Countertop fabricator recommended, VOC compliant.
   2. Fasteners: Type, size, and material to suit each application.

2.3 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, fabricate materials with ample allowance for cutting. Furnish trim for scribing and site cutting.

C. Fabrication Tolerances:
   1. Wood-Based and Solid-Surface Countertops: ANSI/AWI 0620, specified grade.

D. Finish exposed edges of countertops and back and end splashes.

E. Quartz Agglomerate Countertop Fabrication:
   1. Natural Stone Institute's "Dimension Stone Design Manual."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify adequacy of blocking, base cabinets, and brackets to support countertops.

B. Verify location and sizes of utility rough-ins associated with countertops.

3.2 PREPARATION

A. Surface Preparation: Follow ANSI/AWI 0620.

B. Conditioning:
   1. Acclimate products to installation environment per AWI 200 and ANSI/AWI 0620.

3.3 INSTALLATION

A. Follow ANSI/AWI 0620.

B. Installation Grade: Premium.

C. Cut openings for plumbing fixtures, electrical devices, accessories, and appliances.

D. Install countertop fasteners in concealed locations. Use Z's or angle bracket anchors to base cabinets.

E. Align edge surfaces. Provide supports to prevent deflection and lippage.

F. Interface with Other Work: Seal gaps between tops, splashes, and walls with mildew-resistant sealant specified in Section 079200.

3.4 FIELD QUALITY CONTROL

A. Field Tests and Inspections: Inspections provided through AWI's Quality Certification Program. Program inspectors will perform installation inspection and prepare reports. Allow inspectors access to work areas.
   1. Failed Reinspection Cost: Contractor responsibility.

B. Non-Conforming Work: Remove and replace, and re-test.

3.5 CLEANING

A. Cleaning: Clean countertops and splashes; remove excess sealant from adjacent surfaces.

3.6 PROTECTION

A. Protection: Protect countertops from soil and damage during remainder of construction.

END OF SECTION

SECTION 133419

METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Prefabricated metal building systems.

B. Principal Products:
   1. Structural steel framing system.
   2. Metal roof panel system, RF-4.
   3. Metal soffit panel system, SO-1.
   4. Exterior hollow metal doors and frames.

C. Related Requirements:
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 042000: Unit masonry.
   5. Section 054000: Cold formed metal framing.
   6. Section 072100: Thermal insulation.
   7. Section 072700: Air barriers.
   8. Section 074213.23: Metal composite material wall panels.
   9. Section 079200: Joint sealant.
   10. Section 081113: Hollow metal doors and frames.
   11. Section 087100: Door hardware.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination Procedures:
   1. Coordinate work of this Section with foundations and slab on grade.

B. Preinstallation Meeting Attendees and Procedures:
   1. Conduct meeting one month, minimum, before starting Work of this Section, and before concrete is poured.
      a. Include concrete contactors.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Submit metal building system manufacturer's product information, specifications, and installation instructions for building components and accessories.

B. Shop Drawings:
   1. Shop (Erection) Drawings: Submit metal building system manufacturer's erection drawings, including plans, elevations, sections, and details, indicating roof framing, transverse cross-sections, covering and trim details, and accessory installation details to clearly indicate proper assembly of building components.
      a. Show doors and installation details.
      b. Show window openings.
      c. Shop Drawings signed and sealed by responsible Professional Engineer.

C. Certifications: Certificate attesting to design and manufacturing conformance with design and performance criteria, as well as conformance with applicable codes.

D. Samples:
   1. Metal Panels: Nominal 12 inches long by actual panel width. Include fasteners, closures, and other exposed panel accessories.
   2. Flashing and Trim: Nominal 12 inches long. Include fasteners and other exposed accessories.
   3. Vapor-Retarder Facings: Nominal 6-inch-square Samples.
   4. Accessories: Nominal 12-inch-long Samples for each type of accessory.

1.4 INFORMATIONAL SUBMITTALS

A. Certifications: Certificate attesting to design and manufacturing conformance with design and performance criteria, as well as conformance with applicable codes.

B. Delegated Design Submittals: Shop and Erection Drawings and calculations, signed and sealed by responsible Professional Engineer.

C. Welding certificates.

D. Test and Evaluation Reports: Independent testing agency test results showing:
   1. Substantiation of engineering data, performance criteria, and other supporting data.

E. Manufacturer Reports: Field instruction, test, and inspection reports.

F. Qualification Statements: Manufacturer, installer, and professional engineer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panel finishes and roofing to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with AISC 303, AISC 341, AISC 360, SJI LH/DLH-1.1, and MBMA Low Rise Building Systems Manual.

B. Qualifications:
   1. Manufacturers: Company specializing in manufacturing products specified in this section.
   2. Installers (Erector): Company specializing in performing Work of this section.
   3. Testing Agencies: Acceptable to authorities having jurisdiction.
   4. Licensed Professionals: Engineer specializing in design of Work specified in this Section, licensed in the state of Pennsylvania.

C. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1, Structural Welding Code - Steel.
   2. AWS D1.3, Structural Welding Code - Sheet Steel.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements:
   1. Established Dimensions for Foundations: Comply with established dimensions on approved anchor-bolt plans, establishing foundation dimensions and proceeding with fabricating structural framing without field measurements. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.
   2. Established Dimensions for Metal Panels: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal panels without field measurements, or allow for field trimming metal panels. Coordinate construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.9 WARRANTY

A. Integrated Building Envelope Weathertightness Warranty: Include labor and materials required to access failed assembly components, remove and replace components, and re-install enclosing and cladding materials.
   1. Failure includes water and air leakage to building interior.
   2. Warranty Period: 10 years.
   3. Dollar Limit: None.

B. Finish Warranty: Repair deteriorated finishes or replace components.
   1. Deterioration includes the following:
      a. Color Fading: More than 5 Hunter units per ASTM D2244.
      b. Chalking: More than No. 8 rating per ASTM D4214.
      c. Paint cracking, peeling or checking.
   2. Warranty Period: 20 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers and Products:
   1. Butler Manufacturing Co.; as basis of design.
   2. American Building Company.
   3. Lester Building Systems.
   4. Trachte Building Systems, Inc.
   5. Varco-Pruden Buildings.

2.2 METAL BUILDING SYSTEMS

A. General Description:
   1. Configuration: See Drawings.
   2. Primary Framing:
      a. Rigid Modular: Solid member, structural framing system.
   3. End Wall Framing: Manufacturer standard.
   4. Secondary Frame Type: Manufacturer standard purlins, joists, and exterior-framed girts.
   5. Eave Height: See Drawings.
   6. Bay Spacing: See Drawings.
   7. Roof Slope: See Drawings.
   8. Roof System: See Article below for Metal Roof Panels, RF-4.
   9. Exterior Wall System: See Section 042000 for masonry veneer system.

B. Framing Components:
   1. Structural Steel Members: ASTM A36, A572 Grade 50 or A529 Grade 50.
   2. Structural Tubing: ASTM A500, Grade B.
   3. Plate or Bar Stock: ASTM A529 Grade 50.
   4. Anchor Rods: ASTM F1554; Grade 55, weldable.

5. Bolts, Nuts, and Washers: ASTM A325 or ASTM A490 galvanized.
6. Welding Materials: AWS D1.1; type required for materials being welded.
7. Primer: SSPC Paint 20, Red Oxide.
8. Non-Shrink Grout: ASTM C1107; premixed compound, minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.
9. Form Z-purlins, galvanized, with manufacturer's standard acrylic coating.

C. Metal Roof Panels, RF-4:
1. Manufacturer and Product:
   a. Varco Pruden; SSR Standing Seam Roof.
   b. Comparable product submitted and accepted prior to bidding.
2. Minimum Slope: System shall be capable of providing 1/4 inch per foot minimum slopes.
3. Panel Coverage: 24 inches.
4. Panel Height: 3 inches.
5. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.028-inch nominal thickness.
   a. Exterior Finish: Full-strength, 70 percent “Kynar 500” or “Hylar 5000” fluoropolymer (PVDF) coating.
   b. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.
   c. Color: As selected by Architect from manufacturer full range of custom options.
      1) Selection must meet solar reflectance index, SRI, values show in Performance Article of this Section.
6. Clips: Manufacturer standard, floating type to accommodate thermal movement; fabricated from zinc-coated (galvanized) steel, aluminum-zinc alloy-coated steel, or stainless-steel sheet.

D. Masonry Veneer: See Section 042000.

E. Hollow Metal Doors and Frames: See Section 081113 and 087100.

F. Insulation System:
1. Manufacturer and Product:
   a. Thermal Design; Simple Saver System.
   b. Comparable product submitted and accepted prior to bidding.
2. Thermal Performance:
   a. Roof Insulation R-Value: R-30 minimum.
   b. Wall Insulation R-Value: See Section 042000 and 072100 for masonry cavity wall insulation.
3. Insulation: ASTM C991, Type1, fiber glass blankets.
4. Steel Support Straps:
   a. Material: Galvanized steel, 100 ksi minimum, primed and painted.
   b. Dimensions: Manufacturer recommended, 1 inch minimum width.
   c. Spacing: Manufacturer recommended, 30 inches maximum.
   d. Color: Match adjacent fabric facing.

5. Fabric Facing:
    a. Manufacturer and Product:
        1) Thermal Design: Syseal FP.
        2) Comparable product submitted and accepted prior to bidding.
    b. Description: Woven reinforced polyethylene yarns coated on both sides with polyethylene film.
    c. Fire Performance: ASTM E84, Class A.
6. Thermal Break System: Manufacturer recommended system.

G. Roof Drainage Components:
1. Gutters: Factory fabricated gutter system with concealed anchor straps, gutter liner, fastenings with provisions for expansion and contraction compensation.
    a. Gutter: Size and profile per manufacturer's standard design.
2. Downspouts: Factory fabricated downspouts system with matching starter sections and elbows.
    a. Downspouts: Size and profile per manufacturer's standard design.
    b. Supports: Exposed straps, matching downspouts.
3. Same material and finish as adjacent material. Thickness as required for size of component to maintain shape.

2.3 ACCESSORIES

A. Provide all accessories including, but not limited to flashing and trim, vents, gutters, fascia, for a complete installation.
1. Provide manufacturer standard accessories of each type, unless otherwise indicated.

2.4 FABRICATION

A. Framing Fabrication:
1. Fabricate members per AISC Specification for plate, bar, tube, or rolled structural shapes.
2. Anchor Bolts: Formed with bent or straight shank, assembled with template for casting into concrete.
3. Provide framing for openings.

B. Metal Wall and Roof Panel Fabrication:
1. Roofing and Wall Panels: Profile, lapped edges unless otherwise indicated on Drawings.
2. Internal and External Corners: Same material thickness and finish as adjacent material, profile brake formed to required angles. Back brace mitered internal corners with inch thick sheet.
3. Flashings, Closure Pieces, Fascia, Infills, Caps, and Other Trim: Same material and finish as adjacent material, profile to suit system.
4. Fasteners: To maintain load requirements and weather tight installation, same finish as cladding, non-corrosive type.

2.5 FINISHING

A. Framing Members: Clean, prepare, and shop prime to SSPC Manual requirements.

B. Galvanizing for Nuts, Bolts and Washers: ASTM A153.

C. Exposed Coil-Coated Finish:
   1. Liquid Fluoropolymer Steel Sheet Coil Coatings: Three coat system; metallic finish, 70 percent PVDF resin by weight, minimum.
      a. Pencil Hardness, ASTM D3363, HB - H.
      b. Salt Spray Resistance, ASTM G85, 1,000 hours.
      c. Humidity Resistance, ASTM D2247, 1,000 hours.
   2. Color: Architect selected from manufacturer full range of custom options.
      a. Selection for roof panels must meet solar reflectance index, SRI, values show in Performance Article of this Section.

2.6 PERFORMANCE

A. Delegate metal building system design to licensed manufacturer Professional Engineer.
   1. Structural Steel: Follow AISC 360, Specification for Structural Steel Buildings, for design requirements and allowable stresses.
   2. Cold-Formed Steel: Follow AISI, North American Specification for the Design of Cold-Formed Steel Structural Members, for design requirements and allowable stresses.

B. Structural Design Criteria: See Structural Drawings.
   1. Metal panel assemblies shall withstand the effects of gravity loads and loads and stresses within limits and under conditions indicated according to ASTM E1592.

C. Structural Loads: See Drawings and Applicable code compliant.

D. Allowable Deflection: 1/360, maximum.
   1. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
   2. Review anticipated deflection with masonry contractor prior to start of work.

E. Seismic Movement: ASCE/SEI 7.

F. Wind Movement: See Structural Drawings.

G. Accessibility Requirements: Applicable provisions in Department of Justice publication 2010 ADA Standards for Accessible Design, ICC/ANSI A117.1, and state accessibility code.

H. Environmental Performance:
   1. Air Infiltration:

a. Metal Roof Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of roof area when tested according to ASTM E1680 at negative test-pressure difference of 1.57 lbf/sq. ft.

2. Water Penetration:
   a. Metal Roof Panels: No water penetration when tested according to ASTM E1646 at test-pressure difference of 2.86 lbf/sq. ft.
3. Thermal Transmission:
   a. Metal Roof Panel Assemblies: R-30 minimum.
   b. Metal Wall Panel Assemblies: See Drawings.
4. Expansion and Contraction: Withstand 120 degree F ambient and 180 degree F surface thermal cycling without failure.

I. Solar Reflectance Index for Roof Panels: Minimum of 82 initial, 64 for 3-year aged, when calculated according to ASTM E1980 based on testing identical products by a qualified testing agency.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position.

3.2 ERECTION - FRAMING

A. Follow AISC Specification.

B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing.

C. Set column base plates with non-shrink grout.

D. Do not field cut or alter structural members without approval of Architect.

E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.3 ERECTION - ROOFING SYSTEMS

A. Erect Z girts between structural steel rafter members.

B. Fasten roofing system to structural supports, aligned.

C. Locate end laps over supports. End laps minimum 2 inches. Place side laps over bearing.

D. Secure gutters and downspouts in place using concealed fasteners.

E. Install sealant and gaskets to prevent weather penetration.

3.4 INSTALLATION - WALL PANELS

A. Install wall panels per manufacturer written instructions.

B. Fasten cladding system to horizontal girts, aligned and plumb.

C. Locate end laps and side laps over supports.

D. Prepare locations for door and window openings.

E. Install sealant and gaskets to prevent weather penetration.

3.5 INSTALLATION - DOORS

A. Install doors and frames per ANSI/SDI A250.8.

B. Coordinate door frame and anchor installation with other adjacent work and with door hardware.

C. Tolerance: Diagonal distortion 1/8 inch measured diagonally.

D. Repair damaged zinc coatings. Follow ASTM A780, and touch up primer coating.

E. Seal door frames to adjacent partition construction. See Section 079200.

3.6 ERECTION TOLERANCES

A. Framing Members: 1/4 inch from level; 1/8 inch from plumb within distance of10 feet .

B. Siding and Roofing: 1/8 inch from indicated position per panel.

3.7 FIELD QUALITY CONTROL

A. Field Tests and Inspections: Owner will engage inspectors to perform tests and inspections and prepare reports. Allow inspectors access to work areas.
   1. Inspection of fabricators.
   2. Steel construction.
   3. Visually inspect all welds.
   4. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.

B. Failed Test Retest Cost: Contractor responsibility.

C. Do not use materials that fail tests and inspections.

D. Non-Conforming Work: Make corrections or replace, and re-test.

3.8 ADJUSTING

A. Adjust door for smooth and balanced door movement.

END OF SECTION

SECTION 144200

WHEELCHAIR LIFTS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Interior, unenclosed vertical wheelchair lift.

B. Principal Products:
   1. Wheelchair lifts.

C. Related Requirements:
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.

1.2 ACTION SUBMITTALS

A. Product Data: For each lift, including accessory devices.

B. Shop Drawings:
   1. Show assembly details, erection, and anchorage.
   2. Include wiring diagrams for power, control, and signal systems.
   3. Show complete layout and location of equipment, including required clearances and coordination with other adjacent affected construction.

C. Closeout Submittals:
   1. Maintenance data for Owner's maintenance manuals.
   2. Manufacturer warranties.

1.3 CLOSEOUT SUBMITTALS

A. Manufacturer warranties.

B. Maintenance data for Owner's maintenance manuals.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer original packaging. Handle products in accordance with manufacturer instructions. Protect finished surfaces with strippable film.

1.5 FIELD CONDITIONS

A. Except of testing and inspections, use of lift during construction is not permitted unless approved by the Owner.

1.6 WARRANTY

A. Manufacturer Warranty: 3-year extended product warranty against system operation failure, parts and workmanship.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Self-supporting manufactured platform lift system consisting of standard manufactured components, supports, braces, and connections.

2.2 WHEELCHAIR LIFTS - PORTABLE

A. Manufacturer and Product:
   1. Ascension Wheelchair Lifts; Protege.
   2. Comparable product submitted and accepted prior to bidding.

B. Product Characteristics:
   1. Lifting Capacity: 850 pounds.
   2. Lift Height: 42 inches, maximum.
   3. Platform Size: 36 inches by 54 inches.
   4. Platform Configuration: Straight through, front and rear openings.
   5. Landing Openings:
      a. Gates: Self closing.
      b. Gate Height: 42 inches.
      c. Gate Width: 42 inches.
      d. Platform Gate: Travels with platform and opens at lower landing.
      e. Upper Landing Gate: Installed at upper landing.
   6. Drive System: Chain hydraulic.
      a. Emergency Operation: manufacturer standard battery backup.
      b. Travel Speed: 5 fpm.
      c. Motor: 1/2 hp; 24 volts DC.
      d. Power Supply: 120 VAC single phase; 60 Hz on a dedicated 15-amp circuit.
      e. Control Circuits: 24 VDC.

2.3 SAFETY DEVICES

A. Safety Devices:
   1. Grounded electrical system.
   2. 24 VDC operating controls.

3. Constant pressure operating switches.
4. Emergency stop button at passenger control station.
5. Electro-mechanical interlock to prevent accidental opening of lower landing platform gate.
6. Gate switches to prevent platform movement if either platform gate is open.
7. Lift platform stop height sensor.
8. Under-platform safety pan that protects the area under the lift platform.
9. 44-inch high sidewalls and platform gates.
10. Unobstructed view through transparent sidewalls and platform gates.
11. Grab bar extending full length of inside wall.
12. Slip resistant surfaces on platform floor and dock plate.
13. Structural safety factors as specified in ASME A18.1.
14. Self-closing platform gates.
15. Alarm and lighted alarm switch on platform.

2.4 FINISHES

A. Exposed Surfaces: Manufacturer’s standard finishes.

2.5 ACCESSORIES

A. Accessories: Provide accessories supplied, required, or recommended by the manufacturer as necessary for a complete installation.

2.6 PERFORMANCE

A. General: Comply with applicable requirements of the ASME A18.1 - Safety Code for Elevators and Escalators, unless Authorities Having Jurisdiction stipulates more stringent requirements.

B. Accessibility Requirements: In addition to requirements of authorities having jurisdiction, provide installed products that conform to U.S. Access Board publication - Americans with Disabilities Act (ADA).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lift in accordance with ASME A18.1 and manufacturer's installation instructions.

3.2 FIELD QUALITY CONTROL

A. Acceptance Testing: Upon nominal completion of each lift installation, and before permitting use of lift, perform acceptance tests as required and recommended by the AHJ.

B. Verify satisfactory performances and operations of the following:
1. Starting, accelerating and decelerating, running, leveling, and stopping with full maximum load.

2. Door operation and closing pressure for compliance with ADA.
3. Car and equipment noise levels.
4. Door controls.

3.3 DEMONSTRATION

A. Instruct Owner's personnel in proper use, operations, and maintenance of wheelchair lifts.
   1. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies.
   2. Review content of maintenance manual.

END OF SECTION

SECTION 211300

WET PIPE SPRINKLER SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Fire-department connections.
4. Sprinklers.
5. Alarm devices.
6. Pressure gages.

B. General: Provide all materials and labor for the detailed design and installation of an automatic wet-pipe sprinkler system for the areas as shown on the design drawings.

C. All work shall be performed in accordance with these specifications and good engineering practice. No modifications to these specifications will be accepted without the expressed written approval of the Engineer. It is the Contractor's responsibility to document Engineer's approval of any such modifications prior to the execution of work.

D. Contractor shall field verify all information contained on the contract drawings and is responsible for the detailed design and installation of the system in accordance with these specifications.

E. It is intended that the work performed pursuant to these specifications be complete in every respect, resulting in a sprinkler system installed entirely in accordance with the applicable codes, standards, manufacturer's recommendations and Underwriters Laboratories Inc. (ULI) listings.

F. It is further intended that upon completion of this work, the Owner be provided with:
1. Complete information and drawings describing and depicting the entire system as installed, including all information necessary for maintaining, troubleshooting, and/or expanding the system at a future date.
2. Complete documentation of system testing.
3. Certification that the entire system has been inspected and tested, is installed entirely in accordance with the applicable codes, standards, and manufacturer's recommendations, and is in proper working order. Contractor shall use "Contractor's Material and Test Certificate(s)" as required by NFPA 13.

G. Related work includes the following:
   1. Division 28 Sections, Fire Alarm System.

1.2 SYSTEM DESCRIPTION

A. The building areas shall be protected by a wet-pipe sprinkler system throughout. Pressure available at the service main is indicated on the cover sheet.

B. Provide and install all components necessary for the automatic sprinkler systems.

C. Alarms and Wiring: Provide new water-flow switches at each floor zone control valve as shown on the plans. These devices shall be connected to the fire alarm system by the electrical contractor.

D. Drains: Contractor shall provide auxiliary “low point” drains, as necessary. These drains shall be routed to the drain riser, and in some cases janitor’s sinks and Mechanical Rooms as shown on the plans.

E. Submittals: Prepare and submit shop drawings, product data sheets, calculations, record drawings and other submittals required herein.

F. System Tests: Test the new sprinkler system zones. The Sprinkler Contractor shall also attend all fire alarm tests to aid in testing sprinkler system monitoring devices. The Contractor shall be responsible for carrying out required tests in accordance with NFPA 13. Separate tests may be required by the Engineer and Authorities Having Jurisdiction. Complete system pressure tests shall be performed.

G. Warranty: Warranty all new equipment and systems during installation and for a one (1) year period after the final acceptance test.

H. Approvals: Obtain all approvals required for the work of this section from all public authorities having jurisdiction, from the project insurer, and from the Engineer.

I. Coordination: Coordinate work with other trades working on the project.

1.3 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

B. Delegated Design: Sprinkler contractor shall design the sprinkler system, size all piping, provide adequate coverage, and provide hydraulic calculations of the system for permit. The calculations shall include comprehensive engineering analysis by a qualified professional engineer licensed in the state of Pennsylvania, using performance requirements, flow test information collected by the Contractor, and design criteria indicated.

1. Available fire-hydrant flow test records are indicated on the fire protection cover sheet. The sprinkler contractor shall request and pay for new water main flow test if the data is greater than one year old from the time of execution of this contract.

2. The sprinkler contract drawings are diagrammatic in nature and do not include all information for a fully functional fire protection system. Pipe sizes are only indicated for general information and must be selected by the contractor based on hydraulic calculation data. A general sprinkler head layout is shown in the contract, but may not include all heads required. The contractor is to include 5% more sprinkler heads in the bid than what is shown on the plans.

C. Sprinkler system delegated design shall be approved by authorities having jurisdiction.

1. Margin of Safety for Available Water Flow and Pressure: 5 percent, including losses through water-service piping, valves, and backflow preventers.

D. Sprinkler Occupancy Hazard Classifications are indicated on the fire protection drawings, along with the corresponding sprinkler protection densities. Water flow and hose stream allowances per NFPA-13.

E. Minimum Standards: The stated densities and application areas are the minimum acceptable. The Contractor shall confirm densities and areas of application with local codes and local authorities as increases may be needed.

F. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13.

1.4 SUBMITTALS

A. Shop Drawings: The Contractor will be authorized to start each portion of the work when the shop drawings, catalog cuts and calculations for that portion of the work are received, reviewed and approved by the Engineer and AHJ. It is recommended to provide shop drawings to the engineer for approval prior to submitting for permit to avoid having to change the permit set based on Engineer's comments. Calculations to support seismic restraint designs are required with the shop drawings. Installation prior to these approvals shall be at the risk of the Contractor.

1. Shop drawings shall show all of the information required by NFPA 13 for working plans and shall include drawings showing the location of all equipment, hangers, piping, sprinklers, and drains. The drawings shall also show: locations of all seismic bracing and of flexible couplings installed as flexure joints, and location and diameter of all necessary core drills, pipe sleeves and pipe clearance openings in walls and floors.
2. A drawing legend sheet identifying:
    a. All symbols used on the drawings, by type of device or equipment, manufacturer and manufacturer's part number. This information shall correspond to the manufacturer's catalog data sheets and installation manuals.

b. All conventions, abbreviations and specialized terminology used on the drawings, as necessary to understand and interpret the information contained therein.
c. A complete drawing list identifying all drawings in the shop drawing package by title, drawing number and Specification cross reference.

3. Architectural floor plan drawings, drawn to 1/8-inch scale or larger (i.e., 1/4-inch, etc.). All drawings and diagrams shall be prepared on drawing sheets of uniform size, 30 by 42 inches minimum. Floor plan drawings required for this submittal may be generated using the bid drawings as backgrounds. These drawings shall show:
   a. North arrow.
   b. Graphical scale indicator.
   c. Drawing keyplan.
   d. Locations of all fire protection devices, equipment, and risers.

B. Coordination Drawings: Provide 3D coordinated fire protection shop drawings showing all piping on the same sheet, at the correct elevations in the model. Show all sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved. Prepare one set of coordination drawings for this project which includes the following:

1. Domestic water piping.
2. HVAC hydronic piping.
3. Ductwork
4. Items penetrating finished ceiling including the following:

   a. Lighting fixtures.
   b. Air outlets and inlets.

C. Product Data: The Contractor shall submit a product data submittal with the shop drawings showing the type and model of all equipment or material proposed. This information shall include type of pipe or tube, hangers, seismic bracing, valves, pipe fittings/joining methods, sprinklers, escutcheons, fire stopping materials, and signage. When a Data Sheet shows more than one product, the specific proposed product shall be clearly indicated by arrows or other suitable means.

D. Hydraulic Calculations: The contractor's engineer, licensed in Pennsylvania, shall provide hydraulic calculations to show that the pipe sizes provided will produce adequate performance. Include the results of the new water main flow test in the hydraulic calculation documents.

E. Four (4) sets of shop drawings, product data sheets, and hydraulic calculations as described in parts C, D, and E shall be submitted to the Engineer for review. Only complete submittals containing all required information for all work required in this section will be reviewed.

F. All shop drawings shall be prepared by a NICET Certified Level IV Automatic Sprinkler System Engineering Technician or a registered Engineer. An Engineer licensed in Pennsylvania shall sign and stamp each drawing in the drawing title block indicating and confirming completion of review of the drawings.

G. Samples: Within 15 days of authorization to proceed, the Contractor shall submit to the Architect for approval samples of all types of proposed sprinklers, including types of finishes available and a complete list of where each type and finish will be installed.

H. Certificates: The Contractor shall provide the Engineer with one copy of all documents that are reviewed and approved by the local code authorities. These documents shall include, but not be limited to, the following:
   1. Site inspection forms
   2. Permit drawings
   3. Final inspection forms

I. All documents shall include all required approval stamps, signatures or other information necessary to properly certify that the installation has been reviewed and accepted by the Authority Having Jurisdiction.

J. Operation and Maintenance Manual: The Contractor shall provide the Owner with a loose-leaf manual containing, electronic format:
   1. 11" x 17" reduced copies of the record drawings required below.
   2. Manufacturer's catalog data sheets and installation manuals.
   3. Copy of NFPA 25.
   4. Copy of all test certificates and approvals.
   5. A list of recommended spare parts.
   6. Service directory, including a list of individual's names and telephone numbers to obtain service on the system, including emergency service as required elsewhere in these Specifications.

K. Draft O&M Manual: Within sixty (60) days of authorization to proceed, the Contractor shall submit to the Owner three (3) copies of the draft manual for approval (excluding test certificates and drawings). The draft manual will be reviewed for required content and approved or disapproved on that basis. Upon completion of the project, the Contractor shall revise the approved, preliminary manual to be consistent with the system as installed and specifically to coordinate the inspection, testing and maintenance schedule with the approved Contractor testing protocols and with the fire protection device numbers indicated on the Contractor's record drawings.

L. Final O&M Manual: Within 30 days of the completion of the work, three (3) copies of the approved manual with reduced drawings and test certificates shall be delivered to the Owner.

M. Record Drawings: The Contractor shall provide and maintain on the site an up-to-date record set of approved shop drawing prints which shall be marked to show each and every change made to the sprinkler system from the original approved shop drawings. This shall not be construed as authorization to deviate from or make changes to the shop drawings approved by the Engineer without written instruction from the Engineer in each case. This set of drawings shall be used only as a record set. These drawings shall be maintained in a current condition at

all times and shall be made available for review immediately upon request during normal working hours.

N. If the Contractor's submittals, upon review by the Engineer, do not conform to the requirements of these specifications, the Contractor shall be required to resubmit with modifications, within ten (10) working days of receipt of the Engineer's notification to the Contractor. The Contractor shall be responsible for the Engineer's extra expenses for subsequent review of rejected submittals necessitated by the Contractor's failure to make the requested modifications.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

1.6 QUALITY ASSURANCE

A. NFPA Standards: All work shall conform to the requirements of the applicable portions of the National Fire Protection Association (NFPA) Standards and Recommended Practices listed herein.

1. NFPA 1, “Fire Code”
2. NFPA 13, “Standard for the Installation of Sprinkler Systems”
3. NFPA 24, “Standard for the Installation of Private Fire Service mains and Their Apputenances.
4. NFPA 25, “Standard for the Inspection, Testing, and Maintenance of Water Based Fire Protection Systems,"
5. NFPA 101, “Life Safety Code”

B. Governmental Jurisdiction: All work and materials shall conform to all Federal, State, and local codes and regulations governing this installation including the the current Fire Code, as modified or interpreted by the Authority Having Jurisdiction.

C. Code Conflicts: If there is a conflict between the referenced NFPA Standards, Federal, State or local codes and this specification, it shall be the Contractor's responsibility to bring the conflict to the attention of the Engineer for resolution. The contractor shall not attempt to resolve code conflicts with the local authority, independent of the Engineer.

D. Equipment: All devices, systems, equipment and materials furnished and installed shall be new and shall be of types or models approved by the AHJ, and listed by UL for use in systems and occupancies of this type.

E. All grooved fire protection components (including couplings, fittings, valves, and accessories) shall be supplied by a single manufacturer and shall be UL listed. Grooving tools shall be of the manufacturer as the grooved components.

F. Contractor Requirements: The Contractor shall:
   1. Hold all licenses and obtain all permits necessary to perform work of this type. Copies of the Contractor's licenses shall be provided with the bid submittal.
   2. Have at least five (5) years of experience in installation of systems of this type and be familiar with all applicable local, state and Federal laws and regulations.
   3. Be regularly engaged in the design, installation, testing and servicing of automatic sprinkler systems.
   4. Provide a job site supervisor who is to be present at all times when work is actively in progress.

1.7 DELIVERY, STORAGE AND HANDLING

A. The Contractor shall be responsible for all receiving, handling, and storage of his materials at the job site. Use of loading docks, service driveways, and freight elevators shall be coordinated with the Owner.

B. Overnight storage of materials is limited to the assigned storage area. Materials brought to the work area shall be installed the same day, or returned to the assigned storage area unless previously approved by the Owner.

C. The Contractor shall remove rubbish and debris resulting from his work on a daily basis. Rubbish not removed by the Contractor will be removed by the Owner and back-charged to the Contractor.

D. Removal of debris and rubbish from the premises shall be coordinated with the Architect.

1.8 PROJECT CONDITIONS

A. The building will not be occupied during the construction.

1.9 WARRANTY

A. Warranty: The Contractor shall guarantee all materials and workmanship for a period of one (1) year beginning with the date of final acceptance by the Engineer in accordance with Section 1.4 Submittals. The Contractor shall be responsible during the design, installation, testing and

guarantee periods for any damage caused by him (or his subcontractors') or by defects in his (or his subcontractors') work, materials, or equipment.

B. Emergency Service: During the installation and warranty period, the Contractor shall provide emergency repair service for the sprinkler system within four (4) hours of a request by the Owner for such service. This service shall be provided on a 24-hour per day, seven (7) days per week basis.

1.10 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. All equipment and system components furnished and installed shall be new and of first quality, and be listed by Underwriters Laboratories Inc. (UL), for their intended use. All such equipment and system components shall be installed within the limitations of the respective UL listings.

2.2 PIPE AND FITTINGS - GENERAL

A. Pressure ratings: Pressure ratings of all fittings shall meet or exceed maximum working pressures available within the system.

B. Corrosion protection: All piping and hangers where exposed to the weather or installed in a corrosive atmosphere shall be protected against corrosion.

C. Strap hooks, snap hooks, U-bolt, or single bolt fittings (or equivalent) are not permitted.

D. Plain end fittings with mechanical couplings and fittings that use steel gripping devices to bite into the pipe are prohibited.

E. Make changes in pipe sizes through tapered reducing pipe fittings. Bushings are not permitted.

2.3 PIPING COMPONENTS

A. Indoor Pipe Sizes 2-1/2 inches and larger shall be Schedule 40 Pipe meeting ASTM A-53, A-135 or A-795 requirements with mechanical grooved pipe couplings and fittings for roll grooved pipe sizes 2½ inches and larger.

1. Pressure Rating: 175 psig minimum.

B. Indoor Pipe Sizes 2-inches and smaller shall be ASTM A 795, Weight Class STD (Standard), Schedule 40, Type E or Type S, Grade A, steel pipe with threaded end connections. Fittings shall be ASME B16.39, Class 150, threaded fittings. Unions shall be ASME B16.39, Class 150, unions.

1. Pressure Rating: 175 psig minimum.

C. Underground Pipe All Sizes: Standard Weight Schedule 40, Galvanized-Steel Pipe: ASTM A 53/A 53M, Type E. Pipe ends may be factory or field formed to match joining method.

D. Piping shall have manufacturer's name and standard marked on each length.

E. Grooved-Joint, Steel-Pipe Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anvil International, Inc.
b. Shurjoint Piping Products.
c. Tyco Fire & Building Products LP.
d. Victaulic Company.

2. Pressure Rating: 175 psig minimum.
3. Grooved-End Fittings for Steel Piping: ASTM A 536, FireLock® or standard ductile-iron casting; ASTM A 234 forged steel; or ASTM A 53 fabricated from carbon steel pipe with dimensions matching steel pipe and grooves designed to accept Victaulic couplings.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-synthetic rubber gasket, and bolts and nuts.
   a. Rigid Type: Housings shall be cast with offsetting, angle-pattern bolt pads to provide system rigidity and support and hanging in accordance with NFPA 13. Tongue and recess rigid type couplings shall only be permitted if a torque wrench is used for installation. Required torque shall be in accordance with the manufacturer's current listed standards.
      1) 2-1/2" through 4": "Installation Ready" rigid joints, designed for direct "stab" installation onto grooved end pipe without prior disassembly of the coupling. Victaulic FireLock® EZ Style 009H.
      2) 5" and Larger: Standard rigid joints equal to Victaulic FireLock® Style 005 or Style 07 Zero-Flex®.

b. Flexible Type: Use in seismic areas where required by NFPA 13.
   1) 2" through 8": "Installation Ready" flexible joints, designed for direct "stab" installation onto grooved end pipe without prior disassembly of the coupling. Victaulic Style 177 QuickVic™.

c. Gaskets for grooved-end-pipe couplings shall be listed for use with the housings as follows:

Fire Protection Service	Temperature Range	Gasket Recommendation
Water/Wet Systems	Ambient	C-Shape or EZ Style 009H design Grade EPDM, Type A

5. Grooved-End-Pipe Flange Adapters: AWWA C606 and UL 213, ASTM A536, ductile-iron casting, flat faced, for mating directly to ANSI Class 125 and 150 flanged components. Victaulic Style 741 or 744.

F. Underground pipe fittings: Galvanized, Steel Couplings: ASTM A 865, threaded or grooved type.

G. Pipe Hangers and Supports: Pipe hangers and support shall be listed in the UL Fire Protection Directory, and FM Global Approval Guide and shall be the adjustable type. Hanger materials shall match piping material as required for dielectric isolation and shall meet ASTM B633, SC1 and SC3. They shall be according to the manufacturers listing. Mixing of components between manufacturers is not permitted.

H. Hanger rods shall be minimum 3/8-inch thickness. Spacing of hangers shall be in accordance with NFPA 13.

2.4 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Globe Fire Sprinkler Corporation.
   2. Reliable Automatic Sprinkler Co., Inc.
   3. Tyco Fire & Building Products LP.
   4. Victaulic Company.
   5. Viking Corporation.

B. General Requirements:

   1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
   2. Pressure Rating for Automatic Sprinklers: 175 psig minimum.

C. Automatic Sprinklers with Heat-Responsive Element:
   1. Nonresidential Applications: UL 199.

2. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.
3. Die-cast brass frame, Teflon encapsulated Belleville spring seal and frangible glass bulb. Body cast with hex shaped wrench boss. (Sprinklers shall not contain O-rings.) Quick response type.

D. Final Selection: The Architect will select finishes for all automatic sprinklers and escutcheons from samples of available finishes supplied by Contractor.

E. Uniformity: All sprinklers within a space shall be from the same manufacturer and have the same heat response element, including temperature rating and response characteristics.

F. Sprinkler Escutcheons: Escutcheons shall be metal and be listed with the sprinklers for recessed sprinkler locations. Provide finish as follows:

1. Ceiling Mounting: Chrome-plated steel, one piece, flat.
2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

G. All sprinklers in finished areas shall be center of tile plus or minus 2 inches, unless approved by the Architect.

H. Sprinkler Guards, where indicated on the fire protection contract drawings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Reliable Automatic Sprinkler Co., Inc.
b. Tyco Fire & Building Products LP.
c. Victaulic Company.
d. Viking Corporation.

2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.
4. Sprinkler guards shall be listed, supplied, and approved for use with the sprinkler, by the sprinkler manufacturer.

2.5 VALVES

A. All control valves shall be equipped with a port to monitor the street side of the system. Sprinkler system control and drain valves shall be the following types:
1. O.S&Y gate valves by Victaulic or Kennedy.
2. Butterfly valves by Victaulic or Kennedy that are approved for use in sprinkler systems.

B. Listing: All valves must be UL listed or FM approved for their intended use.

C. Pressure Ratings: Pressure ratings of all valves shall meet or exceed maximum working pressures available within the system.

D. Supervision: All control valves shall be electrically supervised with a tamper switch.

E. Provide permanent valve tags (metal) on each valve. Each valve tag shall state the valve ID and system it controls.

F. Access Panels: Provide and install access panels (minimum size 12-inches by 12-inches) for all control valves located above finished ceilings or concealed in walls. Architect will select finish of access panels. Access panels installed in fire resistive construction shall be of the types required for maintaining proper protection of assembly.

2.6 SUPERVISORY AND ALARM EQUIPMENT

A. All waterflow and valve supervisory switches shall be by Potter or approved equal and furnished, installed and properly adjusted by the sprinkler contractor. Alarm monitoring, and associated programming, of these devices will be by others.

B. Contacts: All waterflow and valve supervisory switches shall be provided with two "Form C" (S.P.D.T.) contacts for monitoring. Specific contact rating shall be coordinated with the existing fire alarm system manufacturer.

C. Waterflow Switches: A vane-type waterflow indicator shall be provided to indicate waterflow in each new sprinkler system zone.

D. Supervisory Switches: Valve supervisory switches, shall be provided for all valves controlling the water supply to the sprinkler system under this contract.

E. Loop Type Switches: Valve supervisory switches shall be the yoke mounted or integral type. Contractor shall not use remote mounted, wire loop type switches.

2.7 INSPECTOR'S TEST AND DRAIN ASSEMBLY

A. An inspector's test and drain assembly(s) shall be provided at the zone valve. The assembly shall be provided with a sight glass to observe discharge.

B. Inspector's test and drain assemblies shall comply with the requirements of NFPA 13. All components of test and drain assemblies shall be ULI listed or FM approved.

2.8 FIRE-DEPARTMENT CONNECTIONS

A. Flush-Type, Fire-Department Connection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Elkhart Brass Mfg. Company, Inc.
   b. GMR International Equipment Corporation.
   c. Guardian Fire Equipment, Inc.
   d. Potter Roemer.

2. Standard: UL 405.
3. Type: Flush, for wall mounting.
4. Pressure Rating: 175 psig minimum.
5. Body Material: Corrosion-resistant metal.
6. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
7. Caps: Brass, lugged type, with gasket and chain.
8. Escutcheon Plate: Rectangular, brass, wall type.
9. Outlet: With pipe threads.
10. Body Style: Horizontal.
11. Number of Inlets: Two.
12. Outlet Location: Back.
13. Escutcheon Plate Marking: Similar to "AUTO SPKR & STANDPIPE" or "AUTO SPKR." See drawings.
14. Finish: Polished chrome plated.
15. Outlet Size: NPS 4.

B. Yard-Type, Fire-Department Connection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Elkhart Brass Mfg. Company, Inc.
   b. Fire-End & Croker Corporation.
   c. Fire Protection Products, Inc.
   d. GMR International Equipment Corporation.
   e. Guardian Fire Equipment, Inc.

2. Standard: UL 405.
3. Type: Exposed, freestanding.
4. Pressure Rating: 175 psig minimum.
5. Body Material: Corrosion-resistant metal.
6. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
7. Caps: Brass, lugged type, with gasket and chain.
8. Escutcheon Plate: Round, brass, floor type.
9. Outlet: Bottom, with pipe threads.

10. Number of Inlets: Two.
11. Escutcheon Plate Marking: Similar to "AUTO SPKR & STANDPIPE" or "AUTO SPKR." See drawings.
12. Finish: Polished chrome plated.
13. Outlet Size: NPS 4.

2.9 SPRINKLER SPECIALTY PIPE FITTINGS

A. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anvil International, Inc.
    b. Shurjoint Piping Products.
    c. Tyco Fire & Building Products LP.
    d. Victaulic Company.

2. Standard: UL 213.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-T and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved or threaded.
9. Design Basis: Victaulic Style 920/920N Mechanical-T.

B. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AGF Manufacturing Inc.
    b. Reliable Automatic Sprinkler Co., Inc.
    c. Tyco Fire & Building Products LP.
    d. Victaulic Company.

2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Cast- or ductile-iron or bronze housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded or grooved.

7. Design Basis: Victaulic Style 720 TestMaster™ II.

2.10 PRESSURE GAGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AMETEK; U.S. Gauge Division.
2. Ashcroft, Inc.
3. Brecco Corporation.
4. WIKA Instrument Corporation.

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gauge Range: 0 to 250 psig minimum.

E. Water System Piping Gage: Include "WATER" label on dial face.

2.11 IDENTIFICATION SIGNS

A. Contractor shall furnish and install FDC signage, and hydraulic calculation signs for each new sprinkler zone, to be installed in the mechanical room where the water service enters the building.

B. Required Information: Hydraulic calculation signs shall include all information indicated in Figure A-24.5 of Appendix A, NFPA 13. Valve identification signs shall identify the function of the valve and the area served.

C. Description: Signs shall be rigid, flat steel or aluminum plaques with embossed enamel background and lettering. Signs shall be secured by chain or durable wire to each sprinkler zone control valve, or in an obvious location specifically approved by the Engineer.

2.12 MISCELLANEOUS PRODUCTS

A. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve

seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

PART 3 - EXECUTION

3.1 PREPARATION AND EXAMINATION

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article. Report test results promptly and in writing.

B. It shall be the Contractor's responsibility to inspect the drawings and become familiar with the conditions under which the work will be performed.

C. Working Hours: All work is to be conducted during normal working hours.

D. Cooperation with other trades: The sprinkler Contractor shall coordinate with the work of the other trades towards the general purpose of having the construction progress as rapidly and as smoothly as possible with a minimum of interference between trades.

E. Approval prior to installation: No work shall commence prior to approval of shop drawings by the Engineer. Any change in work which has been installed prior to approval of the shop drawings shall be made without additional compensation to the Contractor.

3.2 INSTALLATION

A. Aesthetics shall be a primary consideration when installing sprinklers and sprinkler piping. Any facet of sprinkler installation that does not meet with the Architect's approval shall be revised by the Contractor to the Architect's satisfaction.

B. Holes: All holes made by the Contractor in any wall, ceiling, or floor shall be patched by the Contractor, restoring the wall, ceiling, floor or member to its original condition, fire resistance and integrity using UL approved fire-stopping materials and systems.

C. General Locations: Location of all equipment, controls, piping, valves and drains shall be subject to Engineer's approval if different than the contract documents.

D. Special Installation Instructions: All sprinklers and equipment shall be installed in accordance with manufacturer's instructions. All special tools recommended by the manufacturer shall be used.

E. Deflector Distances: Sprinklers permanently installed shall be installed with the deflector to ceiling distances in accordance with NFPA 13.

3.3 PIPING

A. All piping passing through walls and floors shall be provided with metal pipe sleeves. Penetrations through floors in mechanical rooms and other rooms subject to wet conditions shall extend 2" above the floor slab.

B. Escutcheon Plates: All exposed pipe which passes through a wall, ceiling, or floor shall be provided with escutcheon plates.

C. Minimum Height: All exposed piping and devices shall be installed as high as possible, but no less than 7-feet 0-inches above the finished floor in traffic or working areas, and so as not to obstruct any portion of a window, doorway, stairway or passageway, and shall not interfere with the operation or accessibility of any mechanical, plumbing or electrical equipment.

D. Protection: The Contractor shall provide adequate permanent protection for any installed piping, valves, devices or accessories which are subject to physical damage or may be hazards.

E. Firestopping: Pipe which passes through fire-resistive barriers (including shaft walls) shall be sleeved and grouted or sealed using UL approved firestopping materials and systems to maintain the integrity and rating of the fire resistive barrier.

F. Testing: All piping is to be flushed and hydraulically tested prior to acceptance by Engineer. Flushing and testing must be performed in accordance with NFPA 24 standards. The contractor shall provide the calculations for permitted underground leakage (if applicable). Piping is not permitted to lose any pressure during the tests.

G. Contractor shall provide all equipment necessary for testing and flushing and any special equipment required for the installation of any portion of the specification and drawings. The contractor is also responsible for removing all same equipment at the end of the job.

H. All piping 2-1/2" and larger shall be provided with labels at 20-foot intervals indicating sprinkler system piping.

3.4 SYSTEM DRAIN CONNECTIONs

A. The sprinkler subcontractor shall provide all low-point drain connections as required by NFPA 13. Drain discharge shall be coordinated.

3.5 FLUSHING AND SANITIZATION

A. All equipment and materials prior to installation shall be clean inside and outside. All waste material such as chips, filings, welding stubs, dirt, rags, debris, and any other foreign material shall be removed from the components before assembly. All pipe coupons or punched holes shall be attached to the pipe near the pipe hole. Caps shall be located over openings even during

and after assembly to prevent foreign material from entering the pipe at any time. For example pipe caps should be provided on all sprinkler extensions even when pipe is roughed in and sprinklers are not yet installed.

B. After installation, the entire piping system shall be flushed with clean water to remove all dirt and debris- either in sections or entirety. Each section shall be flushed to its terminal outlet, valve or connection in accordance with NFPA 24.

C. For all systems the flushing operations shall be continued for a sufficient time to ensure thorough cleaning, but not less than 10 minutes. When planning flushing (and all discharge testing for that matter), safe disposal of the water is the Contractor's responsibility.

3.6 SEISMIC CONSIDERATIONS

A. Sprinkler piping on any floor level may cross building structural separations such as expansion and seismic joints, provided that the piping is specifically designed with flexible connections at each crossing and able to accommodate the calculated differential motions during an earthquake, but not less than a minimum of 4-inches. All required structural, differential movement and drift calculations shall be prepared by a licensed structural engineer possessing current registration. (Contractor shall verify locations of seismic joints.)

B. Seismic bracing shall be provided for all new piping in accordance with NFPA 13.

3.7 SWAY BRACING, FLEXIBLE COUPLINGS, HANGERS

A. All flexible couplings, hangers and sway bracing shall be designed and installed as required by NFPA 13 (including all appendices). Flexibility, internal pressure, and differential movement between the piping and building, earth, or other supporting structure(s) shall be allowed for, so that no allowable stress is exceeded in any member.

3.8 TRAINING

A. The Contractor shall conduct one (1) training session of four (4) hours to familiarize the building personnel with the features, operation and maintenance of the sprinkler systems. Training sessions shall be scheduled by the Owner at a time mutually agreeable to the Contractor and Owner.

B. Agenda: The Contractor shall submit a proposed training agenda for the Owner's review and approval within 60 days of authorization to proceed. The proposed training agenda shall include, but not be limited to, the following:
   1. Overview of system operation.
   2. Overview of system equipment and device locations.
   3. Detailed operation guidelines.

4. Detailed maintenance procedures.
5. Periodic testing procedures.

C. Final Agenda: The Contractor shall submit the final approved training agenda 14 days prior to the first training session.

3.9 PRE-ACCEPTANCE TEST

A. Prepare and submit one (1) complete “Pre-Acceptance Documentation” submittal packages to the Engineer a minimum of five (5) business days prior to pre-acceptance test date. See Part 1 “Submittals” for submittal content.

B. The system is to be ready for testing prior to scheduling a test with the local enforcement agency. A pre-test is to be conducted prior to scheduling the official test for approval. Pre-Acceptance Test: Coordinate with fire alarm pre-acceptance tests, operate as required.
   1. Use the NFPA 13 "Contractor's Material and Test Certificate for Aboveground Piping" to document the waterflow switch activation times and other functional test results. Obtain dated signature from Owner’s designee for each test. Tests that are not witnessed must be repeated. Use common form for each zone that indicates results of previous hydrostatic testing and fire alarm functional tests.

C. Coordinate rescheduled testing where unsatisfactory results cannot be resolved such that testing can be completed during business hours on the scheduled day.

3.10 FINAL INSPECTION AND TEST

A. The Contractor shall make arrangements with the Engineer for final inspection and witnessing of the final acceptance tests. A representative of the owner shall be present for the hydrostatic and acceptance tests of the system, and the local Fire Subcode Inspector.

B. Required Tests: All tests and inspections required by the referenced Codes and Standards shall be performed by the Contractor under this scope of work. The contractor will be responsible for the acceptance test for the local enforcing agency, and for any remedial work and re-testing required. Contractor is responsible for draining systems as needed for test and repair, and for recharging system so they are left in operating condition. Hydraulic place cards shall be installed at main sprinkler riser prior to acceptance testing.
   1. When local code authorities are required to witness tests, the Contractor shall be responsible for making all necessary arrangements with the code authorities and coordinating the work.
   2. The Contractor shall be responsible for obtaining all test documents with necessary approval stamps and signatures of the code authorities. The Contractor shall submit one copy of each of these documents to the Engineer.

C. Acceptance Testing: Upon completion of the installation, perform and document on an approved format, system tests as described herein.
   1. Hydrostatic tests
   2. Flushing of piping
   3. Test of sprinkler supervisory system

D. Notice: Contractor shall provide at least five (5) working days notice for all tests.

E. Final Approval: Final approval and acceptance of the work will be given by the Architect when:
   1. The completed sprinkler systems have been inspected, tested and approved by the Authority Having Jurisdiction.
   2. Required submittals, system operation and maintenance manuals, record drawings, spare parts, special tools and training have been provided to, reviewed, and accepted by the Engineer.
   3. Written certification is submitted that states all equipment has been inspected and tested by a manufacturer's certified representative.
   4. Written certification is submitted that states all equipment is installed in accordance with the manufacturer's recommendations.

F. The Engineer will visit the job site to observe the work and witness the final acceptance tests after the Contractor has confirmed that the work is complete and ready to test. If the work has not been completed or the test is unsatisfactory, the Contractor shall be responsible for the Engineer's extra expenses for reinspection and witnessing the retesting of the work.

G. Additional Tests: Any additional tests, required by the referenced codes, standards or criteria, AHJ, or by the Engineer, shall be performed. This documentation shall include:
   1. The date and time of each test.
   2. A reference set of contractor record drawings, numerically identifying the individual components and circuits tested, test locations, and indicating the measured sound level in each corridor and guest room location.
   3. A description of each test performed.
   4. A checklist of each device tested, indicating the results of each test.
   5. The names and signatures of the individuals conducting and witnessing each test.

3.11 PIPING SCHEDULE

A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

B. Sprinkler specialty fittings may be used, downstream of control vales, instead of specified fittings.

C. Wet-pipe sprinkler system, NPS 2 and smaller, shall be the following:

1. Standard-weight Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

D. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 to NPS 8, shall be one of the following:

1. Standard-weight Schedule 40, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.12 SPRINKLER SCHEDULE

A. Use sprinkler types as indicated in the fire protection contract drawings. Use subparagraphs below when not indicated or unclear:

1. Rooms without Ceilings: Upright sprinklers.
2. Rooms with Suspended Ceilings: Recessed, flush, or concealed sprinklers as indicated in the drawings.

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
2. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
3. Upright and Pendent Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view.

END OF SECTION 21 13 00

SECTION 213113

ELECTRIC-DRIVE CENTRIFUGAL FIRE PUMPS

SECTION 213113 - ELECTRIC-DRIVE, CENTRIFUGAL FIRE PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. **In-line** fire pumps.
2. Fire-pump accessories and specialties.

1.3 PERFORMANCE REQUIREMENTS

A. Pump Equipment, Accessory, and Specialty Pressure Rating: 175 psig minimum unless higher pressure rating is indicated.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, performance curves, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For fire pumps, motor drivers, and fire-pump accessories and specialties. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Certificates: The Contractor shall provide the Engineer with one copy of all documents that are reviewed and approved by the local code authorities. These documents shall include, but not be limited to, the following:
   1. Site inspection forms
   2. Permit drawings
   3. Final inspection forms

D. All documents shall include all required approval stamps, signatures or other information necessary to properly certify that the installation has been reviewed and accepted by the Authority Having Jurisdiction.

E. Operation and Maintenance Manual: The Contractor shall provide the Owner with a loose-leaf manual containing, electronic format:
   1. 11" x 17" reduced copies of the installation drawings.
   2. Manufacturer's catalog data sheets and installation manuals.
   3. Copy of all test certificates and approvals.
   4. A list of recommended spare parts.
   5. Service directory, including a list of individual's names and telephone numbers to obtain service on the system, including emergency service as required elsewhere in these Specifications.

F. Draft O&M Manual: Within sixty (60) days of authorization to proceed, the Contractor shall submit to the Owner three (3) copies of the draft manual for approval (excluding test certificates and drawings). The draft manual will be reviewed for required content and approved or disapproved on that basis. Upon completion of the project, the Contractor shall revise the approved, preliminary manual to be consistent with the system as installed and specifically to coordinate the inspection, testing and maintenance schedule with the approved Contractor testing protocols and with the fire protection device numbers indicated on the Contractor's record drawings.

G. Final O&M Manual: Within 30 days of the completion of the work, three (3) copies of the approved manual with reduced drawings and test certificates shall be delivered to the Owner.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NFPA Compliance: Comply with NFPA 20, "Installation of Stationary Pumps for Fire Protection."

1.6 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR CENTRIFUGAL FIRE PUMPS

A. Description: Factory-assembled and -tested fire-pump and driver unit.

B. Finish: Red paint applied to factory-assembled and -tested unit before shipping.

2.2 END-SUCTION FIRE PUMPS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. A-C Fire Pump Systems; a business of ITT Industries.
2. Corcoran Piping System Co.
3. Patterson Pump Company; a subsidiary of the Gorman-Rupp Company.
4. Peerless Pump, Inc.
5. S.A. Armstrong Limited.
6. Aurora Pump.

B. Pump:

1. Standard: UL 448, for end-suction pumps for fire service.
2. Casing: Radially split case, cast iron with ASME B16.1 pipe-flange connections.
3. Impeller: Cast bronze, statically and dynamically balanced, and keyed to shaft.
4. Wear Rings: Replaceable bronze.
5. Shaft and Sleeve: Steel shaft with bronze sleeve.

    a. Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing.
    b. Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland.

6. Mounting: Pump and driver shafts are horizontal, with pump and driver on same base.

C. Coupling: Flexible and capable of absorbing torsional vibration and shaft misalignment. Include metal coupling guard.

D. Driver:

1. Standard: UL 1004A.
2. Type: Electric motor; NEMA MG 1, polyphase Design B.

2.3 IN-LINE FIRE PUMPS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. A-C Fire Pump Systems; a business of ITT Industries.
2. Corcoran Piping System Co.
3. Patterson Pump Company; a subsidiary of the Gorman-Rupp Company.
4. Peerless Pump, Inc.
5. Pentair Pump Group; Aurora Pump.
6. Pentair Pump Group; Fairbanks Morse.
7. Plad Equipment, Ltd.
8. Reddy-Buffaloes Pump Company.
9. S.A. Armstrong Limited.
10. Aurora Pump.

B. Pump:

1. Standard: UL 448, for in-line pumps for fire service.
2. Casing: Radially split case, cast iron with ASME B16.1 pipe-flange connections.
3. Impeller: Cast bronze, statically and dynamically balanced, and keyed to shaft.
4. Wear Rings: Replaceable bronze.
5. Shaft and Sleeve: Steel shaft with bronze sleeve.

    a. Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing.
    b. Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland.

6. Mounting: Pump and driver shaft is vertical, with motor above pump and pump on base.

C. Coupling: None or rigid.

D. Driver:

1. Standard: UL 1004A.
2. Type: Electric motor; NEMA MG 1, polyphase Design B.

2.4 FIRE-PUMP ACCESSORIES AND SPECIALTIES

A. Automatic Air-Release Valves: Comply with NFPA 20 for installation in fire-pump casing.

B. Relief Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. BERMAD Control Valves.
b. CLA-VAL Automatic Control Valves.
c. Kunkle Valve; a part of Tyco International Ltd.
d. OCV Control Valves.
e. Watts Regulator Company; a division of Watts Water Technologies, Inc.
f. Zurn Plumbing Products Group; Wilkins Water Control Products.
g. .

2. Description: UL 1478, bronze or cast iron, spring loaded; for installation in fire-suppression water-supply piping.

C. Inlet Fitting: Eccentric tapered reducer at pump suction inlet.

D. Outlet Fitting: Concentric tapered reducer at pump discharge outlet.

E. Hose Valve Manifold Assembly:

1. Standard: Comply with requirements in NFPA 20.
2. Header Pipe: ASTM A 53/A 53M, Schedule 40, galvanized steel with ends threaded according to ASME B1.20.1.
3. Header Pipe Fittings: ASME B16.4, galvanized cast-iron threaded fittings.
4. Automatic Drain Valve: UL 1726.
5. Manifold:

a. Test Connections: Comply with UL 405 except provide outlets without clappers instead of inlets.
b. Body: Flush type, brass or ductile iron, with number of outlets required by NFPA 20.
c. Nipples: ASTM A 53/A 53M, Schedule 40, galvanized-steel pipe with ends threaded according to ASME B1.20.1.
d. Adapters and Caps with Chain: Brass or bronze, with outlet threaded according to NFPA 1963 and matching local fire-department threads.
e. Escutcheon Plate: Brass or bronze; rectangular.
f. Exposed Parts Finish: Polished brass.
g. Escutcheon Plate Marking: Equivalent to "FIRE PUMP TEST."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine equipment bases and anchorage provisions, with Installer present, for compliance with requirements and for conditions affecting performance of fire pumps.

B. Examine roughing-in for fire-suppression piping systems to verify actual locations of piping connections before fire-pump installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Fire-Pump Installation Standard: Comply with NFPA 20 for installation of fire pumps, relief valves, and related components.

B. Equipment Mounting:

1. Install fire pumps on cast-in-place concrete equipment bases.

C. Install fire-pump suction and discharge piping equal to or larger than sizes required by NFPA 20.

D. Support piping and pumps separately so weight of piping does not rest on pumps.

E. Install valves that are same size as connecting piping. Comply with requirements for fire-protection valves specified in Section 211313 "Wet-Pipe Sprinkler Systems."

F. Install pressure gages on fire-pump suction and discharge flange pressure-gage tappings. Comply with requirements for pressure gages specified in Section 211313 "Wet-Pipe Sprinkler Systems."

G. Install piping hangers and supports, anchors, valves, gages, and equipment supports according to NFPA 20.

H. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not factory mounted. Furnish copies of manufacturers' wiring diagram submittals to electrical Installer.

I. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

3.3 ALIGNMENT

A. After alignment is correct, tighten anchor bolts evenly. Fill baseplate completely with grout, with metal blocks and shims or wedges in place. Tighten anchor bolts after grout has hardened. Check alignment and make required corrections.

B. Align piping connections.

C. Align pump and driver shafts for angular and parallel alignment according to HI 1.4 and to tolerances specified by manufacturer.

3.4 CONNECTIONS

A. Comply with requirements for piping and valves specified in Section 211313 "Wet-Pipe Sprinkler Systems." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to pumps and equipment to allow service and maintenance.

C. Connect relief-valve discharge to drainage piping or point of discharge.

D. Connect fire pumps to their controllers.

3.5 IDENTIFICATION

A. Identify system components. Comply with requirements for fire-pump marking according to NFPA 20.

3.6 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.7 PRE ACCEPTANCE TEST

A. Prepare and submit one (1) complete “Pre-Acceptance Documentation” submittal packages to the Engineer a minimum of five (5) business days prior to pre-acceptance test date. See Part 1 “Submittals” for submittal content.

B. The system is to be ready for testing prior to scheduling a test with the local enforcement agency. A pre-test is to be conducted prior to scheduling the official test for approval. Pre-Acceptance Test: Coordinate with fire alarm pre-acceptance tests, operate as required.

1. Use the NFPA 20 to document the startup and performance of the fire pump and fire alarm system. Obtain dated signature from Owner’s designee for each test. Tests that are not witnessed must be repeated. Use common form for test that indicates results of testing and fire alarm functional tests.

C. Coordinate rescheduled testing where unsatisfactory results cannot be resolved such that testing can be completed during business hours on the scheduled day.

3.8 FINAL INSPECTION AND TEST

A. The Contractor shall make arrangements with the Engineer for final inspection and witnessing of the final acceptance tests. A representative of the owner shall be present for the acceptance tests of the system, and the local Fire Subcode Inspector.

B. Test each fire pump with its controller as a unit. Comply with requirements for electric-motor-driver fire-pump controllers specified in Section 213900 "Controllers for Fire-Pump Drivers."

C. Required Tests: All tests and inspections required by the referenced Codes and Standards shall be performed by the Contractor under this scope of work. The contractor will be responsible for the acceptance test for the local enforcing agency, and for any remedial work and re-testing required. Contractor is responsible for draining systems as needed for test and repair, and for recharging system so they are left in operating condition. Hydraulic place cards shall be installed at the fire pump prior to acceptance testing.
   1. When local code authorities are required to witness tests, the Contractor shall be responsible for making all necessary arrangements with the code authorities and coordinating the work.
   2. The Contractor shall be responsible for obtaining all test documents with necessary approval stamps and signatures of the code authorities. The Contractor shall submit one copy of each of these documents to the Engineer.

D. Acceptance Testing: Upon completion of the installation, perform and document on an approved format, system tests as described herein.

   1. After installing components, assemblies, and equipment including controller, test for compliance with requirements.
   2. Test according to NFPA 20 for acceptance and performance testing.
   3. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   4. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Notice: Contractor shall provide at least five (5) working days notice for all tests.

F. Final Approval: Final approval and acceptance of the work will be given by the Engineer when:
   1. The completed sprinkler systems have been inspected, tested and approved by the Authority Having Jurisdiction.
   2. Required submittals, system operation and maintenance manuals, record drawings, spare parts, special tools and training have been provided to, reviewed, and accepted by the Owner.
   3. Written certification is submitted that states all equipment has been inspected and tested by a manufacturer’s certified representative.

4. Written certification is submitted that states all equipment is installed in accordance with the manufacturer's recommendations.

G. The Engineer will visit the job site to observe the work and witness the final acceptance tests when he has been advised by the Contractor that the work is completed and ready for test. If the work has not been completed or the test is unsatisfactory, the Contractor shall be responsible for the Engineer's extra expenses for reinspection and witnessing the retesting of the work. Such extra fees ($150 per hour) shall be deducted from payments to the Contractor.

H. Additional Tests: Any additional tests, required by the referenced codes, standards or criteria, AHJ, or by the Engineer, shall be performed. This documentation shall include:
1. The date and time of each test.
2. A reference set of contractor record drawings, numerically identifying the individual components and circuits tested.
3. A description of each test performed.
4. A checklist of each device tested, indicating the results of each test.
5. The names and signatures of the individuals conducting and witnessing each test.

I. Components, assemblies, and equipment will be considered defective if they do not pass tests and inspections.

J. Furnish fire hoses in number, size, and length required to reach storm drain or other acceptable location to dispose of fire-pump test water. Hoses are for tests only and do not convey to Owner.

3.9 DEMONSTRATION

A. The Contractor shall conduct one (1) training session of four (4) hours to familiarize the building personnel with the features, operation and maintenance of the sprinkler systems. Training sessions shall be scheduled by the Owner at a time mutually agreeable to the Contractor and Owner.

B. Agenda: The Contractor shall submit a proposed training agenda for the Owner's review and approval within 60 days of authorization to proceed. The proposed training agenda shall include, but not be limited to, the following:
1. Overview of system operation.
2. Overview of system equipment and device locations.
3. Detailed operation guidelines.
4. Detailed maintenance procedures.
5. Periodic testing procedures.

C. Final Agenda: The Contractor shall submit the final approved training agenda 14 days prior to the first training session.

END OF SECTION 213113

SECTION 213400

PRESSURE-MAINTENANCE PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Multistage, pressure-maintenance pumps.

B. Related Section:

1. Section 213900 "Controllers for Fire-Pump Drivers" for pressure-maintenance-pump controllers.

1.3 PERFORMANCE REQUIREMENTS

A. Pump Equipment, Accessory, and Specialty Pressure Rating: 175 psig minimum unless higher pressure rating is indicated.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, performance curves, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For pumps, accessories, and specialties. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For pumps to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 MULTISTAGE, PRESSURE-MAINTENANCE PUMPS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. A-C Fire Pump Systems; a business of ITT Industries.
2. Grundfos Management A/S; Grundfos Pumps Corporation U.S.A.
3. PACO Pumps; Grundfos Pumps Corporation U.S.A.
4. TACO Incorporated.
5. Aurora Pump.

B. Description: Factory-assembled and -tested, multistage, barrel-type vertical pump as defined in HI 2.1-2.2 and HI 2.3; designed for surface installation with pump and motor direct coupled and mounted vertically.

C. Pump Construction:

1. Barrel: Stainless steel.
2. Suction and Discharge Chamber: Cast iron with flanged inlet and outlet.
3. Pump Head/Motor Mount: Cast iron.
4. Impellers: Stainless steel, balanced, and keyed to shaft.
5. Pump Shaft: Stainless steel.
6. Seal: Mechanical type with carbon rotating face and silicon-carbide stationary seat.

7. Intermediate Chamber Bearings: Aluminum-oxide ceramic or bronze.
8. Chamber-Base Bearing: Tungsten carbide.
9. O-Rings: EPDM or NBR.

D. Motor: Single speed with permanently lubricated ball bearings and rigidly mounted to pump head. Comply with requirements in Section 210513 "Common Motor Requirements for Fire Suppression Equipment."

E. Nameplate: Permanently attached to pump and indicating capacity and characteristics.

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors.

1. Motor Sizes: Minimum size as indicated; if not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. NFPA Standard: Comply with NFPA 20 for installation of pressure-maintenance pumps.

B. Base-Mounted Pump Mounting: Install pumps on concrete bases.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Attach pumps to equipment base using anchor bolts.

C. Install multistage, pressure-maintenance pumps according to HI 1.4.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Pressure-maintenance pumps will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 ADJUSTING

A. Lubricate pumps as recommended by manufacturer.

B. Set field-adjustable pressure-switch ranges as indicated.

END OF SECTION 213400

SECTION 213900

CONTROLLERS FOR FIRE-PUMP DRIVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Full-service, full-voltage controller rated 460 V three phase fire pump, across the line starter.
2. Controller for pressure-maintenance pump.

1.2 DEFINITIONS

A. ATS: Automatic transfer switch(es).

B. ECM: Electronic control module.

C. MCCB: Molded-case circuit breaker.

D. N.O.: Normally open.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories**.**

B. Shop Drawings: For each type of product indicated. Include dimensioned plans, elevations, sections, details, and attachments to other work, including required clearances and service spaces around controller enclosures.

1. Show tabulations of the following:

a. Each installed unit's type and details.
b. Enclosure types and details for types other than NEMA 250, Type 2.
c. Factory-installed devices.
d. Nameplate legends.
e. Short-circuit current (withstand) rating of integrated unit.
f. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices.

2. Detail equipment assemblies and indicate dimensions, weights, loads, method of field assembly, components, and location and size of each field connection.
3. Schematic and Connection Diagrams: For power, signal, alarm, and control wiring and for pressure-sensing tubing.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Product Certificates: For each type of product indicated, from manufacturer.

C. Source quality-control reports.

D. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of product indicated to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.
2. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor-based logic controls.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain fire-pump controllers and all associated equipment from single source or producer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with standards of authorities having jurisdiction pertaining to materials and installation.

D. Comply with NFPA 20 and NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

1.8 PROJECT CONDITIONS

A. Environmental Limitations:

1. Ambient Temperature Rating: Not less than 40 deg F and not exceeding 122 deg F unless otherwise indicated.

B. Interruption of Existing Electric Service: Notify Architect no fewer than seven days in advance of proposed interruption of electric service, and comply with NFPA 70E.

1.9 COORDINATION

A. Coordinate layout and installation of controllers with other construction including conduit, piping, fire-pump equipment, and adjacent surfaces. Maintain required clearances for workspace and equipment access doors and panels. Ensure that controllers are within sight of fire-pump drivers.

PART 2 - PRODUCTS

2.1 FULL-SERVICE CONTROLLERS:

A. The Fire Pump Controller shall be factory assembled, wired and tested as a unit and shall conform to all requirements of the latest edition of NFPA 20, NFPA 70 and be Third Party Listed by Underwriters Laboratories (UL) and Approved by Factory Mutual (FM). The controller shall be available for 208 volt three phase power.

Controller Equipment Features

The controller shall include the following standard features:
• NEMA Type 2 drip proof metal freestanding enclosure
• Operator Interface Device (OID) with 4 lines by 20 character display with large character backlit LCD capable of being read in both direct sunlight or dark lighting conditions
• Pushbuttons for easy screen navigation, system test, lamp test, alarm reset, and horn silencing
• Multicolored LED's for alarm and mode annunciation
• LEDs shall be labeled with removable labels to allow for easy field modification of language changes
• All controller settings shall be programmable through the OID and shall be protected by two password levels
• All features shall be enabled or disabled through the OID, no jumpers or external wires shall be needed or allowed to activate or de-activate a feature
• The system status data shall be displayed on the OID. The displayed items shall include: System pressure, Phase to Phase (AB, BC, AC) voltage, Phase current (A, B, C), System Events and Notifications, Current time and date, Number of starts, Total motor run hours, Displayed countdown timers for: Sequential motor start and motor stop, Status of Automatic Stop Setting.

• Audible horn with silence feature for silence-able alarms
• Lamp test feature
• Microprocessor based logic with real time/date clock capable of running a minimum of 14 days without AC power connected to controller and non-volatile flash memory to permanently store the continuous pressure log, event log, alarm log and all user changeable set points and system data. Battery backup of any kind not allowed.
• Input and output status LED's to provide visual indication of each discrete input's or output's on/off status
• One RS485 Serial Port
• MODBUS Communication Protocol via RS485 port
• All wiring terminals on PCB's shall be removable type
• Service Entrance Rated
• Weekly Test Solenoid

B. Manufacturers: Subject to compliance with requirements, provide Tornatech GPx Series Full Service controller (basis of design) or a comparable product by one of the following:

1. Aquarius Fluid Products, Inc.
2. ASCO Power Technologies, LP; Firetrol Products.
3. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
4. Hubbell Incorporated; Hubbell Industrial Controls.
5. Joslyn Clark Corporation.
6. Master Control Systems, Inc.
7. Metron, Inc.
8. Tornatech – GPx Series – basis of design.

C. General Requirements for Full-Service Controllers:

1. Comply with NFPA 20 and UL 218.
2. Combined automatic and nonautomatic operation.
3. Factory assembled, wired, and tested; continuous-duty rated.
4. Pressure sensing switch located on the outside of the cabinet enclosure.

D. Method of Starting:

1. Pressure-switch actuated.
    a. Water-pressure-actuated switch and pressure transducer with independent high- and low-calibrated adjustments responsive to water pressure in fire-suppression piping.
    b. System pressure recorder, electric ac driven, with spring backup.
2. Magnetic Controller: Across-the-line type.
3. Emergency Start: Mechanically operated start handle that closes and retains the motor RUN contactor independent of all electric or pressure actuators.

E. Method of Stopping: Non-automatic shutdown after automatic starting.
   1. Automatic LRA shut down

F. Capacity: Rated for fire-pump-driver horsepower and short-circuit-current (withstand) rating equal to or greater than short-circuit current available at controller location.

G. Method of Isolation and Overcurrent Protection: Interlocked isolating switch and nonthermal MCCB; with a common, externally mounted operating handle, and providing locked-rotor protection.

H. Door-Mounted Operator Interface and Controls:

   1. Monitor, display, and control the devices, alarms, functions, and operations listed in NFPA 20 as required for drivers and controller types used.
   2. Method of Control and Indication:

      a. Microprocessor-based logic controller, with multiline digital readout.
      b. Membrane keypad.
      c. LED alarm and status indicating lights.

   3. Local Alarm and Status Indications:

      a. Controller power on.
      b. Motor running condition.
      c. Loss-of-line power.
      d. Line-power phase reversal.
      e. Line-power single-phase condition.

   4. Audible alarm, with silence push button.
   5. Nonautomatic START and STOP push buttons or switches.

I. Optional Features:

   1. Extra Output Contacts:

      a. One N.O. contact(s) for motor running condition.
      b. One set(s) of contacts for loss-of-line power.
   2. Operator Interface Communications Ports: USB, Ethernet, and RS485.

2.2 CONTROLLERS FOR PRESSURE-MAINTENANCE PUMPS

A. Manufacturers: Subject to compliance with requirements, provide Tornatech Model “JP” or similar product by one of the following:

   1. Aquarius Fluid Products, Inc.

2. ASCO Power Technologies, LP; Firetrol Products.
3. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
4. Hubbell Incorporated; Hubbell Industrial Controls.
5. Joslyn Clark Corporation.
6. Master Control Systems, Inc.
7. Metron, Inc.
8. Tornatech – JP Model – basis of design.

B. General Requirements for Pressure-Maintenance-Pump Controllers:

1. Type: UL 508 factory assembled, -wired, and tested, across-the-line; for combined automatic and manual operation.
2. Enclosure: UL 508 and NEMA 250, Type 2 for wall-mounting.
3. Factory assembled, wired, and tested.
4. Finish: Manufacturer's standard color paint.

C. Rate controller for scheduled horsepower and include the following:

1. Fusible disconnect switch.
2. Pressure switch.
3. Hand-off-auto selector switch.
4. Pilot light.
5. Running period timer.

2.3 ENCLOSURES

A. Fire-Pump Controllers to comply with environmental conditions at installed locations and NFPA 20.

1. Indoor, Dry and Clean Locations: Type 1 (IEC IP10).

B. Enclosure Color: Manufacturer's standard "fire-pump-controller red".

C. Nameplates: Comply with NFPA 20; complete with capacity, characteristics, approvals, listings, and other pertinent data.

D. Optional Features:

1. Floor stands, 12 inches high, for floor-mounted controllers.

2.4 SOURCE QUALITY CONTROL

A. Testing: Test and inspect fire-pump controllers according to requirements in NFPA 20 and UL 218.

1. Verification of Performance: Rate controllers according to operation of functions and features specified.

B. Fire-pump controllers will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and surfaces to receive equipment, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine equipment before installation. Reject equipment that is wet or damaged by moisture or mold.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONTROLLER INSTALLATION

A. Install controllers within sight of their respective drivers.

B. Connect controllers to their dedicated pressure-sensing lines.

C. Wall-Mounting Jockey Pump Controller: Install controllers on walls with disconnect operating handles not higher than 79 inches above finished floor, and bottom of enclosure not less than 12 inches above finished floor unless otherwise indicated. Bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."

D. Floor-Mounting Fire Pump Controller: Install controllers on 4-inch nominal-thickness concrete bases, using floor stands high enough so that the bottom of enclosure cabinet is not less than 12 inches above finished floor.

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

F. Comply with NEMA ICS 15.

3.3 POWER WIRING INSTALLATION

A. Install power wiring between controllers and their services or sources, and between controllers and their drivers. Comply with requirements in NFPA 20, NFPA 70, and Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 CONTROL AND ALARM WIRING INSTALLATION

A. Install wiring between controllers and the building's fire-alarm system. Comply with requirements specified in Section 283111 "Digital, Addressable Fire-Alarm System."

B. Bundle, train, and support wiring in enclosures.

C. Connect remote manual and automatic activation devices where applicable.

3.5 IDENTIFICATION

A. Comply with requirements in NFPA 20 for marking fire-pump controllers.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification in NFPA 20 and as specified in Section 260553 "Identification for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Acceptance Testing Preparation:

1. Inspect and Test Each Component:

    a. Inspect wiring, components, connections, and equipment installations. Test and adjust components and equipment.
    b. Test insulation resistance for each element, component, connecting supply, feeder, and control circuits.
    c. Test continuity of each circuit.

2. Verify and Test Each Electric-Driver Controller:

    a. Verify that voltages at controller locations are within plus 10 or minus 1 percent of motor nameplate rated voltages, with motors off. If outside this range for any motor, notify Architect before starting the motor(s).
    b. Test each motor for proper phase rotation.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Field Acceptance Tests:

1. Do not begin field acceptance testing until suction piping has been flushed and hydrostatically tested and the certificate for flushing and testing has been submitted to Architect and authorities having jurisdiction.
2. Prior to starting, notify authorities having jurisdiction of the time and place of the acceptance testing.
3. Engage manufacturer's factory-authorized service representative to be present during the testing.
4. Perform field acceptance tests as outlined in NFPA 20.

D. Controllers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.8 ADJUSTING

A. Adjust controllers to function smoothly and as recommended by manufacturer.

B. Set field-adjustable switches, auxiliary relays, time-delay relays, and timers.

C. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

D. Set field-adjustable pressure switches.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain controllers , and to use and reprogram microprocessor-based controls within this equipment.

END OF SECTION 213900

SECTION 220500

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 GENERAL REQUIREMENTS:

A. Examine job site and verify all site conditions prior to starting work. Bring any discrepancy between the contract documents and the actual field conditions to the attention of the architect/engineer.

B. The drawings are diagrammatic. Coordinate in the field, with the architect and with all trades, the exact location of equipment, fixtures, valves, thermostats, etc. and routing of piping and sleeves.

C. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

D. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

E. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces.

F. Perform work in accordance with rules, regulations, standards, codes, ordinances, and laws of local, state, and federal governments, and other authorities having jurisdiction and be responsible for compliance therewith.

G. All plumbing installations including equipment, valves, and solder methods shall conform to the Reduction of Lead in Drinking Water Act.

H. Obtain all necessary approvals, permits and inspections. Pay all associated fees.

I. Guarantee all systems and work for a period of one (1) year from date of final acceptance. See other warranty requirements for specific equipment in subsequent spec sections.

J. Contractor shall maintain a notated set of “as-built” drawings on site showing all deviations from the contract drawings and shall turn them over to the architect/engineer upon substantial completion.

K. All materials shall be new and of commercial grade and bear the underwriter's label where applicable.

L. Locate all existing utilities in the field and make serviceable connections to same.

M. Obtain approval from the building owner's representative prior to any interruption of building systems. Coordinate acceptable working hours with same.

N. All cutting and patching required for plumbing installations is by the plumbing contractor. Core drill or saw cut all masonry and restore all surfaces to original condition, to match adjacent ad to satisfaction of architect and owner. Associated painting and finishing are by the general contractor unless noted otherwise.

O. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment. Field welding shall comply with AWS D1.1.

1.3 PRODUCTS AND INSTALLATIONS

A. This Section includes the following:

1. Sleeves and sleeve seals.
2. Escutcheons.
3. Grout.
4. Plumbing demolition.
5. Equipment installation requirements common to equipment sections.
6. Painting and finishing.
7. Concrete bases.
8. Supports and anchorages.

B. See subsequent spec sections for product and installations for all other plumbing equipment, piping, and fixtures.

1.4 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:
   1. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

   1. EPDM: Ethylene-propylene-diene terpolymer rubber.
   2. NBR: Acrylonitrile-butadiene rubber.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

   1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
   2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Minimum access door size is 18”x18”.

1.8 PLUMBING-ELECTRICAL COORDINATION

A. All motors included for new equipment will be provided by the plumbing contractor, and wired by the electrical contractor.

B. All 120V (and above) wiring is to be done by the electrical contractor under division 26. All lower voltage wiring is to be done by the controls contractor. All data wiring necessary to operate the new digital control system is to be by the controls contractor, in accordance with specification section 23 0900.

C. Coordinated drawings shall be submitted prior to construction of new work. The coordinated drawings shall show all Plumbing installation along with cable tray installation, electrical conduit runs, lighting, and sprinkler work.

1.9 SUBMITTALS

A. Each Submittal shall be identified by the following:
   1. Project Name
   2. Specification Section
   3. Drawing Numbers
   4. Product data submittals shall include but not be limited to:
      a. Manufacturer and Model Number.
      b. Complete electrical data and wiring diagrams.

c. Dimensions, capacities, ratings, materials, finishes, special features and storage conditions.
d. Recommended installation procedures, performance, and conditions of performance, testing, and calibration certifications.

5. For equipment submitted that is not a basis of design, the contractor is to ensure the ability to fit in the original space allotted, the ability to be routed into the building and all required access in maintained, and indicated such on the submittal.
6. Each submittal shall clearly identify which product and components are being furnished and eliminate reference to units, components and features not being furnished.

1.10 INSTRUCTING FACILITIES PERSONNEL

A. Contractor and factory personnel are required to train the Facilities personnel and/or building owner on the operation and maintenance of all scheduled equipment in this contract as part of the scope of work. Include one 4 hour training period at the completion of the project for owner instruction on the equipment installed.

B. The contractor shall provide and electronic copy and two hard copies of bound operation and maintenance manuals for the new equipment installed. The binders shall also include a copy of the approved submittals. General catalog data for these owner's manuals are unacceptable. Provide manufacturer's preventative maintenance data and clearly indicate the drawing tags for the equipment and the equipment selected for this contract.

1. Include the manufacturer's and contractor's name, address, and phone number with the owner's manual for warranty services.
2. Include warranty information in the owner's manuals.
3. Provide one section in the O&M manuals for manufacturer's preventative maintenance procedures.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

B. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

C. All sleeves in above grade floors shall be extended 1" above the floor slab, to prevent water from leaking down through pipe penetration openings.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.
5. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.4 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated.

PART 3 - EXECUTION

3.1 PLUMBING DEMOLITION

A. Disconnect, demolish, and remove plumbing systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

B. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according for all exposed piping.

M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with exterior wall and roof assemblies.
2. Extend sleeves installed in floors above grade 1 inch above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring when required.

3. Install sleeves in new walls and slabs as new walls and slabs are constructed.
4. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

    a. Steel Pipe Sleeves: For pipes smaller than NPS 10.
    b. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.

        1) Seal space outside of sleeve fittings with grout.

5. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint.

N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.

O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

Q. Verify final equipment locations for roughing-in.

R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.4 PAINTING

A. All piping and insulation that runs exposed through a finished space shall be primed and painted white by the plumbing contractor.

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.

2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

B. Field Welding: Comply with AWS D1.1.

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.8 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 22 0500

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Fiberglass pipe hangers.
4. Metal framing systems.
5. Fiberglass strut systems.
6. Thermal-hanger shield inserts.
7. Fastener systems.
8. Pipe stands.
9. Pipe positioning systems.
10. Equipment supports.

1.2 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.2 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig, ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.3 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.4 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:

1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
2. Base: Stainless steel.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
2. Bases: One or more; plastic.
3. Vertical Members: Two or more protective-coated-steel channels.

4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.5 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Division 07 Section "Roof Accessories" for curbs.

F. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. See Division 22 plumbing fixture Sections for requirements for pipe positioning systems for plumbing fixtures.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

N. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and attachments for general service applications.

F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
3. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
4. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
5. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
6. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.

2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

R. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 22 05 29

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Valve tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Valve numbering scheme.

C. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 incheshigh.

2.3 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Domestic Cold Water Piping:

a. Background Color: green.

b. Letter Color: white.

2. Domestic Hot Water Piping:

a. Background Color: yellow.
b. Letter Color: black.

3. Sanitary Waste Piping:

a. Background Color: red.
b. Letter Color: white.

4. Storm Drainage Piping:

a. Background Color: yellow.
b. Letter Color: white.

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. Cold Water: 1-1/2 inches, round.
b. Hot Water: 1-1/2 inches, round.

2. Valve-Tag Color:

a. Cold Water: Natural.
b. Hot Water: Natural.

3. Letter Color:

a. Cold Water: Black.
b. Hot Water: Black.

END OF SECTION 220553

SECTION 22 07 19

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Domestic recirculating hot-water piping.
4. Roof drains and rainwater leaders.
5. Supplies and drains for handicap-accessible lavatories and sinks.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.5 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.6 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

E. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

G. Mineral-Fiber, Preformed Pipe Insulation:

1. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.4 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Adhesive: As recommended by jacket material manufacturer.
2. Color: White.
3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.5 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 11.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 6.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Width: 2 inches.
2. Thickness: 6 mils.
3. Adhesion: 64 ounces force/inch in width.
4. Elongation: 500 percent.
5. Tensile Strength: 18 lbf/inch in width.

2.6 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers,:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Engineered Brass Company.
    b. Insul-Tect Products Co.; a subsidiary of MVG Molded Products.
    c. McGuire Manufacturing.
    d. Plumberex.
    e. Truebro; a brand of IPS Corporation.
    f. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.9 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. NPS 1 and Smaller: Insulation shall be one of the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

2. NPS 1-1/4 and Larger: Insulation shall be one of the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Domestic Hot and Recirculated Hot Water:

1. NPS 2 and Smaller: Insulation shall be one of the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

2. NPS 2-1/2 and Larger: Insulation shall be one of the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

C. Stormwater and Overflow:

1. All Pipe Sizes: Insulation shall be one of the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

D. Roof Drain and Overflow Drain Bodies:

1. All Pipe Sizes: Insulation shall be one of the following:
   a. Flexible Elastomeric: 1 inch thick.
   b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

E. When PVC piping is used for sanitary, 1" of batt insulation shall be provided on all horizontal sanitary waste installed in ceiling for sound purposes.

F. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. All Pipe Sizes: Insulation shall be one of the following:

   a. Flexible Elastomeric: 1/2 inch thick.
   b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

3.13 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. None.

D. Piping, Exposed:

1. PVC: 20 mils thick.

END OF SECTION 22 0719

SECTION 22 11 16

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Domestic water pipes, tubes, fittings, and specialties inside the building.
2. General duty valves.
3. Check valves.
4. Flexible connectors.
5. Water meters furnished by utility company for installation by Contractor.

1.3 SUBMITTALS

A. Coordination Drawings: Provide 3D coordinated plumbing shop drawings showing all sanitary, vent, and water piping on the same sheet, at the correct elevations in the model. See "General Plumbing Requirements" spec section for more information on pipe modeling. Coordinate with other trades for ceiling space.

B. For piping in equipment rooms and other congested areas, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Fire-suppression-water piping.
2. Domestic water piping.
3. HVAC ductwork.
4. HVAC hydronic piping.
5. Sanitary and vent piping.

C. Submit the following field quality-control reports to the engineer for review and approval:
1. potable water flushing report.
2. pressure test results.

3. City inspection reports.

D. Grooved joint couplings and fittings shall be shown on drawings and product submittals and shall be specifically identified with the applicable style or series number.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 61 for potable domestic water piping and components.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of water service.
2. Do not proceed with interruption of water service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

F. Copper Unions:

1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

G. Copper Pressure-Seal-Joint Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Viega.
   b. Grinnell, a Tyco International Company
   c. Victaulic Company

2. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
3. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

H. Appurtenances for Grooved-End Copper Tubing:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Victaulic Company.

2. Bronze Fittings for Grooved-End, Copper Tubing: ASTM B 75 (ASTM B 75M) copper tube or ASTM B 584 bronze castings with copper tubing sized grooved ends (flaring of tube and fitting ends to IPS dimensions is not permitted).
3. Mechanical Couplings for Grooved-End Copper Tubing:

   a. Copper-tube dimensions and design similar to AWWA C606.
   b. Ferrous housing sections cast with offsetting, angle-pattern bolt pads coated with copper-colored enamel.
   c. EPDM-synthetic rubber gaskets suitable for hot and cold water.
   d. Bolts and nuts.
   e. Minimum Pressure Rating: 300 psig (2070 kPa).
   f. Design Basis: “Installation Ready” stab-on design for direct ‘stab’ installation onto roll grooved copper tube without prior field disassembly and no loose parts. Victaulic Style 607 QuickVic™.

2.3 STAINLESS-STEEL PIPING

A. Potable-water piping and components shall comply with NSF 61.

B. Stainless-Steel Pipe: ASTM A 312/A 312M, Schedule 10.

C. Stainless-Steel Pipe Fittings: ASTM A 815/A 815M.

D. Appurtenances for Grooved-End, Stainless-Steel Pipe:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Anvil International.
b. Grinnell Mechanical Products; Tyco Fire Products LP.
c. Shurjoint Piping Products.
d. Victaulic Company.

2. Fittings for Grooved-End, Stainless-Steel Pipe: Stainless-steel casting with dimensions matching stainless-steel pipe.
3. Mechanical Couplings for Grooved-End, Stainless-Steel Pipe:

a. AWWA C606 for stainless-steel-pipe dimensions.
b. Stainless-steel housing sections.
c. Stainless-steel bolts and nuts.
d. EPDM-rubber gaskets suitable for hot and cold water.

2.4 PEX TUBE AND FITTINGS

A. PEX Distribution System: ASTM F 877, SDR 9 tubing.

B. Fittings for PEX Tube: ASTM F 1807, metal-insert type with copper or stainless-steel crimp rings and matching PEX tube dimensions.

C. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F 877; with plastic or corrosion-resistant-metal valve for each outlet.

2.5 PIPING JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

B. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.6 VALVES

A. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves, drain valves, backflow preventers, and vacuum breakers.

B. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Apollo Valve
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Forged brass.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Brass.
i. Ball: Chrome-plated brass.
j. Port: Full.

C. Iron, Single-Flange Butterfly Valves with EPDM Seat and Stainless-Steel Disc:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Crane Co.; Crane Valve Group
b. DeZurik Water Controls.
c. Milwaukee Valve Company.
d. Mueller Steam Specialty; a division of SPX Corporation.
e. NIBCO INC.
f. Sure Flow Equipment Inc.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.

b. CWP Rating: 200 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Stainless steel.

D. 175 CWP, Iron, Grooved-End Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Kennedy Valve; a division of McWane, Inc.
b. Shurjoint Piping Products.
c. Victaulic Company.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 175 psig.
c. Body Material: Coated, ductile iron.
d. Stem: Two-piece stainless steel.
e. Disc: Coated, ductile iron.
f. Seal: EPDM.

E. Check valves:
1. 2 inches and smaller: bronze body, swing type bronze disc, threaded ends.
2. 2-1/2" and larger: cast iron body, bolted cap, flanged ends, swing type bronze disc, replaceable seat ring.

2.7 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2.8 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Flanges:

1. Description:

a. Standard: ASSE 1079.
b. Factory-fabricated, bolted, companion-flange assembly.
c. Pressure Rating: 125 psig minimum at 180 deg F.
d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

C. Dielectric Nipples:

1. Description:

a. Standard: IAPMO PS 66
b. Electroplated steel nipple. complying with ASTM F 1545.
c. Pressure Rating: 300 psig at 225 deg F.
d. End Connections: Male threaded or grooved.
e. Lining: Inert and noncorrosive, propylene.

2.9 FLOOR PLATES

A. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.10 FLEXIBLE CONNECTORS

A. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections NPS 2 and Smaller: Threaded copper pipe or plain-end copper tube.
3. End Connections NPS 2-1/2 and Larger: Flanged copper alloy.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance.

D. Install shutoff valve immediately upstream of each dielectric fitting.

E. Install domestic water piping level without pitch and plumb.

F. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

G. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

H. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

J. Install piping adjacent to equipment and specialties to allow service and maintenance.

K. Install piping to permit valve servicing.

L. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

M. Install piping free of sags and bends.

N. Install fittings for changes in direction and branch connections.

O. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

P. Install thermometers on inlet and outlet piping from each water heater.

Q. Install sleeves for piping penetrations of walls, ceilings, and floors.

R. Install sleeve seals for piping penetrations of concrete walls and slabs.

S. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.2 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

D. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

E. Grooved joint piping systems shall be installed in accordance with the manufacturer's guidelines and recommendations. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by Victaulic. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. Contractor shall remove and replace any improperly installed products.

3.3 HANGER AND SUPPORT INSTALLATION

A. Support vertical piping and tubing at base and at each floor.

B. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

C. Provide rod sizes and spacing per hanger details on the drawings. If not indicated, install hangers for tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.

6. NPS 6: 10 feet with 5/8-inch rod.
7. NPS 8: 10 feet with 3/4-inch rod.

D. Install supports for vertical copper tubing every 10 feet.

E. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.4 VALVE INSTALLATION

A. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball valves for piping NPS 2 and smaller. Use ball or butterfly valves for piping NPS 2-1/2 and larger.

B. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."

1. Hose-End Drain Valves: At low points in water mains, risers, and branches.
2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.

C. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 and smaller and butterfly valves for piping NPS 2-1/2 and larger. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves.

3.5 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. NPS 1-1/2 and Smaller: Fitting-type coupling.
2. NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.6 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.7 WATER METER INSTALLATION

A. Rough-in domestic water piping for water meter installation, and install water meters according to utility company's requirements.

B. Water meters will be furnished and installed by utility company.

C. Install water meters according to AWWA M6, utility company's requirements, and the following:

3.8 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in Division 15 plumbing fixture Sections for connection sizes.
4. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.9 IDENTIFICATION

A. Identify system components. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

    a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

C. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.11 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

    a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
    b. Adjust calibrated balancing valves to flows indicated.

4. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
7. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.12 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

    c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities to engineer.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.13 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water, building service piping, NPS 3 and smaller, shall be the following:

1. Soft copper tube, ASTM B 88, Type K; wrought-copper solder-joint fittings; and brazed joints.

E. Domestic water piping, NPS 2 and smaller, shall be one of the following:
1. Hard copper tube, ASTM B 88, Type L; cast- or wrought- copper solder-joint fittings; and soldered joints.
2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
3. PEX tube, NPS 1 and smaller; fittings for PEX tube; and crimped joints.

F. Domestic water piping, NPS 2-1/2 to NPS 4, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L; cast- or wrought- copper solder-joint fittings; and brazed joints.
2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
3. Hard copper tube, ASTM B 88, Type L; grooved-joint copper-tube appurtenances; and grooved joints.
4. Stainless-steel Schedule 10 pipe, grooved-joint fittings, and grooved joints.

3.14 VALVE SCHEDULE

A. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
2. Throttling Duty: Use ball valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
3. Drain Duty: ¾" Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 221116

SECTION 22 11 16

DOMESTIC WATER SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Vacuum breakers.
2. Backflow preventers.
3. Balancing valves.
4. Temperature-actuated water mixing valves.
5. Strainers.
6. Outlet boxes.
7. Hose bibbs.
8. Wall hydrants.
9. Drain valves.
10. Water hammer arresters.
11. Air vents.
12. Trap-seal primer valves.
13. Thermometers

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated on the drawing schedule.

B. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. NSF Compliance:
   1. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS – SEE SCHEDULES ON DRAWINGS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

      a. Ames Co.
      b. Conbraco Industries, Inc.
      c. Watts Industries, Inc.; Water Products Div.
      d. Zurn Plumbing Products Group; Wilkins Div.

   2. Standard: ASSE 1001.
   3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
   4. Body: Bronze.
   5. Inlet and Outlet Connections: Threaded.
   6. Finish: Rough bronze.

B. Hose-Connection Vacuum Breakers:

   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Conbraco Industries, Inc.
      b. MIFAB, Inc.
      c. Watts Industries, Inc.; Water Products Div.
      d. Zurn Plumbing Products Group; Light Commercial Operation.
      e. Zurn Plumbing Products Group; Wilkins Div.

   2. Standard: ASSE 1011.
   3. Body: Bronze, nonremovable, with manual drain.

4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Rough bronze.

2.2 BACKFLOW PREVENTERS

A. Intermediate Atmospheric-Vent Backflow Preventers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Conbraco Industries, Inc.
   b. Watts Industries, Inc.; Water Products Div.
   c. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1012.
3. Operation: Continuous-pressure applications.
4. Size: NPS 1/2 or NPS ¾ as shown.
5. Body: Bronze.
6. End Connections: Union, solder joint.
7. Finish: Chrome plated.

B. Reduced-Pressure-Principle Backflow Preventers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Conbraco Industries, Inc.
   b. Watts Industries, Inc.; Water Products Div.
   c. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
5. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
7. Configuration: Designed for horizontal, straight through flow.
8. Accessories:

   a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.
   b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

2.3 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Water-Temperature Limiting Devices (for fixtures):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Leonard Valve Company.
   b. Powers; a division of Watts Water Technologies, Inc.
   c. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
   d. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.

2. Standard: ASSE 1070, thermostatically controlled, water tempering valve.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Body: Bronze body with corrosion-resistant interior components.
5. Temperature Control: Adjustable.
6. Inlets and Outlet: Threaded.
7. Finish: Rough or chrome-plated bronze.
8. Tempered-Water Setting: 110F.
9. Tempered-Water Design Flow Rate: 2 gpm.

B. Water-Temperature Limiting Devices (for water heaters):

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Armstrong International, Inc.
   b. Conbraco Industries, Inc.
   c. Leonard Valve Company.
   d. Powers; a Watts Industries Co.
   e. Symmons Industries, Inc.
   f. Watts Industries, Inc.; Water Products Div.
   g. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig.
4. Type: Thermostatically controlled water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Tempered-Water Setting: 110F
9. Valve Finish: Chrome plated.

2.4 OUTLET BOXES

A. Clothes Washer Outlet Boxes:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Guy Gray Manufacturing Co., Inc.
   b. Symmons Industries, Inc.
   c. Watts Industries, Inc.; Water Products Div.
   d. Zurn Plumbing Products Group; Light Commercial Operation.

2. Mounting: Recessed.
3. Material and Finish: Enameled-steel or epoxy-painted-steel or plastic box and faceplate.
4. Faucet: Combination, valved fitting or separate hot- and cold-water, valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.
5. Supply Shutoff Fittings: NPS 1/2 gate, globe, or ball valves and NPS 1/2 copper, water tubing.
6. Drain: NPS 1-1/2 standpipe and P-trap for direct waste connection to drainage piping.
7. Inlet Hoses: Two 60-inch- long, rubber household clothes washer inlet hoses with female, garden-hose-thread couplings. Include rubber washers.
8. Drain Hose: One 48-inch- long, rubber household clothes washer drain hose with hooked end.

2.5 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.

2.6 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Josam Company.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products Inc.
    f. Zurn Plumbing Products Group; Light Commercial Operation.
    g. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.21.3M for concealed or exposed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
5. Inlet: NPS 3/4 or NPS 1.
6. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.

2.7 DRAIN VALVES

A. Stop-and-Waste Drain Valves:

1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
2. Pressure Rating: 200-psig minimum CWP or Class 125.
3. Size: NPS 3/4.
4. Body: Copper alloy or ASTM B 62 bronze.
5. Drain: NPS 1/8 side outlet with cap.

2.8 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. AMTROL, Inc.
    b. Josam Company.
    c. MIFAB, Inc.
    d. PPP Inc.
    e. Sioux Chief Manufacturing Company, Inc.

f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
g. Tyler Pipe; Wade Div.
h. Watts Drainage Products Inc.
i. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows or Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.9 AIR VENTS

A. Bolted-Construction Automatic Air Vents:

1. Body: Bronze.
2. Pressure Rating: 125-psig minimum pressure rating at 140 deg F.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 3/8 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

B. Welded-Construction Automatic Air Vents:

1. Body: Stainless steel.
2. Pressure Rating: 150-psig minimum pressure rating.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 3/8 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

2.10 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. MIFAB, Inc.
b. PPP Inc.
c. Sioux Chief Manufacturing Company, Inc.
d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
e. Watts Industries, Inc.; Water Products Div.

2. Standard: ASSE 1018.

3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type, Trap-Seal Primer Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.

2. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.
3. Size: NPS 1-1/4 minimum.
4. Material: Chrome-plated, cast brass.

2.11 THERMOMETERS

A. Standard: ASME B40.200.

B. Case: Liquid-filled type(s); stainless steel with 3-inch nominal diameter.

C. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F and deg C.

D. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

E. Connector Size: 1/2 inch, with ASME B1.1 screw threads.

F. Stem: 0.25 or 0.375 inch in diameter; stainless steel.

G. Window: Plain glass.

H. Ring: Stainless steel.

I. Element: Bimetal coil.

J. Pointer: Dark-colored metal.

K. Accuracy: Plus or minus 1.5 percent of scale range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Requirements for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
3. Do not install bypass piping around backflow preventers.

C. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install thermometers and water regulators if specified.
2. Install cabinet-type units recessed in or surface mounted on wall as specified.

D. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, solenoid valve, and pump.

E. Install outlet boxes recessed in wall. Install 2-by-4-inch fire-retardant-treated-wood blocking wall reinforcement between studs. Fire-retardant-treated-wood blocking is specified in Division 6 Section "Rough Carpentry."

F. Install water hammer arresters in water piping according to PDI-WH 201.

G. Install air vents at high points of water piping. Install drain piping and discharge onto floor drain.

H. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

I. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping and specialties.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each pressure vacuum breaker reduced-pressure-principle backflow preventer and double-check backflow-prevention assembly according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.4 ADJUSTING

A. Set field-adjustable flow set points of balancing valves.

B. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 22 1119

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following for soil, waste, and vent piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.

1.2 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.
2. Sanitary Sewer, Force-Main Piping: 50 psig.

B. Shop Drawings:
1. Provide 3D coordinated plumbing shop drawings showing all sanitary, vent, and water piping on the same sheet, at the correct elevations in the model. See “General Plumbing Requirements” spec section for more information on pipe modeling. Coordinate with other trades for ceiling space.

1.3 QUALITY ASSURANCE

A. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

PART 2 - PRODUCTS

2.1 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service weight. Mfg. by AB&I, Charlotte or Tyler

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.2 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: Service weight ASTM A 888. Mfg. by AB&I, Charlotte or Tyler

B. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

1. Heavy-Duty, Shielded, Stainless-Steel Couplings: Couplings shall conform to CISPI 310 and ASTM C 1277. Shield Assemblies shall consist of a stainless steel bi-directional corrugated shield; stainless-steel bands and tightening devices; and a ASTM C 564, rubber sleeve with integral center stop. Couplings shall bear the NSF Trademark.

a. Manufacturers, provide product by one of the following, or approved equal (by the engineer):

1) ANACO./Husky SD 4000
2) Clamp-All Corp.-125

2.3 COPPER TUBE AND FITTINGS

A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING SCHEDULE

A. Underground, soil, waste and vent piping shall be any of the following:

1. Service weight, cast-iron bell and spigot soil piping; gasket joints.

B. Aboveground, soil, waste and vent piping 3” and larger shall be any of the following:
1. Hubless cast-iron soil pipe and fittings; heavy-duty shielded couplings.

C. Aboveground, soil, waste and vent piping 2-1/2" and smaller shall be any of the following:
   1. Hubless cast-iron soil pipe and fittings; standard shielded couplings.
   2. Copper DWV tube, copper drainage fittings, and soldered joints.

D. All exposed sanitary piping below plumbing fixtures shall be chrome plated brass.

E. Sanitary forced main piping:
   1. Copper DWV tube, copper drainage fittings, and soldered joints.

3.3 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 22 Section "Common Work Requirements for Plumbing"

B. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

C. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.

D. Install cast-iron sleeve with water stop and mechanical sleeve seal (link seal) at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight.

E. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

F. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

G. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

H. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Sanitary Drain: ¼" per foot downward in direction of flow for piping NPS 2 and smaller; 1/8" per foot downward in direction of flow for piping NPS 2-1/2" and larger.
2. Vent Piping: 1/16" per foot down toward vertical fixture vent or toward vent stack.

I. Provide sleeves for all sanitary stack slab penetrations. The sleeves shall extend 1" above the floor slab to prevent leaks passing floor to floor.

J. Install sleeves for penetrations of masonry walls. Provide escutcheons for all visible piping penetrations of walls and ceilings.

K. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction. Provide pressure test reports to the engineer for record.

3.4 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.5 HANGER AND SUPPORT INSTALLATION

A. Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Horizontal Piping: Install individual, straight, horizontal piping runs according to the following:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

D. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6: 60 inches with 3/4-inch rod.
5. NPS 8 to NPS 12: 60 inches with 7/8-inch rod.

E. Install supports for vertical cast-iron soil piping every 15 feet.

F. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 72 inches with 3/8-inch rod.
2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
3. NPS 2-1/2: 108 inches with 1/2-inch rod.
4. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.

G. Install supports for vertical copper tubing every 10 feet.

H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
4. Prepare reports for tests and required corrective action.

3.8 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 22 1316

SECTION 22 14 13

STORM PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following storm drainage piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.

1.2 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working-pressure, unless otherwise indicated:

1. Storm Drainage Piping: 10-foot head of water.

B. Shop Drawings:
1. Provide 3D coordinated plumbing shop drawings showing all sanitary, vent, and water piping on the same sheet, at the correct elevations in the model. See “General Plumbing Requirements” spec section for more information on pipe modeling. Coordinate with other trades for ceiling space.

C. All storm piping shall be provided with 1” fiberglass pre-formed pipe insulation with a vapor barrier to prevent condensation.

1.3 QUALITY ASSURANCE

A. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

PART 2 - PRODUCTS

2.1 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service weight. Mfg. by AB&I, Charlotte or Tyler

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.2 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301. Mfg. by AB&I, Charlotte or Tyler

1. Heavy-Duty, Shielded, Stainless-Steel Couplings: Couplings shall conform to CISPI 310 and ASTM C 1277. Shield Assemblies shall consist of a stainless steel bi-directional corrugated shield; stainless-steel bands and tightening devices; and a ASTM C 564, rubber sleeve with integral center stop. Couplings shall bear the NSF Trademark. With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.

a. Manufacturers:

1) ANACO./Husky
2) Clamp-All Corp

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING SCHEDULE

A. Underground storm drainage piping shall be any of the following:

1. Service weight, cast-iron bell and spigot soil piping; lead and oakum joints.

B. Aboveground storm drainage piping shall be any of the following:
1. Hubless, cast-iron soil pipe and fittings; heavy-duty, hubless-piping couplings; and coupled joints.

C. Aboveground storm drainage force mains shall be any of the following:

1. Hard copper tube, copper pressure fittings, and soldered joints.
2. Galvanized-steel pipe, pressure fittings, and threaded joints.
3. Fitting-type transition couplings if dissimilar pipe materials.

3.3 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 22 Section "Common Work Requirements for Plumbing"

B. All storm piping shall be provided with 1” fiberglass pre-formed pipe insulation with a vapor barrier to prevent condensation and for sound purposes.

C. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers.

D. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight.

E. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

F. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

G. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

H. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:

1. Building Storm Drain: 1/8” per foot downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Storm-Drainage Piping: 1/8” per foot downward in direction of flow.

I. Provide sleeves for all sanitary stack slab penetrations. The sleeves shall extend 1” above the floor slab to prevent leaks passing floor to floor.

J. Install sleeves for penetrations of masonry walls. Provide escutcheons for all visible piping penetrations of walls and ceilings.

K. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hubless Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

3.5 VALVE INSTALLATION

A. Shutoff Valves: Install shutoff valve on each sump pump discharge.

1. Install gate or full-port ball valve for piping NPS 2 and smaller.
2. Install gate valve for piping NPS 2-1/2 and larger.

B. Check Valves: Install swing check valve, between pump and shutoff valve, on each sump pump discharge.

3.6 HANGER AND SUPPORT INSTALLATION

A. Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Horizontal Piping: Install individual, straight, horizontal piping runs according to the following:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

D. Install hangers for cast-iron storm piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6: 60 inches with 3/4-inch rod.
5. NPS 8 to NPS 12: 60 inches with 7/8-inch rod.

E. Install supports for vertical cast-iron soil piping every 15 feet.

F. Provide Holdrite #117 Series (or approved equal) no-hub fitting restraints at the base of each vertical riser to a roof drain, and at the base of each storm riser thru the building. The restraint devices should be installed on the 90 degree elbow just below each roof drain, and on the 90 degree elbow at the base of each riser.

G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3. Test Procedure: Test storm drainage piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.9 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 22 1413

SECTION 22 33 00

ELECTRIC DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Electric tank type domestic-water heaters.
   2. Domestic-water heater accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. LEED Submittals:

   1. Product Data for Prerequisite EA 2: Documentation indicating that units comply with applicable requirements in ASHRAE/IESNA 90.1, Section 7, "Service Water Heating."

C. Shop Drawings:

   1. Wiring Diagrams: For power, signal, and control wiring.

D. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

E. Field quality-control reports.

F. Warranty.

G. Operation and Maintenance Data: For electric, domestic-water heaters to include in emergency, operation, and maintenance manuals.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61, "Drinking Water System Components - Health Effects."

1.4 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.5 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within five years.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

PART 2 - PRODUCTS

2.1 ELECTRIC TANK TYPE WATER HEATERS

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Bradford White Corporation.
   b. Lochinvar Corporation.
   c. PVI Industries, LLC.
   d. Rheem Manufacturing Company.
   e. Smith, A. O. Water Products Co.; a division of A. O. Smith Corporation.
   f. State Industries.

2. Standard: UL 1453.
3. Storage-Tank Construction: ASME-code, steel vertical arrangement.

   a. Tappings: Factory fabricated of materials compatible with tank and piping connections. Attach tappings to tank before testing.

      1) NPS 2 and Smaller: Threaded ends according to ASME B1.20.1.

2) NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges, and according to ASME B16.24 for copper and copper-alloy flanges.

b. Pressure Rating: 150 psig.
c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.

4. Factory-Installed Storage-Tank Appurtenances:

a. Anode Rod: Replaceable magnesium.
b. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
c. Insulation: Comply with ASHRAE/IESNA 90.1.
d. Jacket: Steel with enameled finish.
e. Heating Elements: Electric, screw-in or bolt-on immersion type.
f. Temperature Control: Adjustable thermostat.
g. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.
h. Relief Valves: ASME rated and stamped for combination temperature-and-pressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

5. Special Requirements: NSF 5 construction.

2.2 DOMESTIC WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AMTROL Inc.
b. Pentair Pump Group (The); Myers.
c. Smith, A. O. Water Products Co.; a division of A. O. Smith Corporation.
d. State Industries.
e. Taco, Inc.

2. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
3. Construction:

a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.

b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
c. Air-Charging Valve: Factory installed.

4. Capacity and Characteristics:

a. Working-Pressure Rating: 150 psig.
b. Capacity Acceptable: 4 gal. minimum.
c. Air Precharge Pressure: 45 PSI.

B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.

C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.

2.3 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test domestic-water heaters to minimum of one and one-half times pressure rating before shipment.

C. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Commercial, Electric, Domestic-Water Heater Mounting: Install commercial, electric, domestic-water heaters on concrete base as indicated in the drawings.
1. Maintain manufacturer's recommended clearances.
2. Arrange units so controls and devices that require servicing are accessible.
3. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
4. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

5. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
6. Install anchor bolts to elevations required for proper attachment to supported equipment.
7. Anchor domestic-water heaters to substrate.

B. Ceiling Mounted Domestic-Water Heater Mounting: Install electric domestic-water heaters on domestic-water heater mounting bracket.

1. Maintain manufacturer's recommended clearances.
2. Arrange units so controls and devices that require servicing are accessible.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Install electric, domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

D. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

E. Install pressure relief valves in water piping for electric, domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

F. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for electric, domestic-water heaters that do not have tank drains.

G. Install thermometers on outlet piping of electric, domestic-water heaters.

H. Install piping-type heat traps on inlet and outlet piping of electric, domestic-water heater storage tanks without integral or fitting-type heat traps.

I. Fill electric, domestic-water heaters with water.

J. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components and label with naming as indicated on the drawing schedule.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain commercial and tankless, electric, domestic-water heaters. Include 2 hours of training time for domestic water heater operation and maintenance.

END OF SECTION 223300

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following conventional plumbing fixtures and related components:

1. Faucets.
2. Flushometers.
3. Toilet seats.
4. Fixture supports.
5. Water closets.
6. Urinals.
7. Lavatories.
8. Sinks.
9. Service basins.
10. Showers.
11. Drinking fountains

B. All plumbing fixture basis of design, accessories, and finishes are listed in the Plumbing Fixture Schedule in the construction documents. This specification section summarizes the information in the schedule and provides the direction for installations.

1.2 SUBMITTALS

A. Provide Product Data for each type of plumbing fixture indicated in the schedule. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

B. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.

C. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. All plumbing installations including equipment, valves, and solder methods shall conform to the Reduction of Lead in Drinking Water Act.

C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

D. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

E. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
   1. Vitreous-China Fixtures: ASME A112.19.2M.
   2. Stainless-Steel Commercial Sinks: NSF 2 construction.

F. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
   1. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
   2. Faucets: ASME A112.18.1.
   3. NSF Potable-Water Materials: NSF 61.
   4. Pipe Threads: ASME B1.20.1.
   5. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
   6. Supply Fittings: ASME A112.18.1.
   7. Brass Waste Fittings: ASME A112.18.2.

G. Comply with the following applicable standards and other requirements specified for shower faucets:

   1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
   2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
   3. Hand-Held Showers: ASSE 1014.
   4. Hose-Coupling Threads: ASME B1.20.7.
   5. Pipe Threads: ASME B1.20.1.

H. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
   1. Brass and Copper Supplies: ASME A112.18.1.
   2. Manual-Operation Flushometers: ASSE 1037.
   3. Brass Waste Fittings: ASME A112.18.2.

4. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.

I. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Disposers: ASSE 1008 and UL 430.
2. Flexible Water Connectors: ASME A112.18.6.
3. Hose-Coupling Threads: ASME B1.20.7.
4. Off-Floor Fixture Supports: ASME A112.6.1M.
5. Pipe Threads: ASME B1.20.1.
6. Plastic Toilet Seats: ANSI Z124.5.
7. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.4 WARRANTY

A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace components of plumbing fixtures that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures of unit.
b. Mechanical failures of any moving parts.

2. Warranty Period for Commercial Applications: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LAVATORY FAUCETS

A. Lavatory Faucets, L-1:
1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

a. American Standard Companies, Inc.
b. Elkay Manufacturing Co.
c. Kohler Co.

2. Description: 2-Handle, Centerset. Coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
a. Finish: Polished chrome plate.

b. Mounting: Carrier wall hung, exposed.
c. Maximum Flow Rate: 0.35 gpm, unless otherwise indicated.
d. Operation: Wrist handles.
e. Drain: Grid.
f. Tempering Device: Mechanical. Contractor to adjust temperature in the field to approximately 100F and remove the tempering device handle.

2.2 JANITORS SINK FAUCET

A. Sink Faucets, MR-1:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

a. Fiat Products
b. Chicago Faucets.
c. Delta Faucet Company.
d. Elkay Manufacturing Co.
e. Speakman Company.

2. Description: Service sink faucet with stops in shanks, vacuum breaker, hose-thread outlet, and pail hook. Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.

a. Body Material: Commercial, solid brass.
b. Finish: Rough chrome plate.
c. Maximum Flow Rate: 2.5 gpm, unless otherwise indicated.
d. Mixing Valve: Two-lever handle.
e. Backflow Protection Device for Hose Outlet: Required.
f. Mounting: Back/wall, exposed.
g. Handle(s): Knob.
h. Spout Type: Rigid, solid brass.
i. Operation: Compression, manual.
j. Drain: Grid.

2.3 OUTDOOR SHOWER FAUCETS

A. Shower Faucets, SH-1:
1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

a. Symmons Industries, Inc. (Hydapipe)

2. Description: Single-handle thermostatic and pressure-balance valve. Vandal resistant head with ball joint on institutional type head bracket. Include hot- and cold-water indicators; check stops; and shower head, arm, and flange. Coordinate faucet inlets with supplies and outlet with diverter valve.
   a. Finish: Stainless steel covering 18 gauge with #4 brush finish
   b. Antiscald Device: Integral with mixing valve.
   c. Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.
   d. Shower Head: Provide Water Sense labeled 1.5 GPM faucet head per schedule
   e. Temperature Indicator: Integral with faucet.

2.4 SINK FAUCETS

A. Sink Faucets, S-1:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

      a. American Standard Companies, Inc.
      b. Elkay Manufacturing Co.
      c. Kohler Co.

   2. Description: Kitchen two handle lever faucet without spray. Swivel gooseneck water outlet with 12” height. Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.

      a. Body Material: Commercial, solid brass.
      b. Finish: Polished chrome plate.
      c. Maximum Flow Rate: 1.5 gpm, unless otherwise indicated.
      d. Mixing Valve: Two-lever handle.
      e. Centers: 8 inches.
      f. Mounting: Deck, exposed.
      g. Handle(s): Lever.
      h. Spout Type: Swivel gooseneck.
      i. Spout Outlet: Aerator.
      j. Operation: Compression, manual.
      k. Drain: Grid.

2.5 FLUSHOMETERS

A. Flushometers, WC-1 and U-1:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

      a. Kohler

b. Zurn
c. Sloan Valve Company.
d. American Standard

2. Description: Flushometer for urinal and water-closet-type fixture. Include brass body with corrosion-resistant internal components, non-hold-open feature, control stop with check valve, vacuum breaker, copper or brass tubing, and polished chrome-plated finish on exposed parts.

a. Internal Design: Diaphragm or piston operation.
b. Style: Exposed.
c. Inlet Size: NPS ¾ urinal, NPS 1 water closet.
d. Trip Mechanism: Oscillating, lever-handle actuator.
e. Consumption: 0.125 gal./flush urinal, 1.28 gal/flush water closet
f. Tailpiece Size: NPS 1-1/4 urinal, NPS 1-1/2 water closet, and standard length to top of bowl.

2.6 TOILET SEATS

A. Toilet Seats, WC-1:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. American Standard Companies, Inc.
b. Bemis Manufacturing Company.
c. Church Seats.
d. Kohler Co.
e. Olsonite Corp.

2. Description: Toilet seat for water-closet-type fixture.

a. Material: Molded, solid plastic.
b. Configuration: Open front without cover.
c. Size: Regular.
d. Hinge Type: CK, check.
e. Class: Standard commercial.
f. Color: White.

2.7 FIXTURE SUPPORTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Josam Company.
2. MIFAB Manufacturing Inc.
3. Smith, Jay R. Mfg. Co.
4. Tyler Pipe; Wade Div.
5. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
6. Zurn Plumbing Products Group; Specification Drainage Operation.

B. Water-Closet Supports, WC-1:

1. Description: Combination carrier designed for accessible standard mounting height of wall-mounting, water-closet-type fixture. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

C. Urinal Supports, U-1:

1. Description: Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture for wall-mounting, urinal-type fixture. Include steel uprights with feet.
2. Accessible-Fixture Support: Include rectangular steel uprights.

D. Lavatory Supports, L-1:

1. Description: Type II, lavatory carrier with concealed arms and tie rod for wall-mounting, lavatory-type fixture. Include steel uprights with feet.
2. Accessible-Fixture Support: Include rectangular steel uprights.

2.8 KITCHEN SINKS

A. Kitchen Sinks, S-1:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. Elkay Manufacturing Co.
   b. American Standard
   c. Kohler Co.
   d. Sloan

2. Description: One-bowl, commercial, counter-mounting, stainless-steel kitchen sink.

   a. Overall Dimensions: 25”x22”x6.5”
   b. Metal Thickness: 18 gauge.
   c. Bowl:

1) Drain: 3-1/2-inch outlet for disposer.

a) Location: Near back of bowl.

d. Sink Faucets: S-1
e. Supplies: NPS 1/2 chrome-plated copper with stops.
f. Drain Piping: NPS 1-1/2 chrome-plated, cast-brass P-trap; 0.045-inch- thick tubular brass waste to wall;and wall escutcheon(s).

2.9 SERVICE BASINS

A. Service Basins, MR-1:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. Crane Plumbing, L.L.C./Fiat Products.
   b. Precast Terrazzo Enterprises, Inc.
   c. Zurn Plumbing Products Group; Light Commercial Operation.

2. Description: Flush-to-wall, floor-mounting, precast terrazzo fixture with rim guard.

   a. Shape: Square.
   b. Size: 32 by 32 inches.
   c. Height: 12 inches.
   d. Rim Guard: On all top surfaces.
   e. Faucet: Sink MR-1.
   f. Drain: Grid with NPS 2 outlet.

2.10 LAVATORIES

A. Lavatories, L-1:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. American Standard Companies, Inc.
   b. Sloan
   c. Kohler Co.

2. Description: Accessible, wall-mounting, vitreous-china fixture.

   a. Type: Slab.
   b. Size: 22”x18” rectangular.
   c. Faucet Hole Punching: One hole.
   d. Faucet Hole Location: Top.

e. Color: White.
f. Faucet: Lavatory L-1 for separate drain.
g. Supplies: NPS 3/8 chrome-plated copper with stops.
h. Drain: Grid.
i. Drain Piping: NPS 1-1/4 chrome-plated, cast-brass P-trap; NPS 1-1/4, 0.032-inch-thick tubular brass waste to wall; and wall escutcheon.
j. Protective Shielding Guard(s): Required
k. Fixture Support: required for lavatory.

B. Lavatories, L-2:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. American Standard Companies, Inc.
   b. Kohler Co.
   c. Sloan

2. Description: Accessible Undercounter-mounting, vitreous-china fixture.

   a. Type: Flat rim with ledge.
   b. Oval Lavatory Size: 17”x14”.
   c. Faucet Hole Punching: One hole.
   d. Faucet Hole Location: Deck.
   e. Color: White.
   f. Faucet: Lavatory L-1 for separate drain.
   g. Supplies: NPS 3/8 chrome-plated copper with stops.
   h. Drain: Grid.
   i. Drain Piping: NPS 1-1/4 chrome-plated, cast-brass P-trap; NPS 1-1/4, 0.032-inch-thick tubular brass waste to wall; and wall escutcheon.

2.11 WATER CLOSETS

A. Water Closets, WC-1:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. American Standard Companies, Inc.
   b. Kohler Co.
   c. Sloan

2. Description Accessible, floor-mounting, back-outlet, vitreous-china fixture designed for flushometer valve operation.
   a. Style: Flushometer valve.

      1) Bowl Type: Elongated with siphon-jet design.

2) Design Consumption: 1.6 gal./flush.
3) Color: White.

b. Flushometer: WC-1
c. Toilet Seat: required
d. Fixture Support: Required, water-closet support combination carrier.

2.12 URINALS

A. Urinals, U-1:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

   a. American Standard Companies, Inc.
   b. Kohler Co.
   c. American Standard

2. Description: Accessible, wall-mounting, back-outlet, vitreous-china fixture designed for flushometer valve operation.

   a. Type: Blowout.
   b. Strainer or Trapway: Integral cast strainer with integral trap.
   c. Design Consumption: 0.125 gal./flush.
   d. Color: White.
   e. Supply Spud Size: NPS 1-1/4.
   f. Outlet Size: NPS 2.
   g. Flushometer: required
   h. Fixture Support: required, urinal chair carrier.

2.13 DRINKING FOUNTAINS

A. Drinking Fountains DF-1: Stainless steel, recessed.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   a. Elkay Manufacturing Co.

2. Standard: Comply with NSF 61.
3. Receptor Shape: Concave with flush wall flange.
4. Bubbler: One, with adjustable stream regulator, located on deck.
5. Control: Push button.
6. Drain: Grid with NPS 1-1/4 minimum horizontal waste and trap, complying with ASME A112.18.2/CSA B125.2.

7. Supply: NPS 3/8 with shutoff valve.
8. Support: Mounting frame or brackets for attaching to substrate.

B. Drinking Fountains DF-2: Stainless steel, free standing.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Elkay Manufacturing Co.

2. Standard: Comply with NSF 61.
3. Receptor Shape: Concave with pedastal.
4. Bubbler: One, with adjustable stream regulator, located on deck.
5. Control: Push button.
6. Drain: Grid with NPS 1-1/4 minimum horizontal waste and trap, complying with ASME A112.18.2/CSA B125.2.
7. Supply: NPS 3/8 with shutoff valve.
8. Support: Marine Grade Freestanding Pedestal

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.

C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

D. Install wall-mounting fixtures with tubular waste piping attached to supports.

E. Install fixtures level and plumb according to roughing-in drawings.

F. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

G. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

H. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

I. Install toilet seats on water closets.

J. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

K. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

L. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "General Plumbing Requirements."

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

3.4 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls. Set maximum faucet discharge temperature at 100F.

B. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 4000

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 GENERAL REQUIREMENTS

A. Examine job site and verify all site conditions prior to starting work. Bring any discrepancy between the contract documents and the actual field conditions to the attention of the architect/engineer.

B. The drawings are diagrammatic. Coordinate in the field, with the architect and with all trades, the exact location of equipment, valves, thermostats, etc. and routing of ductwork, piping, and sleeves.

C. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

E. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces.

F. Perform work in accordance with rules, regulations, standards, codes, ordinances, and laws of local, state, and federal governments, and other authorities having jurisdiction and be responsible for compliance therewith.

G. Obtain all necessary approvals, permits and inspections. Pay all associated fees.

H. Guarantee all systems and work for a period of one (1) year from date of final acceptance. See other warranty requirements for specific equipment in subsequent spec sections.

I. Contractor shall maintain a notated set of “as-built” drawings on site showing all deviations from the contract drawings and shall turn them over to the architect/engineer upon substantial completion.

J. All materials shall be new and of commercial grade and bear the underwriter's label where applicable.

K. Locate all existing utilities in the field and make serviceable connections to same.

L. Obtain approval from the building owner's representative prior to any interruption of building systems. Coordinate acceptable working hours with same.

M. All cutting and patching required for mechanical installations is by the mechanical contractor. Core drill or saw cut all masonry and restore all surfaces to original condition, to match adjacent ad to satisfaction of architect and owner. Associated painting and finishing are by the general contractor unless noted otherwise.

N. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment. Field welding shall comply with AWS D1.1.

O. At the time of bid the mechanical contractor shall indicate the controls contractor and manufacturer of the controls system that is intended for the project. Provide a price for the controls scope of work as a break out number in the bid. See controls specification for more information.

1.3 GENERAL PRODUCTS

A. This Section includes the following:

1. Mechanical contractor responsibilities for owner training.
2. Submittal requirements.
3. Mechanical contractor coordination with other trades.
4. Piping materials and installation instructions common to most piping systems.
5. Dielectric fittings.
6. Sleeves.
7. Mechanical sleeve seals.
8. Escutcheons.
9. Equipment installation requirements common to equipment sections.
10. Painting and finishing.
11. Concrete bases.
12. Supports and anchorages.

1.4 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

D. All workmanship shall conform with all laws, codes, and ordinances of the bodies having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 FIELD TESTING

A. The installing contractor is responsible for the execution, notification, and documentation of the results of the following field tests, coordinated with the project schedule construction milestones:

1. Duct system leak testing (after branch connections are made to the main). The duct system test requirements are listed in specification section 23 3113 “Metal Ducts”. Provide test reports to the engineer for approval.

2. Hydronic system pressure testing. Prior to testing all lines shall be cleaned and flushed per the specifications. The hydronic system test requirements are listed in specification section 23 2113 “Hydronic Piping”. Provide test reports to the engineer for approval.

3. Point to point testing of the automatic control systems as well as monitoring points to the user interface, to be witnessed by the engineer. The control system demonstration requirements are given is specification section 23 09 00 “Instrumentation and Control”.

1.8 INSTRUCTING FACILITIES PERSONNEL

A. Contractor and factory personnel are required to train the Facilities personnel and/or building owner on the operation and maintenance of all scheduled equipment in this contract as part of the scope of work. Include one 4 hour training period at the completion of the project for owner instruction on the equipment installed, and another 4 hour training period on the control system installed and software use.

B. The contractor shall provide three copies of bound operation and maintenance manuals for the new equipment installed. The binders shall also include a copy of the approved submittals. General catalog data for these owner’s manuals are unacceptable. Provide manufacturer’s preventative maintenance data and clearly indicate the drawing tags for the equipment and the equipment selected for this contract.

1. Include the manufacturer’s and contractor’s name, address, and phone number with the owner’s manual for warranty services.
2. Include warranty information in the owner’s manuals.
3. Include control diagrams, including the Building Automation System Architecture Diagram, sequence of operation for each piece of equipment, and service instructions for all controllers (calibration, trouble shooting, etc.).
4. Provide one section in the O&M manuals for manufacturer’s preventative maintenance procedures.

1.9 MECHANICAL-ELECTRICAL COORDINATION

A. All motors included for new equipment will be provided by the mechanical contractor, and wired by the electrical contractor.

B. All 120V (and above) wiring is to be done by the electrical contractor under division 26. All lower voltage wiring is to be done by the controls contractor. All data wiring necessary to operate the new digital control system is to be by the controls contractor, in accordance with specification section 23 0900.

C. Coordinated drawings shall be submitted prior to construction of new work. The coordinated drawings shall show all HVAC and Plumbing installation along with cable tray installation, electrical conduit runs, lighting, and sprinkler work.

D. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed to accommodate electrical and control wiring.

E. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces.

1.10 SUBMITTALS

A. Each Submittal shall be identified by the following:
   1. Project Name
   2. Specification Section
   3. Drawing Numbers
   4. Product data submittals shall include but not be limited to:
      a. Manufacturer and Model Number.
      b. Complete electrical data and wiring diagrams.
      c. Dimensions, capacities, ratings, materials, finishes, special features and storage conditions.
      d. Recommended installation procedures, performance, and conditions of performance, testing, and calibration certifications.
   5. For equipment submitted that is not a basis of design, the contractor is to ensure the ability to fit in the original space allotted, the ability to be routed into the building and all required access in maintained, and indicated such on the submittal.
   6. Each submittal shall clearly identify which product and components are being furnished and eliminate reference to units, components and features not being furnished.

1.11 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. Minimum access door size shall be 18”x18”, unless noted otherwise on the drawings. Access doors to be primed to prep for ceiling finish paint.

D. At the time of system start up, provide construction filters in all air handling systems. Provide temporary filter material on all return grilles in occupied areas where construction activity is ongoing. Replace filter material as necessary during temporary heating/cooling operation. At the completion of construction provide final filters in all air handling equipment.

E. Provide temporary construction strainers in all hydronic systems for flushing and initial fill. After the hydronic systems are in operation for one to two weeks, replace all strainers with final strainers.

F. Submit coordination drawings prior to construction of new work. The coordinated drawings shall show all HVAC and plumbing installations, along with cable tray, conduit, lighting fixtures, lighting controls, and sprinkler work. Include major structural elements. Indicate clearance below each item. Provide floor plans, ceiling plans, and critical sections showing clearance. Design Revit model is available to assist with the coordinated shop drawing effort. Autocad backgrounds can be provided.

PART 2 - PRODUCTS

2.1 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Flanges:

1. Description:

a. Standard: ASSE 1079.
b. Factory-fabricated, bolted, companion-flange assembly.
c. Pressure Rating: 150 psig.
d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric Nipples:

1. Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.2 SLEEVES

A. Steel Pipe: ASTM A 120, Schedule 40, galvanized, plain ends.

B. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

C. All sleeves in above grade floors shall be extended 2" above the floor slab, to prevent water from leaking down through pipe penetration openings.

2.3 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Available Manufacturers:

a. Advance Products & Systems, Inc.
b. Metraflex Co.
c. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Plastic . Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.4 ESCUTCHEONS

A. Provide escutcheons at all locations where piping, exposed to view, penetrates walls partitions, floors and ceilings. Use one of the following types:

B. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.

C. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated.

2.5 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 DUCTWORK SYSTEMS – COMMON REQUIREMENTS

A. Install ductwork according to the following requirements and Division 23 Sections specifying ductwork systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of ductwork systems. Indicated locations and arrangements were used to size duct and calculate friction loss, fan sizing, and other design considerations. Install ductwork as indicated unless deviations to layout are approved on Coordination Drawings.

C. All exposed ductwork, and ductwork components visible thru diffusers or grilles, shall be primed and prepared for field painting, unless otherwise noted on the drawings.

D. All ductwork dampers located above hard ceilings shall be provided with cable or remote operated dampers to prevent the installation of a ceiling access panels. All volume dampers shall be accessible for balancing, and shall be provided at every diffuser and grille.

E. Exposed ductwork requiring external insulation shall be provided with rigid board type insulation.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. The mechanical contractor is responsible for draining any existing hydronic systems for the installation of new piping or equipment. The shut-down and draining of systems shall be scheduled through the building owner or architect. The mechanical contractor is responsible for filling and bleeding all hydronic systems at the completion of the work.

D. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Select system components with pressure rating equal to or greater than system operating pressure.

G. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

    a. Piping with Fitting or Sleeve Protruding from Wall.
    b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    c. Insulated Piping: Two-piece, stamped-steel type with spring clips. If piping is run in a finished space, provide chrome plated finish on the escutcheons.
    d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
    g. Bare Piping in Equipment Rooms: One-piece, cast-brass type.

H. Install sleeves for pipes passing through concrete and masonry walls, grade beams, interior walls, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with exterior walls and roof.
2. Extend sleeves installed in floors above grade 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring when required.

3. Install sleeves in new walls and slabs as new walls and slabs are constructed.
4. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

    a. Steel Pipe Sleeves: For pipes smaller than NPS 10.

b. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.

1) Seal space outside of sleeve fittings with grout.

5. For all interior penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint.

I. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

J. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

K. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

L. Verify final equipment locations for roughing-in.

M. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.4 PAINTING

A. All piping and insulation that runs exposed through a finished space shall be primed and painted white by the mechanical contractor.

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 CONCRETE BASES

A. All floor mounted equipment is to be installed on a minimum of 4” high concrete base.

B. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions.

1. Construct concrete bases not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete.

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1.

3.7 GROUTING

A. Mix and install grout for mechanical equipment base bearing surfaces, pumps, concrete patching, and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 23 0500

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, General Conduct of the Work and Special Requirements, and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Metal pipe hangers and supports.
   2. Trapeze pipe hangers.
   3. Thermal-hanger shield inserts.
   4. Fastener systems.

B. Related Sections:
   1. Division 23 Section "Vibration Controls for HVAC Piping and Equipment" for vibration isolation devices.
   2. Division 23 Section "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
   1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
   2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.6 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
   3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
   4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
   5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:
   1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
   2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Klo-Shure by Hydra-Zorb.
   2. National Pipe Hanger Corporation.
   3. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
   4. Piping Technology & Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
   1. Properties: Nonstaining, noncorrosive, and nongaseous.
   2. Design Mix: 5000-psi , 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
   1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
   2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:
   1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

G. Install lateral bracing with pipe hangers and supports to prevent swaying.

H. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

I. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

K. Insulated Piping:
   1. Attach clamps and spacers to piping.
      a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
      b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
      c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
   2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
   3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
   4. Shield Dimensions for Pipe: Not less than the following:
      a. NPS 1/4 to NPS 3-1/2 : 12 inches long and 0.048 inch thick.
      b. NPS 4 : 12 inches long and 0.06 inch thick.
      c. NPS 5 and NPS 6 : 18 inches long and 0.06 inch thick.
      d. NPS 8: 24 inches long and 0.075 inch thick.
   5. Pipes NPS 8: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
   6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.3 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.4 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils .

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.5 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

D. Use carbon-steel pipe hangers and supports and attachments for general service applications.

E. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

F. Use padded hangers for piping that is subject to scratching.

G. Use thermal-hanger shield inserts for insulated piping and tubing.

H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 .
   2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F ,pipes NPS 4 to NPS 24 , requiring up to 4 inches of insulation.
   3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 , requiring clamp flexibility and up to 4 inches of insulation.
   4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
   5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 .
   6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 , with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
   7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 , with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
   8. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
   9. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 , from two rods if longitudinal movement caused by expansion and contraction might occur.
   10. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24 , from single rod if horizontal movement caused by expansion and contraction might occur.

I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 .
   2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.

K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. C-Clamps (MSS Type 23): For structural shapes.
6. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
7. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
8. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

M. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

N. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Duct labels.
4. Valve tags.

1.2 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch Aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Equipment Label Content: Include equipment's drawing designation or unique equipment number.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.3 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch , and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Chilled-Water Piping:

    a. Background Color: green.
    b. Letter Color: white.

2. Condenser-Water Piping:

    a. Background Color: green.
    b. Letter Color: white.

3. Heating Water Piping:

    a. Background Color: yellow.
    b. Letter Color: black.

4. Refrigerant Piping:

    a. Background Color: green.
    b. Letter Color: white.

5. Low-Pressure Steam Piping:

    a. Background Color: purple.
    b. Letter Color: white.

6. High-Pressure Steam Piping:

a. Background Color: purple.
b. Letter Color: white.

7. Steam Condensate Piping:

a. Background Color: purple.
b. Letter Color: white.

3.4 DUCT LABEL INSTALLATION

A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:

1. Blue: For supply ducts.
2. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
3. ASME A13.1 Colors and Designs: For hazardous material exhaust.

B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. 1-1/2 inches,

2. Valve-Tag Color:

a. Natural.

3. Letter Color:

a. Black.

END OF SECTION 23 0553

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 SUBMITTALS

A. Qualification Data: Within 45 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Certified TAB reports as described in the Final Report section.

C. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.5 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by NEBB.

B. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.

C. TAB Report Forms: Use standard TAB contractor's forms.

D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

1.6 PROJECT CONDITIONS

A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Division 23 Section "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures as follows:
   1. Certifications on all instruments to be used throughout the testing. Certification must be documented within the previous 6 months.
   2. Résumés and Certification of individuals who will be balancing the systems.
   3. Detailed step-by-step plans for each procedure to be performed by the TAB Contractor.
   4. Sample forms to be used for each measurement.
   5. Sample balancing report.

B. Complete system-readiness checks and prepare reports. Verify the following:

   1. Permanent electrical-power wiring is complete.
   2. Hydronic systems are filled, clean, and free of air.
   3. Automatic temperature-control systems are operational.
   4. Equipment and duct access doors are securely closed.
   5. Balance, smoke, and fire dampers are open.
   6. Isolating and balancing valves are open and control valves are operational.
   7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
   8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 15 Section "HVAC Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare single line schematic diagrams of systems' "as-built" duct layouts. Indicate the locations of each test on the single line drawing.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

    a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
    d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

    a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure the outside air and relief air from the air handling system. Set the minimum and maximum stops on the outside air damper per the values in the air handling unit schedule. Set the corresponding relief air values. Calibrate the outside air flow monitoring station, if applicable. Report the results of the outside air and relief air settings in writing in the final TAB report.
5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions. Set the final speed on the supply fan VFD and record the setting as part of the final balancing report.
6. Obtain approval from the engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Division 23 Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-

cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

E. Record the fan-performance data at minimum ventilation air flow.

F. Set the outside air damper at the maximum setting for economizer mode. Verify the return air damper and exhaust air damper correspond to the proper positions. Record the supply, return, exhaust, and outside air flows at this economizer position.

3.6 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Heating-Water Flow Rate: Plus or minus 10 percent.
4. Cooling-Water Flow Rate: Plus or minus 10 percent.

3.7 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. The single line diagrams indicated where each test was performed.
2. Pump curves.
3. Fan curves.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.
12. Data for terminal units, including manufacturer's name, type, size, and fittings.
13. Notes to explain why certain final data in the body of reports vary from indicated values.
14. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Fan drive settings including settings and percentage of maximum pitch diameter.
    e. Settings for supply-air, static-pressure controller.

f. Other system operating conditions that affect performance.

D. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches, and bore.
i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
j. Number, make, and size of belts.
k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Preheat-coil static-pressure differential in inches wg.
g. Cooling-coil static-pressure differential in inches wg.
h. Heating-coil static-pressure differential in inches wg.
i. Outdoor airflow in cfm.
j. Return airflow in cfm.
k. Outdoor-air damper position.
l. Return-air damper position.

E. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.
b. Location indicated on single line diagram.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch o.c.
f. Make and model number.
g. Face area in sq. ft..
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
e. Return-air, wet- and dry-bulb temperatures in deg F.
f. Entering-air, wet- and dry-bulb temperatures in deg F.
g. Leaving-air, wet- and dry-bulb temperatures in deg F.
h. Water flow rate in gpm.
i. Water pressure differential in feet of head or psig.
j. Entering-water temperature in deg F.
k. Leaving-water temperature in deg F.
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psig.
n. Refrigerant suction temperature in deg F.
o. Inlet steam pressure in psig.

F. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Coil identification.
d. Capacity in Btu/h.
e. Number of stages.
f. Connected volts, phase, and hertz.
g. Rated amperage.
h. Air flow rate in cfm.
i. Face area in sq. ft..
j. Minimum face velocity in fpm.

2. Test Data (Indicated and Actual Values):

    a. Heat output in Btu/h.
    b. Air flow rate in cfm.
    c. Air velocity in fpm.
    d. Entering-air temperature in deg F.
    e. Leaving-air temperature in deg F.
    f. Voltage at each connection.
    g. Amperage for each phase.

G. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

    a. System identification.
    b. Location.
    c. Make and type.
    d. Model number and size.
    e. Manufacturer's serial number.
    f. Arrangement and class.
    g. Sheave make, size in inches, and bore.
    h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Motor Data:

    a. Motor make, and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.
    e. Sheave make, size in inches, and bore.
    f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
    g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

    a. Total airflow rate in cfm.
    b. Total system static pressure in inches wg.
    c. Fan rpm.
    d. Discharge static pressure in inches wg.
    e. Suction static pressure in inches wg.

H. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft..
g. Indicated air flow rate in cfm.
h. Indicated velocity in fpm.
i. Actual air flow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

I. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone.
c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft..

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.
b. Air velocity in fpm.
c. Preliminary air flow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final air flow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

J. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

a. System and air-handling-unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

    a. Air flow rate in cfm.
    b. Entering-water temperature in deg F.
    c. Leaving-water temperature in deg F.
    d. Water pressure drop in feet of head or psig.
    e. Entering-air temperature in deg F.
    f. Leaving-air temperature in deg F.

3.8 INSPECTIONS

A. Final Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report. The final inspection shall be performed in the presence of the engineer.
2. Check the following for each system:

    a. Measure airflow of at least 10 percent of air outlets, selected by the engineer.
    b. Measure water flow of at least 5 percent of terminals.
    c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
    d. Verify that balancing devices are marked with final balance position.
    e. Note deviations from the Contract Documents in the final report.

B. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

3.9 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB on 10% of the systems during near-peak summer

and winter conditions. The engineer shall witness all peak testing and shall indicate which equipment and tests to perform.

END OF SECTION 23 05 93

SECTION 23 07 00

HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Insulation Materials:
2. Insulating cements.
3. Adhesives.
4. Mastics.
5. Factory-applied jackets.
6. Field-applied jackets.
7. Tapes.
8. Securements.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.4 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields.

B. Insulation materials shall not be installed on systems until all necessary tests have been conducted and insulated surfaces have been thoroughly cleaned and are in a dry state.

C. Protect insulation during construction by covering with plastic to prevent accumulation of dust and debris. Protection shall be kept in place until completion of construction.

D. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.5 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. All adhesives sealers, vapor barrier coatings, etc. used in conjunction with insulation shall be compatible with the material to which they are applied. Any cement, sealer, or coating used shall be resistant to vermin and mold and shall be durable. Solvent based adhesives, coatings, and sealants shall not be used in occupied areas. The use of solvent based adhesives, coatings, and sealants for new construction shall be coordinated with building occupancy and other environmental health and safety issues during construction.

B. Pipe fittings, specialties, equipment and valves shall be protected using custom premolded fitting covers and insulation to allow frequent removal and reinstallation without damaging the jacket. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

C. Products shall not contain asbestos, lead, mercury, or mercury compounds.

D. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Aeroflex USA Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corp.; Duct Wrap.
b. Johns Manville; Microlite.
c. Knauf Insulation; Duct Wrap.
d. Manson Insulation Inc.; Alley Wrap.
e. Owens Corning; All-Service Duct Wrap.

H. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation without factory-applied jacket. For equipment applications, provide insulation without factory-applied jacket.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corp.; Commercial Board.
b. Johns Manville; 800 Series Spin-Glas.
c. Knauf Insulation; Insulation Board.
d. Manson Insulation Inc.; AK Board.
e. Owens Corning; Fiberglas 700 Series.

I. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Johns Manville; Micro-Lok.
b. Knauf Insulation; 1000 Pipe Insulation.

c. Manson Insulation Inc.; Alley-K.
d. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, without factory-applied jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Flexible Elastomeric and Adhesive: Comply with MIL-A-24179A, Type II, Class I.

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

E. PVC Jacket Adhesive: Compatible with PVC jacket.

2.4 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
2. Service Temperature Range: Minus 50 to plus 180 deg F.
3. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White or gray.

B. FSK and Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.

C. ASJ Flashing Sealants, and Vinyl, and PVC Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.

5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. Metal Jacket:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; Metal Jacketing Systems.
b. PABCO Metals Corporation; Surefit.

c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.

   a. Sheet and roll stock ready for shop or field sizing.
   b. Finish and thickness are indicated in field-applied jacket schedules.
   c. Moisture Barrier for Indoor Applications: 1-mil- thick, heat-bonded polyethylene and kraft paper.
   d. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
   e. Factory-Fabricated Fitting Covers:

      1) Same material, finish, and thickness as jacket.
      2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
      3) Tee covers.
      4) Flange and union covers.
      5) End caps.
      6) Beveled collars.
      7) Valve covers.
      8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

3. Stainless-Steel Jacket: ASTM A 167 or ASTM A 240/A 240M.

   a. Sheet and roll stock ready for shop or field sizing.
   b. Material, finish, and thickness are indicated in field-applied jacket schedules.
   c. Moisture Barrier for Indoor Applications: 1-mil- thick, heat-bonded polyethylene and kraft paper.
   d. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
   e. Factory-Fabricated Fitting Covers:

      1) Same material, finish, and thickness as jacket.
      2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
      3) Tee covers.
      4) Flange and union covers.
      5) End caps.
      6) Beveled collars.
      7) Valve covers.
      8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

D. Underground Direct-Buried Jacket: 125-mil- thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pittsburgh Corning Corporation; Pittwrap.
b. Polyguard; Insulrap No Torch 125.

E. Self-Adhesive Outdoor Jacket: 60-mil- thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with white aluminum-foil facing.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Polyguard; Alumaguard 60.

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 11.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 6.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Width: 2 inches.
2. Thickness: 6 mils.
3. Adhesion: 64 ounces force/inch in width.
4. Elongation: 500 percent.
5. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Width: 2 inches.
2. Thickness: 3.7 mils.
3. Adhesion: 100 ounces force/inch in width.
4. Elongation: 5 percent.
5. Tensile Strength: 34 lbf/inch in width.

2.9 SECUREMENTS

A. Bands:

1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 3/4 inch wide with wing seal .
2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal .

B. Insulation Pins and Hangers: Capable of supporting 20 pounds each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

D. Wire: 0.062-inch soft-annealed, stainless steel.

2.10 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105 or 5005; Temper H-14.

C. Stainless-Steel Corner Angles: 0.024 inch thick, minimum 1 by 1 inch, stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304 or 316.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Pipe fittings, specialties, equipment and valves shall be protected using custom premolded fitting covers with insulation (as defined in the schedule) to allow frequent removal and reinstallation without damaging the jacket.

B. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

C. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

D. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

E. Install insulation with longitudinal seams at top and bottom of horizontal runs.

F. Install multiple layers of insulation with longitudinal and end seams staggered.

G. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

H. Keep insulation materials dry during application and finishing.

I. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

J. Install insulation with least number of joints practical.

K. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

L. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

M. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.

N. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

O. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

P. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

Q. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems" for firestopping and fire-resistive joint sealers.

C. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

C. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

D. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

E. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.7 FINISHES

A. Duct, Equipment, and Pipe Insulation exposed to view: Paint jacket with paint system identified below and as specified by the architect.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint.

a. Finish Coat Material: Interior, flat, white primer coats. Architect to indicate final finish color for all exposed insulation systems.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.8 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. All supply and outdoor air, except exposed supply air in occupied space.
2. Indoor, return located above ceilings or in non-conditioned spaces.
3. Outdoor ductwork.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Factory-insulated flexible ducts.
3. Factory-insulated plenums and casings.
4. Flexible connectors.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.
7. Relief air duct.
8. Low-temperature exhaust air duct.

3.9 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Supply and return air ductwork:
   1. Mineral-Fiber Blanket for concealed ductwork only: 2 inches thick and 1-lb/cu. ft. nominal density.
   2. Mineral-Fiber Board for exposed ductwork and concealed ductwork: 1.5 inches thick and 3-lb/cu. ft. nominal density. For round ductwork provide pre-formed pipe type insulation.

B. Outdoor Air ductwork:
   1. Mineral-Fiber Blanket for concealed ductwork only: 2 inches thick and 1-lb/cu. ft. nominal density.
   2. Mineral-Fiber Board for exposed ductwork and concealed ductwork: 2 inches thick and 6-lb/cu. ft. nominal density. For round ductwork provide pre-formed pipe type insulation.

3.10 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.

B. For rectangular ductwork exposed to weather pitch insulation minimum ¼" per foot to prevent rainwater from accumulating on top of the duct or plenum. Additionally apply a 1/16" coat of mastic to the insulation. Embed one layer of open mesh fiberglass or polyester reinforcing cloth into the mastic, apply 1/8" final coat of mastic covering the cloth completely. As an alternate, cover insulation board with corrugated rolled aluminum jacketing installed in strict accordance with manufacturer's recommendations.

3.11 PIPING INSULATION SCHEDULE, GENERAL

A. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

   1. Drainage piping located in crawl spaces.
   2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be one of the following:
   a. Flexible Elastomeric: 3/4 inch thick.
   b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

B. Refrigerant Piping

1. Flexible Cellular on the suction and liquid lines, both indoor and outdoor, 0.5” thickness.

SECTION 23 23 00

REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:

1. Thermostatic expansion valves.
2. Solenoid valves.
3. Hot-gas bypass valves.
4. Filter dryers.
5. Strainers.
6. Pressure-regulating valves.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.

1. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

1.5 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.6 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
4. Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

2.2 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

B. Packed-Angle Valves:

1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

C. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

D. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

E. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.
8. Manual operator.

F. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: 40 deg F.
6. Reverse-flow option (for heat-pump applications).
7. End Connections: Socket, flare, or threaded union.
8. Working Pressure Rating: 700 psig.

G. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.

1. Body, Bonnet, and Seal Cap: Ductile iron or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
5. Seat: Polytetrafluoroethylene.
6. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
7. End Connections: Socket.
8. Throttling Range: Maximum 5 psig.
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 240 deg F.

H. Straight-Type Strainers:

1. Body: Welded steel with corrosion-resistant coating.
2. Screen: 100-mesh stainless steel.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig.
5. Maximum Operating Temperature: 275 deg F.

I. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.

2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig.
6. Maximum Operating Temperature: 275 deg F.

J. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 240 deg F.

K. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 240 deg F.

L. Permanent Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 240 deg F.

M. Receivers: Comply with ARI 495.

1. Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
2. Comply with UL 207; listed and labeled by an NRTL.
3. Body: Welded steel with corrosion-resistant coating.
4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
5. End Connections: Socket or threaded.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

N. Liquid Accumulators: Comply with ARI 495.

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 deg F.

2.3 REFRIGERANTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines NPS 3-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

B. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection, unless provided by factory.

C. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.

D. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

E. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.
4. Compressor.

F. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or

panels as specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

L. Install refrigerant piping in protective conduit where installed belowground.

M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

N. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

P. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

Q. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

3.5 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Spring hangers to support vertical runs.
3. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
7. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
8. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.
9. NPS 4: Maximum span, 12 feet; minimum rod size, 1/2 inch.

D. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.

d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 23 31 13

METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 2- to plus 8-inch wg, as follows:.

1. Single-wall rectangular ducts and fittings.
2. Double-wall rectangular ducts and fittings.
3. Single-wall round ducts and fittings.
4. Double-wall round ducts and fittings.
5. Sheet metal materials.
6. Duct liner.
7. Sealants and gaskets.
8. Hangers and supports.

B. Related Sections include the following:

1. Division 23 Section "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select size and type of air-moving and -distribution equipment and other air system components. Changes to layout or configuration of duct system must be specifically approved in writing by the Engineer. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

B. All supply, return, and building exhaust ductwork is sized for a maximum of 1,000 FPM. Deviations from the contract cannot result in higher velocities than that, and should target a static pressure drop of 0.08” per 100 feet or less. Kitchen exhaust air ductwork must have a minimum velocity of 500 FPM, and is sized on the drawings closer to 1,200 FPM.

1.3 SUBMITTALS

A. Coordination Drawings: Provide 3D type shop drawings of ductwork, air devices, hangers, and all ductwork accessories. All dimensions, elevations, and air device airflows shall be shown. See “General HVAC Requirements” spec section for more information. Provide plan view shop drawings with coordinated reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Ceiling suspension assembly members.
2. Hydronic piping, plumbing piping, electrical conduits, and other systems installed in the ceiling space, coordinated with the ductwork.
3. Ceiling- and wall-mounting access doors and panels required to provide access to dampers and other operating devices.
4. Ceiling-mounting items, including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

B. Field quality-control pressure test reports, submitted to the engineer as the ductwork is completed.

1.4 QUALITY ASSURANCE

A. NFPA Compliance:

1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
3. Comply with NFPA and UL codes for kitchen exhaust ducts for Type 1 systems.

B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated. All ductwork shall be galvanized sheet metal unless otherwise indicated on the drawings.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support

intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 DOUBLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. Rectangular Ducts: Fabricate ducts with indicated dimensions for the inner duct.

B. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Maximum Thermal Conductivity: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
2. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
3. Coat insulation with antimicrobial coating.
4. Cover insulation with polyester film complying with UL 181, Class 1.

F. Inner Duct: Minimum 0.028-inch perforated galvanized sheet steel having 3/32-inch- diameter perforations, with overall open area of 23 percent.

G. Formed-on Transverse Joints (Flanges): Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Traverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

H. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated. All round spiral ductwork shall be galvanized sheet metal unless otherwise noted on the drawings.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.4 DOUBLE-WALL ROUND DUCTS AND FITTINGS

A. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension) of the inner duct.

B. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.

1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

    a. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

2. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

    a. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
    b. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Inner Duct: Minimum 0.028-inch perforated galvanized sheet steel having 3/32-inch- diameter perforations, with overall open area of 23 percent.

D. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Maximum Thermal Conductivity: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
2. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
3. Coat insulation with antimicrobial coating.
4. Cover insulation with polyester film complying with UL 181, Class 1.

2.5 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Metal: Lock-forming quality; complying with ASTM A 653/A 653M and having G60 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

E. Kitchen exhaust duct to be welded steel throughout entire run. Provide grease cleanouts at each turn of the ductwork, and as shown on the plans. All kitchen exhaust duct to have a 2-Hr rated fire wrap throughout the interior runs.

2.6 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. CertainTeed Corporation; Insulation Group.
    b. Johns Manville.
    c. Knauf Insulation.
    d. Owens Corning.
    e. Maximum Thermal Conductivity:

        1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

2. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
7. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.
    c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

8. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.7 SEALANT MATERIALS

A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.

B. Joint and Seam Tape: 2 inches wide; glass-fiber-reinforced fabric.

C. Tape Sealing System: Woven-fiber tape impregnated with gypsum mineral compound and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.

D. Water-Based Joint and Seam Sealant: Flexible, adhesive sealant, resistant to UV light when cured, UL 723 listed, and complying with NFPA requirements for Class 1 ducts.

E. Solvent-Based Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant formulated with a minimum of 75 percent solids.

F. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

G. Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.

2.8 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

B. Hanger Materials: Galvanized sheet steel or threaded steel rod.
   1. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.

   1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

2.9 RECTANGULAR DUCT FABRICATION

A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
2. Deflection: Duct systems shall not exceed deflection limits according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.

C. Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.

1. Duct Size: Maximum 30 inches wide and up to 2-inch wg pressure class.
2. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.

D. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of nonbraced panel area unless ducts are lined.

PART 3 - EXECUTION

3.1 DUCT APPLICATIONS

A. Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:

1. Supply Ducts within mechanical rooms: 3-inch wg.
2. Supply Distribution Ductwork: 2-inch wg.
3. Return Ducts (Negative Pressure): 2-inch wg.
4. Exhaust Ducts (Negative Pressure): 2-inch wg.
5. Outside Air Ducts (Negative Pressure): 2-inch wg.

B. All ductwork shall be constructed to SMACNA “Seal Class A”. All transverse joints, longitudinal seams, and duct wall penetrations shall be sealed, regardless of pressure class.

3.2 DUCT INSTALLATION

A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.

B. Install round ducts in lengths not less than 12 feet unless interrupted by fittings.

C. Install ducts with fewest possible joints.

D. Install fabricated fittings for changes in directions, size, and shape and for connections.

E. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches, with a minimum of 3 screws in each coupling.

F. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.

J. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.

K. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.

L. Electrical Equipment Spaces: Route ducts to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2 inches.

N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, sleeves, and firestopping sealant. Fire and smoke dampers are specified in Division 15 Section "Duct Accessories." Firestopping materials and installation methods are specified in Division 7 Section "Through-Penetration Firestop Systems."

O. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction."

P. Paint interiors of metal ducts, that do not have duct liner, for 24 inches upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 painting Sections.

3.3 SEAM AND JOINT SEALING

A. Seal duct seams and joints according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for duct pressure class indicated.

B. Seal ducts before external insulation is applied.

3.4 HANGING AND SUPPORTING

A. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection. Horizontal hangers shall not exceed 10’ distance.

B. Support vertical ducts at maximum intervals of 16 feet and at each floor.

C. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

D. Install concrete inserts before placing concrete.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors according to Division 23 Section "Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test 100 percent of all interior installed ductwork for each designated pressure class.
3. Interior supply, return, outside air, and general exhaust systems shall have a maximum of 5% system leakage, tested at 1.25 times the expected operating pressure.

4. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
5. Test for leaks before applying external insulation.
6. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
7. Give seven days' advance notice to the design engineer for testing.
8. All required blank off plates, duct connections, dampers, and test rigs shall be provided by the installing contractor as part of this scope.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

    a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.8 DUCT CLEANING

A. Clean new and existing duct system(s) within the work area before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.

2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.9 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

END OF SECTION 23 31 13

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Back draft dampers.
2. Manual volume dampers.
3. Cable/Remote operated volume dampers.
4. Fire dampers.
5. Fire/smoke dampers.
6. Turning vanes.
7. Duct-mounted access doors.
8. Flexible connectors.
9. Flexible ductwork
10. Sound Attenuators
11. Duct accessory hardware.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60.
2. Exposed-Surface Finish: Mill phosphatized.

C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Description: Gravity balanced.

B. Maximum Air Velocity: 2000 fpm.

C. Maximum System Pressure: 2-inch wg.

D. Frame: 0.052-inch- thick, galvanized sheet steel, with welded corners and mounting flange.

E. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch width, 0.025-inch- thick, roll-formed aluminum with sealed edges.

F. Blade Action: Parallel.

G. Blade Seals: Extruded vinyl, mechanically locked.

H. Return Spring: Adjustable tension.

I. Bearings: Steel ball.

J. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Screen Material: Galvanized steel.
3. Screen Type: Bird.
4. 90-degree stops.

2.3 MANUAL VOLUME DAMPERS

A. Low-Leakage, Steel, Manual Volume Dampers:

1. Comply with AMCA 500-D testing for damper rating.
2. Low-leakage rating and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
3. Suitable for horizontal or vertical applications.
4. Frames:

    a. Angle shaped.
    b. 0.094-inch- thick, galvanized sheet steel.
    c. Mitered and welded corners.
    d. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Galvanized, roll-formed steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

    a. Molded synthetic or Stainless-steel sleeve.
    b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Blade Seals: Vinyl or Neoprene.
9. Jamb Seals: Cambered stainless steel.
10. Tie Bars and Brackets: Galvanized steel.
11. Accessories:

    a. Include locking device to hold single-blade dampers in a fixed position without vibration.

2.4 CABLE/REMOTE OPERATED DAMPERS

A. All ductwork dampers located above hard ceilings shall be provided with cable or remote operated dampers to prevent the installation of a ceiling access panels.

B. Basis-of-Design Product: Subject to compliance with requirements, provide Metropolitan Air Technology, model RT-250, or comparable product by one of the following:
1. Young Regulator model 5020.

2. Zip Group LLC, Zipset System Z Series.

C. Cable Operated Damper Description: Cable system designed for remote manual damper adjustment, as shown on the plans. Provide round damper cable control with concealed cable operator with 3/8" diameter cap installed flush in ceiling. Coordinate the installation of the cable operator with the architectural plans. The flush ceiling plates are to be installed adjacent to the supply diffusers, or as close as possible.
   1. Tubing: Brass plated.
   2. Cable: Stainless steel.
   3. Provide smallest size wrench with the operators for cable adjustment to coordinate with the architectural clearances provided.

D. Remote Operated Damper Description: Motor operated damper with hand held adjustment device. Damper can stand alone and requires no hard wired power. Locate wire termination point adjacent to ceiling diffusers, if not indicated on the plans.

   Construction:

   1. Frame: 5.75" x 22 gauge galvanized steel.
   2. Blade: 20 gauge galvanized steel with V groove stiffening.
   3. Axles: 3/8" square galv steel.
   4. Bearings: Molded synthetic, press fitted into the frame.
   5. Mounting: Position Independent
   6. Actuator: Model ZSA-1, Universal Mount, 9-12VDC; MECHANICAL CABLE SYSTEMS ARE NOT ACCEPTABLE.
   7. Options: Aluminum or SS Frame and Blade; Insulation standoffs

   Accessories:

   Model ZSA-1, 9-12V Actuator:

   8. Operating Range: +30°F to 125°F
   9. Operating Voltage: 9-12VDC
   10. Rated Torque: 30 in-lbs
   11. UL Class: Meets UL94-5VA for Plenum-Rated Ceilngs
   12. Mounting: Universal bracket mounts to most round, oval or rectangular brands with drive shaft profiles from ¼ thru ½ inch round, hex or square. Minimum L = 3.25 inches

2.5 CONTROL DAMPERS

A. Dampers shall have a maximum leakage of 6 cfm/ sq. ft. @ 4 in. wg or 3 cfm/sq. ft. @ 1 in. wg.

B. Dampers shall have a maximum differential pressure rating of 5 in. wg.

C. Dampers shall have a maximum velocity rating of 3000 fpm (15.2m/s).

D. Suitable for horizontal or vertical applications.

E. Frames:
1. Damper frame shall be 16 ga. galvanized steel formed into a 5" x 1" structural hat channel. Top and bottom frame members on dampers less than 17" high shall be low profile design to maximize the free area of these smaller dampers. Frame shall be 4-piece construction with 1 ½" (minimum) integral overlapping gusset reinforcements in each corner to assure square corners and provide maximum resistance to racking. Aluminum or stainless steel frame is optional.

F. Blades:
1. Blades: Damper blades shall be 16 ga. galvanized steel strengthened by three longitudinal 1" deep Vee grooves running the entire length of each blade. Each blade shall be symmetrical relative to its axle pivot point, presenting identical performance characteristics with air flowing in either direction through the damper. Provide symmetrical blades of varying size as required to completely fill the damper opening. Blade orientation is horizontal. Blade operation is parallel or opposed. Aluminum or stainless steel frame is optional.

G. Blade Axles: Galvanized steel.

H. Blade Stops: Each blade stop (at top and bottom of damper frame) shall occupy no more than ½" of the damper opening area to allow for maximum free area and to minimize pressure loss across the damper.

I. Blade Seals:
1. Blade Edge: Blade seals shall be TPE comes standard which are mechanically fastened to each blade. Silicone blade seal is optional.
2. Jamb: Flexible stainless steel compression type

2.6 FIRE DAMPERS

A. Type: Style B Static; rated and labeled according to UL 555 by an NRTL.

B. Fire Rating: 1-1/2 hours.

C. Frame: Curtain type with blades outside airstream ; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners.

D. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 0.052 or 0.138 inch thick, as indicated, and of length to suit application.
2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

E. Mounting Orientation: Vertical or horizontal as indicated. For horizontal provide Style A fire damper.

F. Blades: Roll-formed, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.

G. Heat-Responsive Device: Replaceable, 212 deg F rated, fusible links.

2.7 COMBINATION FIRE AND SMOKE DAMPERS

A. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.

B. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.

C. Fire Rating: 1-1/2 and 3 hours, as required.

D. Frame: Hat-shaped, 0.094-inch- thick, galvanized sheet steel, with welded or mechanically attached corners and mounting flange.

E. Heat-Responsive Device: Electric resettable device and switch package, factory installed, rated.

F. Smoke Detector: Provided by the fire alarm contractor as shown in the electrical drawings.

G. Blades: Roll-formed, horizontal, interlocking, 0.063-inch- thick, galvanized sheet steel.

H. Leakage: Class II.

I. Rated pressure and velocity to exceed design airflow conditions.

J. Mounting Sleeve: Field installed sleeve to match wall conditions and construction.

K. Damper Motors: two-position action, 120V type.

2.8 TURNING VANES

A. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

2.9 DUCT-MOUNTED ACCESS DOORS

A. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

1. Door:

    a. Double wall, rectangular.
    b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
    c. Vision panel.
    d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
    e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

    a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
    b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
    c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches.

2.10 FLEXIBLE CONNECTORS

A. Materials: Flame-retardant or noncombustible fabrics.

B. Coatings and Adhesives: Comply with UL 181, Class 1.

C. Metal-Edged Connectors: Factory fabricated with a fabric strip [3-1/2 inches] [5-3/4 inches] wide attached to 2 strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.

D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

2.11 FLEXIBLE DUCTS

A. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film. Flexible ductwork shall not be longer than six feet.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 10 to plus 160 deg F.
4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.

2.12 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 10 to plus 160 deg F.
4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.

C. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.
2. Non-Clamp Connectors: Liquid adhesive plus tape.

2.13 DUCT SILENCERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dynasonics.
2. Industrial Noise Control, Inc.
3. McGill AirFlow LLC.
4. Ruskin Company.
5. Vibro-Acoustics.

6. IAC
7. VAW Systems

B. General Requirements:

1. Factory fabricated.
2. Fire-Performance Characteristics: Adhesives, sealants, packing materials, and accessory materials shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84.
3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

C. Shape:

1. Rectangular straight with splitters or baffles.

D. Rectangular Silencer Outer Casing: ASTM A 653/A 653M, G90, galvanized sheet steel, 0.034 inch thick.

E. Inner Casing and Baffles: ASTM A 653/A 653M, G90 galvanized sheet metal, 0.034 inch thick, and with 1/8-inch- diameter perforations.

F. Connection Sizes: Match connecting ductwork unless otherwise indicated.

G. Principal Sound-Absorbing Mechanism:

1. Dissipative type with fill material.

a. Fill Material: Acoustic grade glass fiber protected by perforated metal

H. Fabricate silencers to form rigid units that will not pulsate, vibrate, rattle, or otherwise react to system pressure variations. Do not use mechanical fasteners for unit assemblies.

1. Joints: Lock formed and sealed or flanged connections.
2. Suspended Units: Factory-installed suspension hooks or lugs attached to frame in quantities and spaced to prevent deflection or distortion.

I. Accessories:
1. Factory-installed end caps to prevent contamination during shipping.

J. Source Quality Control: Test according to ASTM E 477.

1. Testingto be witnessed by Owner.
2. Record acoustic ratings, including dynamic insertion loss and generated-noise power levels with an airflow of at least 2000-fpm face velocity.

3. Leak Test: Test units for airtightness at 200 percent of associated fan static pressure or 6-inch wg static pressure, whichever is greater.

K. Capacities and Characteristics:

1. Configuration: Straight.
2. Shape: Rectangular.
3. Attenuation Mechanism: Acoustical glass fiber with protective liner.
4. Maximum Pressure Drop: 0.18” wg.
5. Casing:

   a. Attenuation: Standard.
   b. Outer Material: Galvanized steel.
   c. Inner Material: Galvanized steel.

6. Velocity Range: 750 to 1250.
7. Length: 5 feet.
8. Face Dimension: as shown on the drawings
9. Dynamic Insertion Loss: .
10. Generated Noise: .

2.14 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

D. All ductwork dampers located above hard ceilings shall be provided with cable or remote operated dampers to prevent the installation of a ceiling access panels.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire and smoke dampers according to UL listing.

H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. Control devices requiring inspection.
8. Elsewhere as indicated.

I. Install access doors with swing against duct static pressure.

J. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

K. Install flexible connectors to connect ducts to equipment.

L. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

M. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

N. Connect diffusers to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.

O. Connect flexible ducts to metal ducts with draw bands. Any elbows in flexible ductwork to be supported using a product equivalent to Thermaflex Flexflow Elbow.

P. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 23 33 00

SECTION 23 34 23

EXHAUST FANS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Roof exhaust fans.
   2. In-line centrifugal fans.

1.2 PERFORMANCE REQUIREMENTS

A. Operating Limits: Classify according to AMCA 99.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:
   1. Provide dimensional drawings and product data on each fan.
   2. Provide fan curves for each fan at the specified operation point, with the flow, static pressure and horsepower clearly plotted.
   3. Provide outlet velocity and fan's inlet sound power readings for the eight octave bands, decibels, and sones.
   4. Strictly adhere to QUALITY ASSURANCE requirements as stated in section 1.04 of this specification.
   5. Provide manufacturer's certification that exhaust fans are licensed to bear Air Movement and Control Association (AMCA), Certified Rating Seal for sound and air performance.
   6. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   7. Material thickness and finishes, including color charts.
   8. Roof curb, dampers (including housings, linkages, and operators) and other accessories.
   9. Fan speed controllers (as required).
   10. Installation, Operation, and Maintenance Manual (IOM): Provide manufacturer's installation, operations, and maintenance manual, including instructions on installation, operations, maintenance, pulley adjustment, receiving, handling, storage, safety information and cleaning. A troubleshooting guide, parts list, warranty and electrical wiring diagrams.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Belts: One set(s) for each belt-driven unit.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

C. Performance ratings: Conform to AMCA standard 211 and 311. Fans must be tested in accordance with ANSI/AMCA Standard 210-99 and AMCA Standard 300-96 in an AMCA accredited laboratory. Fans shall be certified to bear the AMCA label for air and sound performance seal.

D. Comply with the National Electrical Manufacturers Association (NEMA), standards for motors and electrical accessories.

E. UL Standards: Power ventilators shall comply with UL 705.

1.6 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate the installation of manufacturer’s roof curbs with roof installation.

1.7 WARRANTY

1. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and is not a limitation of, other rights Owner may have under Contract Documents.

2. The warranty of this equipment is to be free from defects in material and workmanship for a period of 1 Yr (Standard) from the purchase date. Any units or parts which prove defective during the warranty period will be replaced at the Manufacturers option when returned to Manufacturer, transportation prepaid.
3. Motor Warranty is warranted by the motor manufacturer for a period of one year. Should motors furnished by us prove defective during the period, they should be returned to the nearest authorized motor service station.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Greenheck Fan Corporation.
   2. Loren Cook Company.
   3. PennBarry.

B. Housing:
   1. Motor cover, shroud, curb cap, and lower wind-band shall be constructed of heavy gauge aluminum
   2. Shroud shall have an integral rolled bead for extra strength
   3. Shroud shall be drawn from a disc and direct air downward
   4. Lower wind-band shall have a formed edge for added strength
   5. Motor cover shall be drawn from a disc
   6. All housing components shall have final thicknesses equal to or greater then preformed thickness
   7. Curb cap shall have pre-punched mounting holes to ensure correct attachment
   8. Rigid internal support structure
   9. Leak proof

C. Housing Supports and Drive Frame:
   1. Drive frame assemblies shall be constructed of heavy gauge steel and mounted on vibration isolators

D. Vibration Isolation:
   1. Rubber isolators
   2. Sized to match the weight of each fan

E. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

F. Motor: Electronically Commutated Motor for each fan as follows:
   1. Motor enclosure: TEFC

2. Motor to be a DC electronic commutation type motor (ECM) specifically designed for fan applications. AC induction type motors are not acceptable. Examples of unacceptable motors are: Shaded Pole, Permanent Split Capacitor (PSC), Split Phase, Capacitor Start and 3 phase induction type motors
3. Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase
4. Internal motor circuitry to convert AC power supplied to the fan to DC power to operate the motor
5. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by either a potentiometer dial mounted at the motor or by a 0-10 VDC signal
6. Motor shall be a minimum of 85% efficient at all speeds

G. Accessories:
1. Birdscreen:
   a. Material Type: Galvanized
   b. Protects fan discharge
2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
3. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
4. Backdraft Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
5. Motorized Dampers: Motor actuated low leakage insulated damper, provided by the fan manufacturer.

6. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.

H. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Built-in cant and mounting flange.
2. Overall Height: 12 inches.
3. Pitch Mounting: Manufacture curb for roof slope.
4. Metal Liner: Galvanized steel.
5. Insulation: 1” thick interior insulation.

2.2 IN-LINE CENTRIFUGAL FANS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Loren Cook Company.

2. Greenheck.
3. Penn Barry

B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

D. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

E. Accessories:
1. Volume-Control Damper for EF-A: Manually operated with quadrant lock, located in fan outlet.
2. Companion Flanges: For inlet and outlet duct connections.
3. Vibration isolators, see schedule for type.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Install floor-mounted units on concrete bases.

C. Ceiling Units: Suspend units from structure; use threaded rod with vibration isolators.

D. Install units with clearances for service and maintenance.

E. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION 23 34 23

SECTION 23 37 13

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

1.3 SUBMITTALS

A. Product Data: For each product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate Drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS – SEE SCHEDULE ON DRAWINGS

2.1 MANUFACTURERS

1. Available Manufacturers:
   a. Price Industries.
   b. Titus.
   c. Tuttle & Bailey.
   d. Krueger.
   e. METALAIRE, Inc.
   f. Nailor Industries

2.2 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Refer to the “Take-off/Flex Duct Schedule” for supply diffuser neck sizes, and the “Return Air Connection” schedule for return grille neck sizes.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 3713

SECTION 23 72 00

AIR-TO-AIR ENERGY RECOVERY VENTILATOR

PART 1 - GENERAL

1.1 SUMMARY

- This section includes Air-to-Air Energy Recovery Ventilators for rooftop installation.
- Within this document, these units may be referred to as Energy Recovery Ventilator (ERV) for brevity.

1.2 RELATED

Drawing and general provisions of the contract, including General Requirements Division 01, Division 23, Division 23 Specifications Sections, and common work requirements for HVAC apply to work specified in this section.

1.3 SUBMITTALS

- Product data: For each type or model of Energy Recovery Ventilator, include the following:
    - Unit performance data for both Supply Air and Exhaust Air, with system operating conditions indicated.
    - Enthalpy plate performance data for both summer and winter operation.
    - Motor ratings and unit electrical characteristics.
    - Dimensioned drawings for each type of installation, showing isometric and plan views, to include location of attached ductwork and service clearance requirements.
    - Estimated gross weight of each installed unit.
    - Filter types, quantities, and sizes
    - Installation, Operating and Maintenance manual (IOM) for each model.
- LEED Submittals:
    - Provide data for prerequisite E01: Documentation indicating that units comply with ASHRAE 62.1-2010, Section 5 - "Systems and Equipment".
- Shop Drawings: For air-to-air energy recovery ventilators, include plans, elevations, sections, details, and attachments to other work.
    - Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
    - Wiring Diagrams: For power, signal, and control wiring.

- Operation and maintenance data for air-to-air energy recovery ventilator

1.4 QUALITY ASSURANCE

- Source Limitations: Obtain Air-to-Air Energy Recovery Ventilator with all appurtenant components or accessories from a single manufacturer.
- For the actual fabrication, installation, and testing of work under this section, use only thoroughly trained and experienced workers completely familiar with the items required and with the manufacturer's current recommended methods of installation.
- The ERV core shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of ten (10) years from the date of purchase. The balance-of-unit shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of two (2) years from the date of installation.
- Manufacturer shall be able to provide evidence of independent testing of the core by Underwriters Laboratory (UL), verifying a maximum flame spread index (FSI) of 25 and a maximum smoke developed index (SDI) of 50 thereby meeting NFPA90A and NFPA 90B requirements for materials in a compartment handling air intended for circulation through a duct system. The method of test shall be UL Standard 723.
- Certifications:
    - The energy recovery cores used in these products shall be third party Certified by AHRI under its Standard 1060 for Energy Recovery Ventilators. AHRI published certifications shall confirm manufacturer’s published performance for airflow, static pressure, temperature and total effectiveness, purge air (OACF) and exhaust air leakage (EATR). Products that are not currently AHRI certified will not be accepted. OACF shall be no more than 1.02 and EATR shall be at 0% against balanced airflow.
    - Entire unit shall be listed under UL 1812 Standard for Ducted Air to Air Heat Exchangers and comply with CSA Standard 22.2.
    - Units intended for outdoor use shall be rain tested in accordance with UL 1812 Section 67.
- Every unit to be factory tested prior to shipping: Motor Dielectric Voltage-Withstand Bench Test, Unit Dielectric Voltage-Withstand Test, Continuity of Internal Control Circuits Test, Unit Amperage Test

1.5 COORDINATION

- Coordinate size and location of all building penetrations required for installation of each Energy Recovery Ventilator and associated electrical systems.
- Coordinate sequencing of construction for associated plumbing, HVAC, electrical supply.

- Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- Available Manufacturers: Subject to compliance with specifications contained within this document, manufacturers offering products that may be incorporated into the work include, but are not limited to:
    - RenewAire (basis)
    - Fantech
    - Daikin
    - Mitsubishi
- Manufacturer should be in business for minimum 10 years manufacturing energy recovery ventilators.

2.2 MANUFACTURED UNITS

- Air-to-Air Energy Recovery Ventilators shall be fully assembled at the factory and consist of a fixed-plate cross-flow heat exchanger with no moving parts, an insulated double wall G90 galvanized 20-gauge steel cabinet, outdoor air hood with bird screen, motorized outside air intake damper, filter assemblies for both intake and exhaust air, enthalpy core, supply air blower assembly, motorized return air damper, exhaust air hood, exhaust air blower assembly and electrical control box with all specified components and internal accessories factory installed and tested and prepared for single-point high voltage connection. Entire unit with the exception of field-installed components shall be assembled and test operated at the factory.

2.3 CABINET

- Materials: Formed double wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.
- Outside casing: 20 gauge, galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish. [Painted components as supplied by the factory shall have polyester urethane paint on 20 gauge G90 galvanized steel.]
- Access doors shall be hinged with airtight closed cell foam gaskets. Door pressure taps, with captive plugs, shall be provided for cross-core pressure measurement allowing for accurate airflow measurement.

- Unit shall have factory-installed duct flanges on all duct openings.
- Cabinet Insulation: Unit walls and doors shall be insulated with 1 inch, 4 pound density, foil/scrim faced, high density fiberglass board insulation, providing a cleanable surface and eliminating the possibility of exposing the fresh air to glass fibers, and with a minimum R-value of 4.3 (hr-ft^2-°F/BTU).
- Enthalpy core: Energy recovery core shall be of the total enthalpy type, capable of transferring both sensible and latent energy between airstreams. Latent energy transfer shall be accomplished by direct water vapor transfer from one airstream to the other, without exposing transfer media in succeeding cycles directly to the exhaust air and then to the fresh air. No condensate drains shall be allowed. The energy recovery core shall be designed and constructed to permit cleaning and removal for servicing. The energy recovery core shall have a ten year warranty. Performance criteria are to be as specified in AHRI Standard 1060.
- Control center / connections: Energy Recovery Ventilator shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections to the [non-fused][fused] disconnect.
- Passive Frost Control: The ERV core shall perform without condensing or frosting under normal operating conditions (defined as outside temperatures above -10ºF and inside relative humidity below 40%). Occasional more extreme conditions shall not affect the usual function, performance or durability of the core. No condensate drains will be allowed.
- Motorized Isolation Damper(s): [None included.][Return Air][and][Outside Air][motorized damper(s)][of an AMCA Class I low leakage type shall be factory installed.]

2.4 BLOWER SECTION

- Blower section construction, Supply Air and Exhaust Air: Blower assemblies consist of a 208V, 1 Phase, 60 HZ, ECM motor, and a direct driven forward-curved blower.
- Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.

2.5 MOTORS

- Blower motors shall be Premium Efficiency, EISA compliant for energy efficiency. The blower motors shall be totally enclosed (TEFC) and be shall be supplied with factory installed motor starters. Direct drive models shall be EISA-compliant for energy efficiency with open drip proof design and integral thermal protection.

2.6 UNIT CONTROLS

- Fan control:[Single contactor for common fan control.

- Sensors: Dirty filter monitor for both airstreams.
- Timeclock: Digital Time Clock wall mount with up to 8 on/off cycles per day or 50 per week, 24VAC power, witrh battery backup protection of program settings against power failure to energize unit
- Carbon Dioxide: Adjustable control from 600 - 2000 PPM for wall mounting with digital display
- Factory-installed microprocessor controller and sensors, ERV controls that:
    - Has factory-installed hardware to monitor, control, and display status and alarms
    - The microprocessor controller shall be capable of operating at temperatures between -20F to 160F
    - The microprocessor controller shall be a DIN rail mounting type
    - Factory-installed microprocessor controller shall come with backlit display that allows menu-driven display for navigation and control of unit
    - The microprocessor controller shall have an internal programmable time clock that will allow the user to add up to different occupancy schedules and add holidays
    - The microprocessor control shall be capable of integral diagnostics
    - The microprocessor control shall be capable of IP or SI unit display
    - The microprocessor controller shall have a battery powered clock
    - The microprocessor controller shall at a minimum offer the ability for three modes of determining occupancy: a dry contact, the internal time clock
    - A remote user terminal to allow for remote monitoring and adjustment of parameters, allowing ease of control access without going outdoors or into the mechanical room if desired by the user
    - The microprocessor controller shall have at a minimum (10) universal inputs/outputs (AI, DI, AO) and have (6) six relay outputs (DO)
    - The microprocessor controller shall have an integrated fieldbus port
    - The microprocessor controller shall have the capability for I/O expansion
    - The microprocessor controller shall have a micro USB port to load the application program, the unit parameters, saving logs, etc.
    - The sensors that will be required for control are:
        - (2) Temperature sensor for fresh air and exhaust air
        - (2) Temperature and humidity sensor for outside air, return air
        - (2) Differential pressure sensors for filter alarms
        - (2) Adjustable current switches
    - The microprocessor controller shall have the capability to monitor the unit conditions for alarm conditions. Upon detecting an alarm, the microprocessor controller shall have the capability to record the alarm description, time, date, available temperatures, and unit status for user review. A digital output shall be reserved for remote alarm indication. Provide the following alarm functions:
        - Outside air temperature sensor alarm

- Outside air humidity sensor alarm
- Return air temperature sensor alarm
- Return air humidity sensor alarm
- Fresh air sensor alarm
- Exhaust air sensor alarm
- Dirty filter alarm
- Supply and exhaust air proving alarm

- Display the following on the face of microprocessor controller:
  - Unit on
  - Outdoor air temperature
  - Outdoor air humidity
  - Return air temperature
  - Return air humidity
  - Supply air temperature
  - Unit on/off
  - Fan on/off
  - Damper status
  - Alarm digital display
- The microprocessor controller shall have factory pre-programmed multiple operating sequences for control of the ERV. Factory default settings shall be fully adjustable in the field. Available factory pre-programmed sequences on operations are:

SEQUENCE OF OPERATIONS

CONTROLLER:

- Controller with integral LCD readout for changing set points and monitoring unit operation.
- Provided with required sensors and programming.
- Factory programmed, mounted, and tested.
- Integral USB and Ethernet ports for updating programs and retrieving log files.

GENERAL OPERATION

POWER UP:

- When the unit main disconnect is closed a delay of 10 seconds (adjustable) occurs for the controller to come online.

ERV UNIT START COMMAND:

- An input signal is required to enable the unit operation. The unit will be commanded on by:
    - Enable via controller display
- All types of input that are enabled must be true before the unit will start.
    - The exhaust fan starts after a 3 second delay (adjustable). The exhaust fan will not start until the damper actuator end switch closes.
    - The supply fan starts after a 6 second delay (adjustable). The supply fan will not start until the damper actuator end switch closes.
    - The supply fan, exhaust fan, [heating] are controlled based on the chosen unit operating modes and air conditions.

ERV UNIT STOP COMMAND (OR DE-ENERGIZED):

- The unit can then be commanded off by:
    - Disable via controller display
- Supply fan and exhaust fan are de-energized.
- All dampers are unpowered and spring return to their default position after a 10 second delay (adjustable).

SUPPLY FAN OPERATION:

- The supply fan will operate at a constant speed.
- The unit will attempt to start the supply fan when the supply fan delay timer expires. When the supply fan starts the supply fan adjustable current switch should close and remain closed until the fan is turned off.

SUPPLY FAN STATUS:

Once the supply fan current switch closes [heating] operation is allowed. After a delay of 90 seconds (adjustable) from supply fan start signal, if the supply fan current switch is still open the supply fan alarm should be set to true and [heating] operation shall be prohibited. The supply fan status shall be set to true only when the supply fan output is on and supply fan current switch is closed. The supply fan status shall be false in all other circumstances.

FIXED FAN SPEED OPTION:

The analog voltage command to the supply fan ECM can be set from the unit controller display [or by the BMS]. The adjustable range of 0% to 100% correspond to the minimum and maximum fan operating speed. This supply fan operation mode can be used to field balance the supply air flow rate.

EXHAUST FAN OPERATION:

- The exhaust fan will operate at a constant speed.

- The unit will attempt to start the exhaust fan when the exhaust fan delay timer expires. When the exhaust fan starts the exhaust fan adjustable current switch should close and remain closed until the fan is turned off.

EXHAUST FAN STATUS:

After a delay of 90 seconds (adjustable) from exhaust fan start signal, if exhaust fan current switch is still open the exhaust fan alarm should be set to true. The exhaust fan status shall be set to true only when the exhaust fan output is on and exhaust fan current switch is closed. The exhaust fan status shall be false in all other circumstances.

FIXED FAN SPEED OPTION:

The analog voltage command to the exhaust fan ECM can be set from the unit controller display [or provided by the BMS]. The adjustable range of 0% to 100% correspond to the minimum and maximum fan operating speed (0 VDC minimum to 10 VDC maximum, adjustable). This exhaust fan operation mode can be used to field balance the exhaust air flow rate.

2.7 FILTER SECTION

- ERV shall have 2" thick MERV 13 disposable pleated filters located in the outdoor air and exhaust airstreams. All filters shall be accessible from the exterior of the unit.

PART 3 – EXECUTION

3.1 EXAMINATION

- Prior to start of installation, examine area and conditions to verify correct location for compliance with installation tolerances and other conditions affecting unit performance. See unit IOM.
- Examine roughing-in of plumbing, electrical and HVAC services to verify actual location and compliance with unit requirements. See unit IOM.
- Proceed with installation only after all unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- Installation shall be accomplished in accordance with these written specifications, project drawings, manufacturer's installation instructions as documented in manufacturer's IOM, Best Practices and all applicable building codes.
- Install unit with clearances for service and maintenance.

3.3 CONNECTIONS

In all cases, industry Best Practices shall be incorporated. Connections are to be made subject to the installation requirements shown above.

- Duct installation and connection requirements are specified in Division 23 of this document.
- Electrical installation requirements are specified in Division 26 of this document.

3.4 FIELD QUALITY CONTROL

- Contractor to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to Architect/Engineer in writing. Inspection must include a complete startup checklist to include (as a minimum) the following: Completed Start-Up Checklists as found in manufacturer's IOM. Insert any other requirements here.

3.5 START-UP SERVICE

- Contractor to perform startup service. Clean entire unit, comb coil fins as necessary, and install clean filters. Measure and record electrical values for voltage and amperage. Refer to Division 23 "Testing, Adjusting and Balancing" and comply with provisions therein.

3.6 DEMONSTRATION AND TRAINING

- Contractor to train owner's maintenance personnel to adjust, operate and maintain the entire Make-Up Air unit. Refer to Division 01 Section Closeout Procedures and Demonstration and Training.

SECTION 237413

PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes packaged rooftop units with the follow features and options:

1. Direct-expansion cooling.
2. Heat-pump refrigeration components.
3. Hot-gas reheat for dehumidification sequence.
4. Electric-heating coils.
5. Economizer outdoor- and return-air damper section.
6. Outside air flow monitoring station
7. Factory DDC controls.
8. Roof curbs.

1.3 DEFINITIONS

A. DDC: Direct-digital controls.

B. ECM: Electrically commutated motor.

C. Outdoor-Air Refrigerant Coil: Refrigerant coil in the outdoor-air stream to reject heat during cooling operations and to absorb heat during heating operations. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

D. Outdoor-Air Refrigerant-Coil Fan: The outdoor-air refrigerant-coil fan in RTUs. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

E. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, outdoor, central-station air-handling units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.

F. Supply-Air Fan: The fan providing supply air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

G. Supply-Air Refrigerant Coil: Refrigerant coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during heating operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

H. VVT: Variable-air volume and temperature.

1.4 ACTION SUBMITTALS

A. Product Data: Literature shall be provided that indicates dimensions, operating and shipping weights, capacities, ratings, fan performance, filter information, factory supplied accessories, electrical characteristics and connection requirements. Installation, Operation, and Maintenance manual with startup requirements shall be provided.

B. Shop Drawings: Unit drawings shall be provided that indicate assembly, unit dimensions, construction details, clearances and connection details. Computer generated fan curves for each fan shall be submitted with specific design operation point noted. Wiring diagram shall be provided with details for both power and control systems and differentiate between factory installed and field installed wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

B. Warranty: Special warranty specified in this Section.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fan Belts: One set for each belt-driven fan.
2. Filters: One set of filters for each unit.

1.8 QUALITY ASSURANCE

A. ARI Compliance:

1. Comply with ARI 203/110 and ARI 303/110 for testing and rating energy efficiencies for RTUs.
2. Comply with ARI 270 for testing and rating sound performance for RTUs.

B. ASHRAE Compliance:

1. Comply with ASHRAE 15 for refrigeration system safety.
2. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

D. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.

E. UL Compliance: Comply with UL 1995.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.9 WARRANTY

A. Manufacturer shall provide a limited “parts only” warranty for a period of 12 months from the date of equipment startup or 18 months from the date of original equipment shipment from the factory, whichever is less. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided manufacturer’s written instructions for Installation, Operation, and maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts and filters.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of RTUs that fail in materials or workmanship within one year, and for specific components as listed below:.

1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.

2. Warranty Period for Gas Furnace Heat Exchangers: Manufacturer's standard, but not less than five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ROOFTOP UNITS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1. AAON, Inc.
2. Addison Inc.
3. Daikin International.
4. Trane Inc.

B. General Description:
1. Unit shall be factory assembled and tested including leak testing of the coils, pressure testing of the refrigeration circuit, and run testing of the completed unit. Run test report shall be supplied with the unit in the service compartment's literature pocket.
2. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.
3. Unit components shall be labeled, including pipe stub outs, refrigeration system components and electrical and controls components.
4. Estimated sound power levels (dB) shall be shown on the unit ratings sheet.
5. Installation, Operation, and Maintenance manual shall be supplied within the unit.
6. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's hinged access door.
7. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's hinged access door.

C. CASING
1. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.
2. Unit insulation shall have a minimum thermal resistance R-value of 13. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929-11 for a minimum flash ignition temperature of 610°F.
3. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, prevents heat transfer through the panel, and prevents exterior condensation on the panel.
4. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Cabinet leakage shall not exceed 1% of total airflow when tested at 3 times the minimum external static pressure provided in AHRI Standard 340/360. Panel deflection shall not exceed

L/240 ratio at 125% of design static pressure, at a maximum 8 inches of positive or negative static pressure, to reduce air leakage. Deflection shall be measured at the midpoint of the panel height and width. Continuous sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.

5. Roof of the air tunnel shall be sloped to provide complete drainage. Cabinet shall have rain break overhangs above access doors.
6. Access to filters, dampers, cooling coils, reheat coil, exhaust fans, compressors, and electrical and controls components shall be through hinged access doors with quarter turn, zinc cast, lockable handles. Full length stainless steel piano hinges shall be included on the doors.
7. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.
8. Units with cooling coils shall include double sloped 304 stainless steel drain pans.
9. Unit shall be provided with base discharge and return air openings. All openings through the base pan of the unit shall have upturned flanges of at least 1/2 inch in height around the opening.
10. Unit shall include lifting lugs on the top of the unit.
11. Unit base pan shall be provided with 1/2 inch thick foam insulation.
12. Unit shall include factory wired control panel compartment LED service lights.
13. Unit shall include outside airflow measuring station and airflow signal processor that communicates directly with the factory provided control systems or can also be used with customer provided controls with a 0-10 VDC output signal. Lon Talk and BACnet may also be available for some applications. Monitoring size is dependent on the cfm.
14. Base of unit shall have a minimum of four locations for thru-the-base gas and electrical connections standard. Both gas and electric connections shall be internal to the cabinet to protect from environmental issues.
15. Gas Connections:
    a. All gas piping connecting to unit gas valve shall enter the unit cabinet at a single location on side of unit (horizontal plane).
    b. Thru-the-base capability
        1) Standard unit shall have a thru-the-base gas-line location using a raised, embossed portion of the unit basepan.
        2) Thru-the-base provisions/connections are available as standard with every unit. When bottom connections are required, field furnished couplings are required.
        3) No basepan penetration, other than those authorized by the manufacturer, is permitted.
16. Electrical Connections
    a. All unit power wiring shall enter unit cabinet at a single, factory-prepared, knockout location, and be a single point connection as indicated in the schedule.
    b. Unit shall be provided with a factory installed and factory wired disconnect switch.

c. Unit shall be provided with a factory installed and factory wired 115V, 12 amp GFI outlet disconnect switch in the unit control panel.
d. Unit shall be provided with phase and brown out protection which shuts down all motors in the unit if the electrical phases are more than 10% out of balance on voltage, the voltage is more than 10% under design voltage or on phase reversal.
e. Thru-the-base capability.
    1) Thru-the-base provisions/connections are available as standard with every unit. When bottom connections are required, field furnished couplings are required.
    2) No basepan penetration, other than those authorized by the manufacturer, is permitted.

D. Supply fans:
1. Unit shall include direct drive, unhoused, backward curved, plenum supply fans.
2. Blowers and motors shall be dynamically balance and mounted on rubber isolators.
3. Motors shall be premium efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points.
4. Variable frequency drives shall be factory wired and mounted in the unit. Fan motors shall be premium efficiency.

E. Exhaust fans:
1. Exhaust dampers shall be sized for 100% relief.
2. Fans and motors shall be dynamically balanced.
3. Motors shall be premium efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points.
4. Access to exhaust fans shall be through double wall, hinged access doors with quarter turn lockable handles.
5. Unit shall include belt driven, unhoused, backward curved, plenum exhaust fans.
6. Variable frequency drives shall be factory wired and mounted in the unit. Fan motors shall be premium efficiency.

F. Condenser-Coil Fan: Propeller, mounted on shaft of permanently lubricated motor.

a. Condenser fans shall be a vertical discharge, axial flow, direct drive fans.

b. Condenser fans shall be VFD driven variable speed for condenser head pressure control. Factory provided and factory programmed VFDs shall continuously modulate the fan air flow to maintain head pressure at acceptable levels. Cooling operation shall be allowed down to 35°F with adjustable compressor lockout.

G. COILS
1. Supply-Air Refrigerant Coil:

a. Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and galvanized steel end casings. Fin design shall be sine wave rippled.

b. Coils shall have interlaced circuitry and shall be standard capacity.

c. Coils shall be hydrogen or helium leak tested.

d. Coils shall be furnished with factory installed expansion valves.

2. Hot-Gas Reheat Refrigerant Coil:
   a. Aluminum-plate fin and seamless internally grooved copper tube in steel casing with equalizing-type vertical distributor.
   b. Shall have a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins.
   c. Coating process shall ensure complete coil encapsulation of tubes, fins and headers.
   d. Color shall be high gloss black with gloss per ASTM D523-89.
   e. Uniform dry film thickness from 0.8 to 1.2 mil on all surface areas including fin edges.
   f. Superior hardness characteristics of 2H per ASTM D3363-92A and cross-hatch adhesion of 4B-5B per ASTM D3359-93.
   g. Impact resistance shall be up to 160 in.-lb (ASTM D2794-93).
3. Condenser Coils:
   a. Coils shall be designed for use with R-410A refrigerant. Coils shall be multi-pass and fabricated from aluminum microchannel tubes.
   b. Coils shall be designed for a minimum of 10°F of refrigerant sub-cooling.
   c. Coils shall be hydrogen or helium leak tested.

H. REFRIGERANT CIRCUIT COMPONENTS

1. Unit shall be factory charged with R-410A refrigerant.
2. Compressors shall be scroll type with thermal overload protection and carry a 5 year non-prorated warranty, from the date of original equipment shipment from the factory.
3. Compressors shall be mounted in an isolated service compartment which can be accessed without affecting unit operation. Lockable hinged compressor access doors shall be fabricated of double wall, rigid polyurethane foam injected panels to prevent the transmission of noise outside the cabinet.
4. Compressors shall be isolated from the base pan with the compressor manufacturer's recommended rubber vibration isolators, to reduce any transmission of noise from the compressors into the building area.
5. Each refrigeration circuit shall be equipped with expansion valve type refrigerant flow control.
6. Each refrigeration circuit shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure and low pressure sides and a factory installed replaceable core liquid line filter driers.
7. Unit shall include a variable capacity scroll compressor on the lead refrigeration circuit

which shall be capable of modulation from 10-100% of its capacity.

8. Lead refrigeration circuit shall be provided with hot gas reheat coil, modulating valves, electronic controller, supply air temperature sensor and a control signal terminal which low the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space.

I. MIXED AIR/FILTRATION SECTION

1. Unit shall include 2 inch thick, pleated panel filters with an ASHRAE efficiency of 30% and MERV rating of 8, upstream of the cooling coil.
2. Unit shall include a clogged filter switch.
3. Unit shall include 0-100% economizer consisting of a motor operated outside air damper and return air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 20 cfm of leakage per sq ft. at 4 in. w.g. air pressure differential across the damper. Low leakage dampers shall be Class 2 AMCA certified, in accordance with AMCA Standard 511. Damper assembly shall be controlled by spring return enthalpy activated fully modulating actuator. Unit shall include outside air opening bird screen, outside air hood, and barometric relief dampers.
4. Economizer shall be furnished with the Constant Volume Outside Air ventilation control assembly which maintains a minimum amount of entering outside air. It shall measure the outside air velocity pressure and adjust the economizer dampers to maintain a constant velocity pressure and thus a constant volume of outside air.

J. AIR-TO-AIR ENERGY RECOVERY WHEELS

1. Total Energy Recovery Wheels:
   a. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
      1) SEMCO Incorporated.
      2) DRI
      3) Innergy Tech
      4) Thermotech
      5) Novel Aire
2. Wheel Construction
   a. The energy wheel shall be constructed of synthetic matrix with an adsorbent integrally bound into the matrix. The adsorbent shall be selected for its high affinity for water vapor. The wheel is to have a minimum 80% recovery effectiveness at 550 FPM. Construction of the wheel shall be corrugated, fluted design, which provides distinct air passageways and prevents internal wheel bypass. The desiccant shall be intimately, permanently bound and uniformly dispersed throughout the wheel matrix. The desiccant shall not be applied as a glued on surface coating and not susceptible to erosion, abrasion, or de-lamination. The

wheel matrix shall be rigid and glued layer-to-layer, and not susceptible to sagging or separation of the layers. The wheel shall be structurally reinforced with a spoking system to minimize wheel deflection. The media shall meet the flammability requirements governing this class of products and be UL recognized components in accordance to UL 1812 and UL1995

b. Casing:
    1) Heavy duty G90 galvanized steel, with manufacturer's standard paint coating.
    2) Integral purge section limiting carryover of exhaust air to between 0.05 percent at 1.6-inch wg and 0.20 percent at 4-inch wg differential pressure.
    3) Support rotor on grease-lubricated ball bearings with extended grease fittings.
c. All cassettes shall include both a circumferential seal as an air block-off around the perimeter, and an inner diametric seal separating the exhaust and supply sides. Seals shall be full contact nylon brush seals, which minimizes leakage. Seals are factory set and field adjustable and make intimate contact with the wheel on all surfaces.
d. The drive system shall consist of a heavy-duty fractional horsepower mounted in the cassette and cooled by the AHU air stream. Motor location shall be as required. All motors have permanently lubricated bearings. Drive belts shall be high performance v-belt multilink belts.
e. The wheel matrix shall be cleanable by vacuuming or pressurized air blowing, or alternatively with low temperature steam, hot water, light detergent.
f. Cassettes shall be provided with bearings which support rotation of the wheel around a center shaft driven by a perimeter belt. The bearings shall be internal ball bearings press fitted into the bored wheel hub for all wheels up to and including 72” diameter. Internal bearings are permanently lubricated, no maintenance bearings which support fixed shaft operation of the wheel assembly. Flanged or pillow block bearings which support rotating shaft operation of the wheel assembly are used for all units larger than 72” diameter. Outboard bearings are provided with grease fittings for periodic lubrication. L10 bearing life is greater than 400,000 at design conditions.
g. Mixed air units with economizing shall be constructed with internal bypass dampers such that the pressure drop across the wheel does not increase during economizing.
h. Coordinate splits of the wheel with the mechanical room access clearances indicated on the drawings.

3. Energy Recovery Wheel Factory Controls:
    1) Control of the energy wheel shall be by the energy recovery wheel manufacturer, and provided by the air handling unit manufacturer as a factory installed system. The energy recovery device shall be designed with variable effectiveness control, to vary the wheel’s recovery capacity. This shall be done by an internal bypass damper provided by the air handler manufacturer or by wheel speed VFD. The wheel’s variable effectiveness

control shall have the ability to modulate the wheels total energy recovery ability down to 40% or less of the initial recovery capacity. The wheel shall be enabled/disabled based on outside air enthalpy vs return air enthalpy. The wheel shall modulate to control supply air temperature off the wheel. See controls specifications for more information.

2) Frost Control:

4. Frost prevention shall be achieved by variable speed control or by jogging the wheel. Frost set point temperatures based on the scheduled design air conditions, shall be provided by the air handler manufacturer. Winter design supply and exhaust air conditions leaving the energy wheel provided by the air handler manufacturer shall include any de-rate in performance due to frost prevention measures.
5. A wheel rotation detector shall be provided for interface to the wheel control system. A wheel rotation alarm shall be provided if the wheel is enabled on but the rotation detector status is off.

2.2 ELECTRICAL POWER CONNECTIONS

A. Provide for single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

2.3 CONTROLS: Provide Factory Installed and Factory Provided Controller as follows:

A. Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory installed in the unit controls compartment and factory tested. Controller shall be capable of stand-alone operation with unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.

B. Controller shall include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.

C. Variable Air Volume Controller
1. Unit shall utilize a variable capacity compressor system and a variable speed supply fan system to modulate cooling and airflow as required to meet space temperature cooling loads and to save operating energy. Supply fan speed shall modulate based on supply air duct static pressure. Cooling capacity shall modulate based on supply air temperature.
2. With modulating hot gas reheat, unit shall modulate cooling and hot gas reheat as efficiently as possible, to meet space humidity loads and prevent supply air temperature swings and overcooling of the space.
3. Unit shall modulate heating with constant airflow to meet space temperature heating loads. Modulating heating capacity shall modulate based on supply air temperature.

D. Unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling shall be accomplished with connection to interface module with LCD screen and input keypad, interface module with touch screen, or with connection to PC with free configuration software. Controller shall be capable of connection with other factory installed and factory provided unit controllers with individual unit configuration, setpoint adjustment, sensor status viewing, and occupancy scheduling available from a single unit. Connection between unit controllers shall be with a modular cable. Controller shall be capable of communicating and integrating with a LonWorks or BACnet network.

E. Controller shall meet the following specifications:
   1. Shall be ASHRAE 62-2001 compliant.
   2. Shall accept 18-30VAC, 50-60Hz, and consumer 15VA or less power.
   3. Shall have an operating temperature range from -40_F (-40_C) to 130_F (54_C), 10% - 90% RH (non-condensing).
   4. Shall include built-in protocol for BACNET (MS/TP and PTP modes), Modbus (RTU and ASCII), Johnson N2 and LonWorks. LonWorks Echelon processor required for all Lon applications shall be contained in separate communication board.
   5. Shall allow access of up to 62 network variables (SNVT). Shall be compatible with all open controllers
   6. Shall have an LED display independently showing the status of serial communication, running, errors, power, all digital outputs, and all analog inputs.
   7. Shall accept the inputs as indicated on the controls drawings, including scheduling functions for occupied and unoccupied modes.
   8. Shall provide outputs to the building DDC as shown on the controls drawings.
   9. Shall have built-in surge protection circuitry through solid state polyswitches. Polyswitches shall be used on incoming power and network connections. Polyswitches will return to normal when the “trip” condition clears.
   10. Shall have a battery back-up capable of a minimum of 10,000 hours of data and time clock retention during power outages.
   11. Shall include an EIA-485 protocol communication port, an access port for connection of either a computer or a manufacturer technician tool, an EIA-485 port for network communication to intelligent space sensors and displays, and a port to connect an optional LonWorks communications card.
   12. Software upgrades will be accomplished by either local or remote download. No software upgrades through chip replacements are allowed.

F. Interface Requirements for HVAC Instrumentation and Control System:

   1. Interface relay for scheduled operation.
   2. Interface relay to provide indication of fault at the central workstation and diagnostic code storage.
   3. Provide BACnet compatible interface for central HVAC control workstation for the points indicated on the controls drawings.

2.4 ACCESSORIES

A. Factory disconnect switch, with single point electrical connection.

B. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required. Outlet shall be energized even if the unit main disconnect is open.

C. Low-ambient kit using variable-speed condenser fans for operation down to 35 deg F.

D. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.

E. Outside air flow monitoring station.

2.5 ROOF CURBS

A. Curbs shall to be fully gasketed between the curb top and unit bottom with the curb providing full perimeter support, cross structure support and air seal for the unit. Curb gasket shall be furnished within the control compartment of the rooftop unit to be mounted on the curb immediately before mounting of the rooftop unit.

B. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.
   1. Materials: ASTM C 1071, Type I or II.
   2. Thickness: 2 inches on the inside of the curb.

C. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.
   1. Liner Adhesive: Comply with ASTM C 916, Type I.
   2. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
   3. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
   4. Liner Adhesive: Comply with ASTM C 916, Type I.

D. Curb Height: 12 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.

B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.

C. Examine roofs for suitable conditions where RTUs will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Roof Curb: Install on roof structure or concrete base, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Section 077200 "Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.

3.3 CONNECTIONS

A. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.

B. Install piping adjacent to RTUs to allow service and maintenance.

1. Gas Piping: Comply with applicable requirements in Section 231123 "Facility Natural-Gas Piping." Connect gas piping to burner, full size of gas train inlet, and connect with union and shutoff valve with sufficient clearance for burner removal and service.

C. Duct installation requirements are specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to RTUs with flexible duct connectors specified in Section 233300 "Air Duct Accessories."
4. Install return-air duct continuously through roof structure.

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

3.5 STARTUP SERVICE

A. Complete installation and startup checks according to manufacturer's written instructions and do the following:

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to furnace combustion chamber.
3. Inspect for visible damage to compressor, coils, and fans.
4. Inspect internal insulation.
5. Verify that labels are clearly visible.
6. Verify that clearances have been provided for servicing.
7. Verify that controls are connected and operable.
8. Verify that filters are installed.
9. Clean condenser coil and inspect for construction debris.
10. Clean furnace flue and inspect for construction debris.
11. Connect and purge gas line.
12. Remove packing from vibration isolators.
13. Inspect operation of barometric relief dampers.
14. Verify lubrication on fan and motor bearings.
15. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
16. Adjust fan belts to proper alignment and tension.
17. Start unit according to manufacturer's written instructions.

    a. Start refrigeration system.
    b. Do not operate below recommended low-ambient temperature.
    c. Complete startup sheets and attach copy with Contractor's startup report.

18. Inspect and record performance of interlocks and protective devices; verify sequences.

19. Operate unit for an initial period as recommended or required by manufacturer.
20. Perform the following operations for both minimum and maximum firing. Adjust burner for peak efficiency.

    a. Measure gas pressure on manifold.
    b. Inspect operation of power vents.
    c. Measure combustion-air temperature at inlet to combustion chamber.
    d. Measure flue-gas temperature at furnace discharge.
    e. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
    f. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.

21. Calibrate thermostats.
22. Adjust and inspect high-temperature limits.
23. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
24. Start refrigeration system and measure and record the following when ambient is a minimum of 15 deg F above return-air temperature:

    a. Coil leaving-air, dry- and wet-bulb temperatures.
    b. Coil entering-air, dry- and wet-bulb temperatures.
    c. Outdoor-air, dry-bulb temperature.
    d. Outdoor-air-coil, discharge-air, dry-bulb temperature.

25. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
26. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.

    a. Supply-air volume.
    b. Return-air volume.
    c. Relief-air volume.
    d. Outdoor-air intake volume.

27. Simulate maximum cooling demand and inspect the following:

    a. Compressor refrigerant suction and hot-gas pressures.
    b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.

28. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:

    a. High-temperature limit on gas-fired heat exchanger.
    b. Low-temperature safety operation.

c. Filter high-pressure differential alarm.
d. Economizer to minimum outdoor-air changeover.
e. Relief-air fan operation.
f. Smoke and firestat alarms.

29. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.6 CLEANING AND ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site during other-than-normal occupancy hours for this purpose.

B. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs. Refer to Section 017900 "Demonstration and Training."

END OF SECTION 237413

SECTION 23 81 26

SPLIT SYSTEM AIR CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes split-system air-conditioning and heat-pump units consisting of separate one to one evaporator-fan and compressor-condenser components. Multi-split variable refrigerant flow systems are covered in a different specification section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. LEED Submittals:

1. Product Data for Credit EA 4: Documentation indicating that equipment and refrigerants comply.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

D. Field quality-control reports.

E. Warranty: Sample of special warranty.

F. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.4 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases.

B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.5 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Compressor: 10 year(s) from date of Substantial Completion.
b. For Parts: 10 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Mitsubishi Electric.
2. Daikin

2.2 INDOOR UNITS

A. Ducted Evaporator-Fan Components:

1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
2. Insulation: Faced, glass-fiber duct liner.
3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
4. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
5. Fan Motors:

    a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements.
    b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
    c. Wiring Terminations: Connect motor to chassis wiring with plug connection.

6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
    a. General Requirements for Air Filtration Section:
        1) Comply with NFPA 90A.
        2) Minimum Arrestance: According to ASHRAE 52.1 and MERV according to ASHRAE 52.2.
        3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.
    b. Disposable Panel Filters:

        1) Factory-fabricated, viscous-coated, flat-panel type.
        2) Thickness: 1 inch.
        3) Merv according to ASHRAE 52.2: 7.
        4) Media: Interlaced glass fibers sprayed with nonflammable adhesive.
7. Condensate Drain Pans:

    a. Fabricated with two percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and to direct water toward drain connection.

        1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
        2) Depth: A minimum of 2 inches deep.
    b. Double-wall, stainless-steel sheet with space between walls filled with foam insulation and moisture-tight seal.

c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
d. Pan-Top Surface Coating: Asphaltic waterproofing compound.
e. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.

B. Cabinet Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and ends in factory standard color and finish.

a. Discharge Grille: Welded steel bars forming a linear grille and welded into supporting panel.
b. Insulation: Faced, glass-fiber duct liner.
c. Drain Pans: Galvanized steel, with connection for drain; insulated.

2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
3. Fan: Direct drive, centrifugal.
4. Fan Motors:

a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements.
b. Multitapped, multispeed with internal thermal protection and permanent lubrication.

5. Air Filtration Section:

a. General Requirements for Air Filtration Section:

1) Comply with NFPA 90A.
2) Minimum Arrestance: According to ASHRAE 52.1 and MERV according to ASHRAE 52.2.
3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

b. Disposable Panel Filters:

1) Factory-fabricated, viscous-coated, flat-panel type.
2) Thickness: 1 inch.
3) Merv according to ASHRAE 52.2: 7.
4) Media: Interlaced glass fibers sprayed with nonflammable adhesive.

C. Wall-Mounted, Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and ends in factory standard color and finish, and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
3. Fan: Direct drive, centrifugal.
4. Fan Motors:

    a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements.
    b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
    c. Enclosure Type: Totally enclosed, fan cooled.
    d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
    e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.

5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
6. Condensate Drain Pans:

    a. Fabricated with two percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and to direct water toward drain connection.
        1) Depth: A minimum of 1 inch deep.
    b. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

    c. Pan-Top Surface Coating: Asphaltic waterproofing compound.

7. Air Filtration Section: Provide mesh type cleanable filters for each wall mounted cassette.

D. Ceiling Mounted Evaporator-Fan Components:
1. Indoor, direct-expansion, low profile in-ceiling fan coil. Unit shall be complete with a coil, fan, DC inverter driven fan motor, piping connectors, condensate pump with a lift capability of 24.7”, and hanging brackets.
2. Unit Cabinet: Cabinet shall be constructed of zinc-coated steel. Fully insulated discharge and inlet grilles shall be attractively styled, high-impact non- metallic material.
    a. The inlet grille shall have hinges and can be opened to obtain access to the cleanable filters, indoor fan motor and control box.
3. Fans: Fan shall be centrifugal direct-drive blower type with air intake in the center of the unit and discharge at the perimeter. Automatic, motor-driven vertical air sweep shall be provided standard. Automatic motor-driven louvers shall be provided standard and shall be adjustable for 2, 3 or 4-way discharge.
    a. Air sweep operation shall provide three user selectable modes.

4. Coil: Coil shall be copper tube with aluminum fins and galvanized steel tube sheets. Fins shall be bonded to the tubes by mechanical expansion and specially coated for enhanced wet-ability. A drip pan under the coil shall have a factory installed condensate pump and drain connection for hose attachment to remove condensate. A replaceable element in the condensate disposal system provides antibacterial protection.
5. Motors: Motors shall be totally enclosed, permanently lubricated ball bearing with inherent overload protection. Fan motors shall be inverter controlled variable speed.

6. Air Filtration Section: Provide mesh type cleanable filters for each wall mounted cassette.

2.3 OUTDOOR UNITS (5 TONS OR LESS)

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

    a. Compressor Type: Scroll.
    b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
    c. Refrigerant Charge: R-410A.
    d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.

3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Permits operation down to 45 deg F.
7. Mounting Base: Polyethylene.

2.4 OUTDOOR UNITS (6 TONS OR MORE)

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

    a. Compressor Type: Scroll.
    b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
    c. Refrigerant Charge: R-410A.
    d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.

3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Permits operation down to 45 deg F.
7. Mounting Base: Polyethylene.

2.5 ACCESSORIES

A. Provide factory control system for both outdoor and indoor components of the split system. The factory control system shall be provided with scheduling capability as well as temperature and dehumidification control for the rooms that the indoor units are serving. See controls drawings for any building DDC system integration or graphics required.

B. Thermostat: Provide a hard wired, “simple” type thermostat with the following features:

1. Compressor time delay.
2. 24-hour time control of system stop and start.
3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
4. Fan-speed selection including auto setting.

C. Automatic-reset timer to prevent rapid cycling of compressor.

D. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

E. Drain Hose: For condensate.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounted, compressor-condenser components on equipment supports per manufacturer’s recommendations and details on the drawings. Anchor units to supports with removable, cadmium-plated fasteners.

D. Equipment Mounting:

1. Install ground-mounted, compressor-condenser components on cast-in-place concrete equipment base(s).
2. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

C. Duct Connections: Duct installation requirements are specified in Section 233113 "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Section 233300 "Air Duct Accessories."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.4 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain units. Provide two hours of training for the split systems installed.

END OF SECTION 238126

SECTION 23 82 39

CABINET UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cabinet unit heaters with centrifugal fans and electric-resistance heating coils.

1.3 DEFINITIONS

A. BAS: Building automation system.

B. CWP: Cold working pressure.

C. PTFE: Polytetrafluoroethylene plastic.

D. TFE: Tetrafluoroethylene plastic.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. LEED Submittals:

1. Product Data for Prerequisite IEQ 1: Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."

C. Shop Drawings:

1. Include plans, elevations, sections, and details.

2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include location and size of each field connection.
4. Include details of anchorages and attachments to structure and to supported equipment.
5. Include equipment schedules to indicate rated capacities, operating characteristics, furnished specialties, and accessories.
6. Indicate location and arrangement of piping valves and specialties.
7. Indicate location and arrangement of integral controls.
8. Wiring Diagrams: Power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For cabinet unit heaters to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Cabinet Unit-Heater Filters: Furnish one spare filter(s) for each filter installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Airtherm; a Mestek company.
2. Berko; Marley Engineered Products.
3. Chromalox, Inc.
4. Indeeco.
5. Markel Products Company; TPI Corporation.
6. McQuay International.
7. Ouellet Canada Inc.
8. QMark; Marley Engineered Products.
9. Trane Inc.

2.2 DESCRIPTION

A. Factory-assembled and -tested unit complying with AHRI 440.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with UL 2021.

2.3 PERFORMANCE REQUIREMENTS

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

B. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

2.4 COIL SECTION INSULATION

A. Insulation Materials: ASTM C 1071; surfaces exposed to airstream shall have aluminum-foil facing to prevent erosion of glass fibers.

1. Thickness: 1/2 inch.
2. Thermal Conductivity (k-Value): 0.26 Btu x in./h x sq. ft. at 75 deg F mean temperature.
3. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
4. Adhesive: Comply with ASTM C 916 and with NFPA 90A or NFPA 90B.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.5 CABINETS

A. Material: Steel with baked-enamel finish with manufacturer's standard paint, in color selected by Architect.

1. Vertical Unit, Exposed Front Panels: Minimum 0.0528-inch- thick galvanized sheet steel, removable panels with channel-formed edges secured with tamperproof cam fasteners.
2. Recessed Flanges: Steel, finished to match cabinet.
3. Control Access Door: Key operated.
4. False Back: Minimum 0.0428-inch- thick steel, finished to match cabinet.

2.6 FILTERS

A. Minimum Arrestance: According to ASHRAE 52.1 and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
   1. Glass Fiber Treated with Adhesive: 80 percent arrestance and MERV 5.

2.7 COILS

A. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and hum, mounted in ceramic inserts in galvanized-steel housing; with fuses in terminal box for overcurrent protection and limit controls for high-temperature protection. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.

2.8 CONTROLS

A. Fan and Motor Board: Removable.

   1. Fan: Forward curved,double width, centrifugal, directly connected to motor; thermoplastic or painted-steel wheels and aluminum, painted-steel, or galvanized-steel fan scrolls.
   2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board.
   3. Wiring Terminations: Connect motor to chassis wiring with plug connection.

B. Basic Unit Controls:
   1. Unit-mounted thermostat with the following features:

      a. Heat-off switch.
      b. Fan on-auto switch.
      c. Manual fan-speed switch.
      d. Adjustable deadband.
      e. Exposed set point.
      f. Exposed indication.
      g. Deg F indication.

C. Electrical Connection: Factory-wired motors and controls for a single field connection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive cabinet unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in forelectrical connections to verify actual locations before unit-heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install cabinet unit heaters to comply with NFPA 90A.

B. Suspend cabinet unit heaters from structure with elastomeric hangers. Vibration isolators are specified in Section 230548 "Vibration and Seismic Controls for HVAC."

C. Install new filters in each fan-coil unit within two weeks of Substantial Completion.

3.3 CONNECTIONS

A. Comply with safety requirements in UL 1995.

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Units will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust initial temperature set points.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain cabinet unit heaters.

END OF SECTION 238239

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 GENERAL REQUIREMENTS

A. Examine job site and verify all site conditions prior to starting work. Bring any discrepancy between the contract documents and the actual field conditions to the attention of the architect/engineer.

B. The drawings are diagrammatic. Coordinate in the field, with the architect and with all trades, the exact location of equipment, routing of conduit, and sleeves.

C. Arrange for conduit spaces, chases, slots, and openings in building structure during progress of construction, to allow for electrical installations.

D. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

E. Coordinate requirements for access panels and doors for electrical items requiring access that are concealed behind finished surfaces.

F. Perform work in accordance with rules, regulations, standards, codes, ordinances, and laws of local, state, and federal governments, and other authorities having jurisdiction and be responsible for compliance therewith.

G. Obtain all necessary approvals, permits and inspections. Pay all associated fees.

H. Guarantee all systems and work for a period of one (1) year from date of final acceptance. See other warranty requirements for specific equipment in subsequent spec sections.

I. Contractor shall maintain a notated set of “as-built” drawings on site showing all deviations from the contract drawings and shall turn them over to the architect/engineer upon substantial completion.

J. All materials shall be new and of commercial grade and bear the underwriter's label where applicable.

K. Obtain approval from the building owner's representative prior to any interruption of building electrical or fire alarm systems. Coordinate acceptable working hours with same.

L. All cutting and patching required for electrical installations is by the electrical contractor. Core drill or saw cut all masonry and restore all surfaces to original condition, to match adjacent ad to satisfaction of architect and owner. Associated painting and finishing are by the general contractor unless noted otherwise.

M. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment. Field welding shall comply with AWS D1.1.

1.3 SUMMARY

A. Section Includes:
1. Electrical equipment coordination and installation.
2. Submittals
3. Sleeves for raceways and cables.
4. Grout.
5. Common electrical installation requirements.

1.4 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. EPDM: Ethylene-propylene-diene terpolymer rubber.

G. NBR: Acrylonitrile-butadiene rubber.

1.5 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:
   1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
   2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
   3. To allow right of way for piping and conduit installed at required slope.
   4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.

D. Coordinate sleeve selection and application with selection and application of firestopping.

E. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

F. All workmanship shall conform with all laws, codes, and ordinances of the bodies having jurisdiction.

1.6 MECHANICAL-ELECTRICAL COORDINATION

A. All motors included for new equipment will be provided by the mechanical contractor, and wired by the electrical contractor.

B. Coordinated drawings shall be submitted prior to construction of new work. The coordinated drawings shall show all HVAC and Plumbing installation along with cable tray installation, electrical conduit runs, lighting, and sprinkler work.

1.7 SUBMITTALS

A. Each Submittal shall be identified by the following:
   1. Project Name

2. Specification Section
3. Drawing Numbers
4. Product data submittals shall include but not be limited to:
    a. Manufacturer and Model Number.
    b. Complete electrical data and wiring diagrams.
    c. Dimensions, capacities, ratings, materials, finishes, special features and storage conditions.
    d. Recommended installation procedures, performance, and conditions of performance, testing, and calibration certifications.
5. For equipment submitted that is not a basis of design, the contractor is to ensure the ability to fit in the original space allotted, the ability to be routed into the building and all required access in maintained, and indicated such on the submittal.
6. Each submittal shall clearly identify which product and components are being furnished and eliminate reference to units, components and features not being furnished.

1.8 INSTRUCTING FACILITIES PERSONNEL

A. Contractor and factory personnel are required to train the Facilities personnel and/or building owner on the operation and maintenance of all electrical distribution equipment in this contract as part of the scope of work. Include one 4 hour training period at the completion of the project for owner instruction on the equipment installed, and additional 2 hours for any lighting control system adjustments and training.

B. The contractor shall provide an electronic copy and two hard copies of bound operation and maintenance manuals for the new equipment installed. The binders shall also include a copy of the approved submittals. General catalog data for these owner's manuals are unacceptable. Provide manufacturer's preventative maintenance data and clearly indicate the drawing tags for the equipment and the equipment selected for this contract.

1. Include the manufacturer's and contractor's name, address, and phone number with the owner's manual for warranty services.
2. Include warranty information in the owner's manuals.
3. Include lighting control diagrams, sequence of operation for each room and service instructions for all controllers (calibration, trouble shooting, etc.).
4. Provide one section in the O&M manuals for manufacturer's preventative maintenance procedures.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Sleeves for Rectangular Openings: Galvanized sheet steel.
   1. Minimum Metal Thickness:
      a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
      b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

F. All exposed feeder installations to be provided in EMT conduit. All concealed installations above ceilings or within walls can be MC cable, unless noted otherwise.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls and foundations, or fire-rated floor and wall assemblies.

B. Concrete Slabs, Walls and Foundations: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.

G. Seal space outside of sleeves with grout for penetrations of concrete and masonry
   1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants."

I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 7 Section " Penetration Firestopping."

J. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

3.3 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7 Section " Penetration Firestopping."

END OF SECTION 26 05 00

SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following

1. American Insulated Wire Corp.; a Leviton Company.
2. General Cable Corporation.
3. Southwire Incorporated.
4. Okonite Cable Company.
5. Allied Wire & Cable

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by the following
1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. 3M; Electrical Markets Division.
4. Tyco Electronics.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Stranded for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Stranded for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Type THHN-2-THWN-2, single conductors in raceway

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway.

C. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway.

D. Branch Circuits Concealed above accessible Ceilings: Type THHN-2-THWN-2 single conductors in raceway.

E. Branch Circuits Concealed above inaccessible Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
   2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

B. Test and Inspection Reports: Prepare a written report to record the following:
   1. Procedures used.
   2. Results that comply with requirements.
   3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 26 0519

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Hangers and supports for electrical equipment and systems.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
   1. Available Manufacturers: : Use one of the following manufacturers, subject to compliance with requirements:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.
      c. Thomas & Betts Corporation.
      d. Unistrut; Atkore International.
   2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   3. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for conduit as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
   1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, conduit may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
   1. To Wood: Fasten with lag screws or through bolts.
   2. To New Concrete: Bolt to concrete inserts.
   3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
   4. To Concrete: Expansion anchor fasteners.
   5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
   6. To Light Steel: Sheet metal screws.

7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

3.3 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Metal conduits and fittings.
   2. Nonmetal conduits and fittings.
   3. Metal wireways and auxiliary gutters.
   4. Boxes, enclosures, and cabinets
   5. Handholes

1.3 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, cabinets, and handholes.

B. Shop Drawings: For custom enclosures, cabinets, and handholes. Include plans, elevations, sections, and attachment details.

C. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
   1. Structural members in paths of conduit groups with common supports.
   2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1.
   2. Allied Tube & Conduit.
   3. O-Z/Gedney.
   4. Thomas & Betts Corporation.
   5. Wheatland Tube Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Rigid Stel: Comply with ANSI C80.1 and UL 6.

D. EMT: Comply with ANSI C80.3 and UL 797.

E. FMC: Comply with UL 1; zinc-coated steel.

F. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
   1. Fittings for EMT:
      a. Material: steel
      b. Type: compression.

H. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Condux International, Inc
   2. Lamson & Sessions; Carlon Electrical Products.
   3. RACO; Hubbell.
   4. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. RNC: Type EPC-80-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Cooper B-Line, Inc.
   2. Hoffman.
   3. Cutler Hammer/Eaton
   4. Square D.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
   1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Screw-cover type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. FSR Inc.
   2. Hoffman.
   3. Thomas & Betts Corporation.
   4. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Metal Floor Boxes:

1. Material: Cast metal or sheet metal.
2. Type: Fully adjustable
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

G. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.
1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

J. Gangable boxes are allowed.

K. Cabinets:
1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

2.5 HANDHOLES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Quazite service box by Hubbell power system, Inc. or comparable product by one of the following:
1. Armorcast Products Company
2. Carson Industrties LLC.

B. Description: Polymer Concrete Handholes and Boxes with Polymer Concrete Cover: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Indoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed, Not Subject to Physical Damage: EMT.
   2. Exposed and Subject to Severe Physical Damage: rigid steel.
   3. Concealed in Ceilings and Interior Walls and Partitions: FMC.
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
   5. Damp or Wet Locations: rigid steel.
   6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

B. Minimum Raceway Size: 3/4-inch trade size.

C. Raceway Fittings: Compatible with raceways and suitable for use and location.
   1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
   2. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
   3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Stub-ups to Above Recessed Ceilings:
   1. Use EMT or RMC for raceways.
   2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

K. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

L. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits

M. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

N. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

O. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

P. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

Q. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

R. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
   1. Where conduits pass from interior to exterior locations.
   2. Where otherwise required by NFPA 70.

S. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

T. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center.

U. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

V. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

W. Locate boxes so that cover or plate will not span different building finishes.

X. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

Y. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

Z. Set metal floor boxes level and flush with finished floor surface.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.4 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION 26 0533

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Equipment identification labels.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:
   1. Legend: Indicate voltage.

C. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.2 METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

   1. Legend: Indicate voltage.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, flexible label clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted flexible label clear, weather- and chemical-resistant, self-laminating, protective shield over the legend

C. Snap-Around Labels: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.

D. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.5 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.6 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black except where used for color-coding.

B. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, self-locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label. Install labels at 10-foot] maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. :

C. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

D. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

E. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.
    b. Controls with external control power connections.

F. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Indoor Equipment: Adhesive film label with clear protective overlay. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
    b. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    c. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.

c. Switchboards
d. Lighting Inverters
e. Access doors and panels for concealed electrical items.
f. Contactors.
g. Monitoring and control equipment.

END OF SECTION 260553

SECTION 26 05 73

OVERCURRENT PROTECTIVE DEVICE STUDIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes computer-based, fault-current and overcurrent protective device coordination studies. Section also includes a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment. Protective devices shall be set based on results of the protective device coordination study

1. Coordination of series-rated devices is permitted where indicated on Drawings.

1.3 SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: The following submittals shall be made after the approval process for system protective devices has been completed. Submittals shall be in digital form.

1. Coordination-study input data, including completed computer program input data sheets.
2. Study and Equipment Evaluation Reports.
3. Coordination-Study Report.
4. Arc-flash study input data, including completed computer program input data sheets.
5. Arc-flash study report; signed, dated, and sealed by a qualified professional engineer.

a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

C. Qualification Data: For coordination-study specialist and Arc-Flash Study Specialist.

D. Product Certificates: For coordination-study and fault-current-study computer software programs, certifying compliance with IEEE 399. For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E

1.4 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are not acceptable.

B. Coordination-Study Specialist Qualifications: An entity experienced in the application of computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. Professional engineer, licensed in the state where Project is located, shall be responsible for the study. All elements of the study shall be performed under the direct supervision and control of engineer.

C. Comply with IEEE 242 for short-circuit currents and coordination time intervals.

D. Comply with IEEE 399 for general study procedures.

E. Arc-Flash Study Software Developer Qualifications: An entity experienced in the application of computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. Professional engineer, licensed in the state where Project is located, shall be responsible for the study. All elements of the study shall be performed under the direct supervision and control of engineer.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Available Computer Software Developers: Subject to compliance with requirements, companies offering computer software programs that may be used in the Work include, but are not limited to, the following:

B. Computer Software Developers: Subject to compliance with requirements, provide products by one of the following:

C. Provide product by SKM Systems Analysis, Inc.

2.2 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

A. Comply with IEEE 399.

B. Analytical features of fault-current-study computer software program shall include "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

1. Optional Features:

a. Arcing faults.
b. Simultaneous faults.
c. Explicit negative sequence.
d. Mutual coupling in zero sequence.

2.3 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 260553 " Electrical Identification." Produce a 3.5-by-5-inch thermal transfer label of high-adhesion polyester for each work location included in the analysis.

B. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:

1. Location designation.
2. Nominal voltage.
3. Flash protection boundary.
4. Hazard risk category.
5. Incident energy.
6. Working distance.
7. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.

1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 POWER SYSTEM DATA

A. Gather and tabulate the following input data to support coordination study:

1. Product Data for overcurrent protective devices specified in other electrical Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Impedance of utility service entrance.
3. Electrical Distribution System Diagram: In hard-copy and electronic-copy formats, showing the following:

    a. Circuit-breaker and fuse-current ratings and types.
    b. Relays and associated power and current transformer ratings and ratios.
    c. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, and X/R ratios.
    d. Generator kilovolt amperes, size, voltage, and source impedance.
    e. Cables: Indicate conduit material, sizes of conductors, conductor material, insulation, and length.
    f. Busway ampacity and impedance.
    g. Motor horsepower and code letter designation according to NEMA MG 1.

4. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:

    a. Special load considerations, including starting inrush currents and frequent starting and stopping.
    b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
    c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.

d. Generator thermal-damage curve.
e. Ratings, types, and settings of utility company's overcurrent protective devices.
f. Special overcurrent protective device settings or types stipulated by utility company.
g. Time-current-characteristic curves of devices indicated to be coordinated.
h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
j. Panelboards, switchboards, motor-control center ampacity, and interrupting rating in amperes rms symmetrical.

3.3 FAULT-CURRENT STUDY

A. Calculate the maximum available short-circuit current in amperes rms symmetrical at circuit-breaker positions of the electrical power distribution system. The calculation shall be for a current immediately after initiation and for a three-phase bolted short circuit at each of the following:

1. Distribution panelboard.
2. Branch circuit panelboard.

B. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions.

C. Calculate momentary and interrupting duties on the basis of maximum available fault current.

D. Calculations to verify interrupting ratings of overcurrent protective devices shall comply with IEEE 241 and IEEE 242.

1. Transformers:

a. ANSI C57.12.10.
b. ANSI C57.12.22.
c. ANSI C57.12.40.
d. IEEE C57.12.00.
e. IEEE C57.96.

2. Low-Voltage Circuit Breakers: IEEE 1015 and IEEE C37.20.1.
3. Low-Voltage Fuses: IEEE C37.46.

E. Study Report:

1. Show calculated X/R ratios and equipment interrupting rating (1/2-cycle) fault currents on electrical distribution system diagram.

F. Equipment Evaluation Report:

1. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
2. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
3. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

3.4 COORDINATION STUDY

A. Perform coordination study using approved computer software program. Prepare a written report using results of fault-current study. Comply with IEEE 399.

1. Calculate the maximum and minimum 1/2-cycle short-circuit currents.
2. Calculate the maximum and minimum interrupting duty (5 cycles to 2 seconds) short-circuit currents.
3. Calculate the maximum and minimum ground-fault currents.

B. Comply with IEEE 241 recommendations for fault currents and time intervals.

C. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

a. Inrush current when first energized.
b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

D. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

E. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:

1. Tabular Format of Settings Selected for Overcurrent Protective Devices:

   a. Device tag.
   b. Relay-current transformer ratios; and tap, time-dial, and instantaneous-pickup values.
   c. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.
   d. Ground-fault relay-pickup and time-delay settings.

2. Coordination Curves: Prepared to determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

   a. Device tag.
   b. Voltage and current ratio for curves.
   c. Three-phase and single-phase damage points for each transformer.
   d. No damage, melting, and clearing curves for fuses.
   e. Cable damage curves.
   f. Transformer inrush points.
   g. Maximum fault-current cutoff point.

F. Completed data sheets for setting of overcurrent protective devices.

3.5 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Use the short-circuit study output and the field-verified settings of the overcurrent devices.

C. Calculate maximum and minimum contributions of fault-current size.

1. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume no motor load.
2. The maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

D. Calculate the arc-flash protection boundary and incident energy at locations in the electrical distribution system where personnel could perform work on energized parts.

E. Include medium- and low-voltage equipment locations.

F. Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/sq.cm.

G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond three to five cycles.
2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g., contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

H. Arc-flash computation shall include both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.
2. When the line terminals of the circuit breaker are separate from the work location.

I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.6 FIELD ADJUSTING

A. Adjust relay and protective device settings according to the recommended settings provided by the coordination study.

B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.

3.7 LABELING

A. Apply one arc-flash label for 600-V ac, 480-V ac, and applicable 208-V ac panelboards and enclosed circuit breakers.

END OF SECTION 260573

SECTION 26 09 23

LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Indoor occupancy sensors.

B. Related Requirements:

   1. Section 262726 "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

   1. Interconnection diagrams showing field-installed wiring.
   2. Include diagrams for power, signal, and control wiring.

C. Field quality-control reports.

D. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 INDOOR OCCUPANCY SENSORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Lighting Control and Design; Acuity Lighting Group, Inc. or comparable product by the following:
   1. Lutron Electronics Co., Inc.
   2. Any other manufacturer only accepted with Owner approval.

B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.

   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
   3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
   4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
   5. Mounting:

      a. Sensor: Suitable for mounting in any position on a standard outlet box.
      b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
      c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

   6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
   7. Bypass Switch: Override the "on" function in case of sensor failure.
   8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.

C. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

   1. Sensitivity Adjustment: Separate for each sensing technology.
   2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of

average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.

3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

2.2 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Lighting Control and Design; Acuity Lighting Group, Inc. or comparable product by one of the following:

1. Sensor Switch.
2. Leviton Mfg. Company Inc.
3. Lutron Electronics Co., Inc.
4. Square D.
5. Watt Stopper.

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

2.3 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 WIRING INSTALLATION

A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.3 IDENTIFICATION

A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Lighting control devices will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 26 0923

SECTION 26 24 13

SWITCHBOARDS

PART 1 - GENERAL

1.1 SCOPE

A. The contractor shall provide and install dead-front service entrance switchboards as herein specified and as shown on related electrical drawings.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data.

B. Drawings: Submit shop drawings for approval. Include components, materials, finishes, detailed plan and elevation views, required conduit rough-in openings, anchors and accessories.

1.3 RELATED STANDARDS

A. The switchboard shall be designed, manufactured and tested according to the latest applicable version of the following standards:
   1. ANSI
   2. NEMA PB2 – Deadfront Distribution Switchboards
   3. UL 891 – Deadfront Switchboards

1.4 QUALITY ASSURANCE

A. Manufacturer: For equipment required for the work of this section, provide product which is the responsibility of one manufacturer.

B. Performance Requirements: Provide switchboards manufactured in accordance with Article 408 of the latest National Electrical Code and applicable portions of the NEMA PB2, UL 891 and NFPA 70, the National Electrical Code.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures and construction operations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide SIEMENS SB switchboards and accessories by Siemens or pre-approved equal. Approved manufacturers are as follows:
   1. SIEMENS

B. For the equipment specified herein, the manufacturer shall be ISO 9000, 9001 or 9002 certified.

C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum of ten (10) years.

D. Intent: In the following specifications, products of Siemens are used to provide a standard of quality and performance for the work of this section.

2.2 GENERAL REQUIREMENTS

A. Construction
   1. Switchboard shall be of the modular type construction, constructed in accordance with the latest NEMA PB-2 and UL 891 standards, with the required number of vertical sections bolted together to form one metal enclosed rigid switchboard. The sides, top and rear shall be covered with removable screw-on code gauge steel plates. Switchboard shall include all protective devices and equipment as listed on drawings with necessary interconnections, instrumentation and control wiring. All groups of control wires leaving the switchboard shall be provided with terminal blocks with suitable numbering strips. Service entrance switchboards shall be suitable only for use as service equipment and be labeled in accordance with UL requirements. System voltage, amperage and interrupting capacity shall be as indicated on the drawings. Enclosure construction shall be NEMA 1 indoor

B. Bus Requirements
   1. The bus shall be750A / sq-in for aluminum and shall be fully rated the entire length of the switchboard. The bus shall be braced and supported to withstand mechanical forces exerted during a short circuit from a power source having the available short circuit

current as indicated on the drawings. Provide a full capacity neutral where a neutral is indicated on the drawings. The through bus on the end section shall be extended and pre-drilled to allow the addition of future sections. Ground bus and grounding conductor lug shall be furnished. Ground bus shall extend the entire length of the switchboard and shall be firmly secured to each vertical section. Bus Material shall be tin plated aluminum.

C. Incoming Service
   1. Underground Service:
      a. To isolate incoming underground service conductors, an underground cable pull or auxiliary section shall be used when shown on the drawings. This section shall be of the non-bussed bussed type and shall be sealable per local utility requirements, when required.
   2. Service Section:
      b. The service section shall be designed for the system parameters indicated and shall have a metering compartment per utility requirements user metering as indicated and shall have a main protective device as indicated.
   3. Lugs:
      c. Screw-type mechanical lugs Compression lugs to terminate aluminum copper cable shall be provided as detailed on the drawings.

D. Utility Metering
   1. The utility metering section shall be built in accordance with requirements and codes of the local utility.

E. Main Protective Device
   1. Molded Case Circuit Breaker Molded case circuit breaker shall be of the quick-make, quick-break, trip-free, thermal magnetic solid-state type. When solid state breakers are used, the continuous current rating shall be adjustable from 20 to 100% without the need for a rating plug. Solid state breakers shall be Siemens Sensitrip IV, VL, 3VA6 or equivalent design. Solid state breaker trip functions shall include adjustments for continuous amperage, long time pickup and delay, instantaneous short time pickup and delay, ground fault pickup and delay, zone selective interlocking for short time and ground fault. Breaker ratings shall be as shown on the drawings.

F. Distribution Sections
   1. Utility metering sections per the drawings.

G. Ground Fault Protection
   1. Not required.

H. Finish
   1. The complete switchboard shall be phosphatized and finished with ANSI 61 light gray polyester powder paint.

I. Markings

1. Each switchboard section shall have a label permanently affixed to it, listing the following information: Name of manufacturer, system voltage, ampacity, type, manufacturer's shop order number and date.
2. Each section of switchboard shall bear a UL listing mark, where qualified and a short circuit rating label.
3. Front, side, rear and top of each switchboard section will have a DANGER label in accordance with NEMA Standard PB-2.

J. Arc Flash
1. Apply in the field, the factory supplied arc flash warning label to all switchboards that are in other than dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized to warn qualified persons of potential electrical arc flash hazards.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine substrates and conditions in which units will be installed. Check for clearance that will be required before, during and after equipment installation. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Strictly comply with manufacturer's instructions and recommendations and NEMA PB 2.1. Coordinate installation with adjacent work to ensure proper sequence of construction, clearances and support.

C. Install units plumb, level and rigid without distortion to the switchboard cubicle(s).

3.2 ADJUSTING AND CLEANING

A. Clean exposed surfaces using manufacturer recommended materials and methods.

B. Touch-up damaged coatings and finishes using non-abrasive materials and methods recommended by manufacturer. Eliminate all visible evidence of repair.

3.3 TESTING

A. Perform factory and installation tests in accordance with applicable NEC, NEMA and UL requirements.

3.4 WARRANTY

A. Equipment manufacturer warrants that all goods supplied are free of non-conformities in workmanship and materials for one year from date of initial operation, or up to eighteen months from date of shipment.

END OF SECTION 26 2413

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.
   1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
   2. Detail enclosure types and details for types other than NEMA 250, Type 1.
   3. Detail bus configuration, current, and voltage ratings.
   4. Short-circuit current rating of panelboards and overcurrent protective devices.
   5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
   6. Include wiring diagrams for power, signal, and control wiring.
   7. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

C. Field Quality-Control Reports:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
   1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Product Selection for Restricted Space: For clearances between panelboards and adjacent surfaces and other items comply with indicated minimum manufacturer clearance dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

1.4 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: Flush- or surface mounted cabinets.
   1. Rated for environmental conditions at installed location.
      a. Indoor Dry and Clean Locations: NEMA 250, Type 1
   2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
   3. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
   4. Finishes:
      a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
      b. Back Boxes: Galvanized steel.

c.

5. Directory Card: Inside panelboard door, mounted in transparent card holder.

B. Incoming Mains Location: Top and bottom.

C. Phase, Neutral, and Ground Buses:
   1. Material: Hard-drawn copper, 98 percent conductivity.
   2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

D. Conductor Connectors: Suitable for use with conductor material and sizes.
   1. Material: Hard-drawn copper, 98 percent conductivity.
   2. Main and Neutral Lugs: Mechanical type.
   3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
   4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 PANELBOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Square D; a brand of Schneider Electric or comparable product by one of the following:
   1. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
   2. Siemens

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
   1. For doors more than 36 inches high, provide two latches, keyed alike.

D. Mains: Refer to single line diagram.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Square D; a brand of Schneider Electric or comparable product by one of the following:
   1. General Electric Company; GE Consumer & Industrial - Electrical Distribution.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
   1. The life safety system shall be provided with circuit breakers that are specifically designed to be used in combination for absolute coordination in life safety systems. Refer to Div 26 specification section, Overcurrent Protective Device Studies for required documentation.
      a. Microprocessor-based trip units shall be required for the emergency distribution panel (EDP).
      b. Microprocessor-based trip units may be required for downstream panels.
      c. Thermal-magnetic circuit breakers typically do not selectively coordinate in the instantaneous region, unless specifically designed and tested for life safety applications.
   2. Standard-function, microprocessor-based trip units with interchangeable rating plug, trip indicators, and the following field-adjustable settings:
      a. Instantaneous trip.
      b. Long- and short-time time adjustments.
   3. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
   4. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
   5. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
      a. Standard frame sizes, trip ratings, and number of poles.
      b. Lugs: Mechnanical style, suitable for number, size, trip ratings, and conductor materials.
      c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
      d. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

C. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."

D. Mount top of trim 90 inches above finished floor unless otherwise indicated.

E. Install overcurrent protective devices and controllers not already factory installed.
   1. Set field-adjustable, circuit-breaker trip ranges.

F. Install filler plates in unused spaces.

G. Arrange conductors in gutters into groups and bundle and wrap with wire ties

H. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:
   1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

C. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.
   1. Measure as directed during period of normal system loading.
   2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
   3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.

4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

END OF SECTION 26 2416

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Snap switches.
3. Wall-switch occupancy sensors.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

D. Field quality-control reports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
1. Retain "Products" Subparagraph and list of manufacturers and products below to require specific products or a comparable product from other manufacturers.

2. Products: Subject to compliance with requirements, provide the following:

a. Cooper; 5351 (single), CR5362 (duplex).
b. Hubbell; HBL5351 (single), HBL5352 (duplex).
c. Leviton; 5891 (single), 5352 (duplex).
d. Pass & Seymour; 5361 (single), 5362 (duplex).

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide the following:

a. Cooper; VGF20.
b. Hubbell; GFR5352L.
c. Pass & Seymour; 2095.
d. Leviton; 7590.

2.5 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120-V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Single Pole:

1) Cooper; AH1221.
2) Hubbell; HBL1221.
3) Leviton; 1221-2.
4) Pass & Seymour; CSB20AC1.

b. Two Pole:

1) Cooper; AH1222.
2) Hubbell; HBL1222.
3) Leviton; 1222-2.
4) Pass & Seymour; CSB20AC2.

c. Three Way:

1) Cooper; AH1223.
2) Hubbell; HBL1223.
3) Leviton; 1223-2.
4) Pass & Seymour; CSB20AC3.

2.6 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for devices at stone or wood wall locations: Refer to architect for material and color selection.
3. Material for Finished GWB Spaces: Brushed stainless Steel.
4. Material for Unfinished Spaces: Brushed stainless steel.
5. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with “while-in-use” cover.

2.7 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

    a. Cut back and pigtail, or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the left.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 26 2726

SECTION 26 51 00

LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior lighting fixtures, lamps, and ballasts.
2. Exit signs.
3. Lighting fixture supports.

1.3 DEFINITIONS

A. BF: Ballast factor.

B. CCT: Correlated color temperature.

C. CRI: Color-rendering index.

D. HID: High-intensity discharge.

E. LER: Luminaire efficacy rating.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.4 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.
3. Energy-efficiency data.
4. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
5. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.

    a. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Shop Drawings: For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Installation instructions.

D. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lighting fixtures.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extends to within 12 inches of the plane of the luminaires.
4. Ceiling-mounted projectors.
5. Structural members to which suspension systems for lighting fixtures will be attached.
6. Other items in finished ceiling including the following:
    a. Sprinklers.
    b. Smoke and fire detectors.
    c. Occupancy sensors.
    d. Access panels.
7. Perimeter moldings.

E. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.

F. Field quality-control reports.

G. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
2. Plastic Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Fluorescent-fixture-mounted, emergency battery pack: One for every 20 emergency lighting unit.
4. Ballasts: One for every 100 of each type and rating installed. Furnish at least one of each type.

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

1.7 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

B. Fixture refurbishment: Electrical contractor to be responsible for complete refurbishment of chandeliers. Refurbishment shall include:
1. Replacing internal fixture wire
2. Cleaning/replacing fixture lamp socket
3. Cleaning and protecting fixture finish
4. Certifying repair work under UL certification
5. Submit certificates of conformance indicating repairs made to fixture

6. Provide 90 day warranty on repair work completed

1.8 WARRANTY

A. Warranty period for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-design Products: The design for each lighting fixture is based on the product named in the Drawings. Subject to compliance with requirements, provide either the named product or a comparable product.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Metal Parts: Free of burrs and sharp corners and edges.

C. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. Diffusers and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

    a. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
    b. UV stabilized.

2. Glass: Annealed crystal glass unless otherwise indicated.

F. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp and ballast characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter code (T-4, T-5, T-8, T-12, etc.), tube configuration (twin, quad, triple, etc.), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
d. Start type (preheat, rapid start, instant start, etc.) for fluorescent and compact fluorescent luminaires.
e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
f. CCT and CRI for all luminaires.

2.3 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
2. Dual voltage input capacity (120/277V)
3. Universal surface mounting. Canopy provided.

2.4 LED FIXTURES AND POWER SUPPLIES

A. General Requirements:
1. LED fixtures shall be supplied with all low voltage cabling and power supplies from the fixture manufacturer.
2. Fixtures utilizing illuminated linear LED sections shall be supplied with LED supports and mounting components from the fixture manufacturer.
3. Power supplies and low voltage cabling shall be selected based on the maximum connected load, with a minimum rating as shown on the Drawings.
4. Power supplies shall be provided with dedicated enclosures suitable for locations in which installed.
5. Low voltage LED supply cabling shall meet the requirements as listed in Division 26 section “Conductors and Cables.”
6. LED lamps shall be 3500K unless noted otherwise.

2.5 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage .

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.

F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. Install lamps in each luminaire.

B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.

C. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.

1. Install ceiling support system rods or wires independent of the ceiling suspension devices**,** for each fixture. Locate not more than 6 inches from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

D. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Verify that self-luminous exit signs are installed according to their listing and the requirements in NFPA 101.

C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.4 STARTUP SERVICE

A. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner. Burn-in fluorescent and compact fluorescent lamps intended to be dimmed, for at least 100 hours at full voltage.

B. Relamp all fixtures not operating at substantial completion.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.

1. Adjust aimable luminaires in the presence of Architect.

END OF SECTION 26 5100

1.5 MATERIALS

A. Housings:

1. Vandal resistant.
2. Extruded aluminum housing and heat sink.
3. Color and finish selected by Architect.

B. Lighting Diffusers: Prismatic glass.

C. Batteries: Nickel cadmium.

D. Lamps: LED.

SECTION 265668 – EXTERIOR ATHLETIC LIGHTING

PART 1 – GENERAL

1.1 PERFORMANCE REQUIREMENTS

A. Lighting design: If not supplied by the City, the lighting design shall be provided by the Contractor and the selected lighting manufacturer. Light poles and foundations shall be designed for applicable code requirements for wind loading and weight. Light pole foundations designs shall be prepared by a qualified structural engineer licensed as Professional Engineer in the Commonwealth of Pennsylvania.

B. Facility Type: Recreational or social facility.

C. Illuminance Calculations: Computer-analyzed point method for grid pattern dimensions and glare control.

D. Electric Power: Dependent on service provided. Multi-voltage drivers or ballasts are preferred.

E. Baseball Fields:

1. IESNA RP-6, Class of Play: I.
2. Speed of Sport: Slow.
3. Grid Pattern Dimensions: 30 by 30 feet.

F. Softball Fields:

1. IESNA RP-6, Class of Play: I.
2. Speed of Sport: Slow.
3. Grid Pattern Dimensions: 20 by 20 feet.

G. Football Fields:

1. IESNA RP-6, Class of Play: I.
2. Speed of Sport: Slow.
3. Grid Pattern Dimensions: 30 by 30 feet.

H. Soccer Fields:

1. IESNA RP-6, Class of Play: I.
2. Speed of Sport: Slow.
3. Grid Pattern Dimensions: 30 by 30 feet.

I. Outdoor Tennis Courts:

1. IESNA RP-6, Class of Play: I.
2. Speed of Sport: Slow.
3. Grid Pattern Dimensions: 10 by 10 feet.

J. Basketball:

1. IESNA RP-6, Class of Play: I.
2. Speed of Sport: Slow.
3. Grid Pattern Dimensions: 10 by 10 feet.

1.2 FIELD QUALITY CONTROL

A. Testing: By a qualified electrical inspection agent hired by the Contractor.

PART 2 – PRODUCTS

2.1 COMPONENTS

A. Lighting Control: Manual, low voltage, or digital.

B. Electric Power: Dependent on service provided. Multi-voltage drivers or ballasts are preferred.

C. Luminaires:

1. Spill-light control devices.
2. Bracket-mounted, full-cutoff type with integral drivers.
3. LED, rated up to 1000 W.

D. Driver Mounting: At location of associated luminaires.

E. Support Structures: Light Standards for Sports Parking and Vandal lighting use shall be complete assemblies of 40'- 0" to 80'-0" high poles with the number of luminaries indicated on the drawings.

F. Poles shall be round tapered galvanized steel or aluminum, 40'- 0" to 80'-0" high with 4" x 6" hand hole (tamperproof screws), vibration dampener and nut covers at base. Finish of poles shall be polyester powder coat dark bronze, black, or dark bronze anodized. Color shall be approved by Philadelphia Parks and Recreation. Pole heights shall be the same for a specific field.

G. Poles shall be provided with single, double, triple or quad arm pole top brackets for the configurations indicated.

H. Poles shall be per Lighting Manufacturer's recommendations or equal to sports lighting poles manufactured by Valmont Industries, Inc.

I. Pole Foundations: Reinforced concrete, min. 4,000 psi at 28 days, designed by a qualified structural engineer licensed as Professional Engineer in the Commonwealth of Pennsylvania.

J. Wiring below Grade: Nonmetallic raceway.

K. Weatherproof electrical enclosures.

L. Panelboard surge suppressors.

M. Pole Protection: Polyfoam pole pads.

2.2 APPROVED MANUFACTURERS

A. Musco Lighting – 100 1st Avenue West, P.O. Box 808, Oskaloosa, IA 52577, Phone: (800) 825.6030, E-mail: lighting@musco.com, Web: https://www.musco.com/

B. Eaton Sport Lighting – 1000 Cherrington Parkway, Moon Township, PA 15108, Phone: (412) 893-3300, Web: https://www.eaton.com/.

C. Philadelphia Parks and Recreation (PPR) approved equal.

2.3 FLOODLIGHTS (Up to 1000 watt)

A. Floodlights shall be LED of the voltage and wattage shown. Drivers shall be integral, prewired, -20 degrees F.

B. Drivers and lamps shall be standard "off the shelf" items supplied by at least two manufacturers.

C. Reflectors for round general purpose floodlights shall be one-piece, symmetrical, end-punched spun aluminum, of sphero-parabolic shape. Reflectors shall be protected by heavy-duty cast aluminum outer housing.

D. Reflectors for rectangular floodlights shall be hydro-formed, semi-specular anodized aluminum protected by a die-cast aluminum housing.

E. Lenses shall be clear flat, high-strength heat-resistant tempered glass, mounted with a one-piece silicone rubber gasket into a hinged stainless steel or cast aluminum lens frame or clear fluorinated hydrocarbon, 5 mil. minimum thickness, in a suitable frame. The lens frame shall be secured in at least four points with captive stainless steel hardware, producing a water-tight seal.

F. Lenses shall be protected by a heavy gauge (.048) framed and welded stainless steel guard (3/4" x 3/4" grid) mounted to the lens frame with 1 inch stand-off bolts and tubing. Guard shall be furnished by luminaire manufacturer.

G. Integral driver housing shall be cast aluminum, with captive stainless steel access fasteners. The driver housing shall be physically and thermally isolated from the lamp socket and the optical assembly.

H. All wiring between the power source and the driver, and between the driver and the lamp socket, shall be completely enclosed in a watertight metal structure, such as liquid tight flexible conduit.

I. The entire floodlight including all wiring, shall be completely watertight and dust-tight even after repeated opening for lamp replacement and/or servicing.

J. Floodlights shall be complete with rifle-type aiming sight, vertical degree scale, lockable repositioning device and two locking screws. Mounting shall be via two-inch slipfitter.

K. Floodlights shall be mounted not less than 30 feet above finished grade.

L. Each floodlight shall be furnished with a 1/8 inch stainless steel safety cable. Cable shall be supplied by the floodlight manufacturer.

M. Each 250 watt HPS floodlight proposed for vandal lighting application shall be furnished with a twist-lock type photocell receptacle and compatible photocell, as previously specified.

2.4 POLES FOR FLOODLIGHTS

A. Poles up to 40 feet in height shall be one-piece, tapered, spun aluminum, unless the applied loading exceeds the maximum rating of the heaviest available aluminum pole. If maximum rating is exceeded, use galvanized steel as specified herein. Poles greater than 40 feet in height may be round or octagonal, tapered, galvanized steel. Galvanizing on shaft shall meet all the requirements of ASTM A 123 and shall be factory applied by the pole manufacturer. All poles greater than 40 feet shall be provided with safety climbing device and pole steps above 40 feet (double steps at 5'-6" and 6'-9" from top of pole).

B. Finish for all poles shall be 25 year life design.

C. Poles shall be supplied complete with mounting bolts, template and manufacturers recommendations for reinforced concrete foundations. Anchor bolts shall be of such material and finish as to remain free from rust for the life of the installation.

D. Complete installations of foundations, bolts, poles, floodlights and bracket arms or platforms, shall withstand winds to 80 mph, with gusts to 104 mph, without loosening, leaning or sustaining any other damage. All poles of each size shall be designed to withstand the wind loading of the maximum number of floodlights used on each project for that size.

E. The Electrical Contractor shall be responsible for the construction of pole foundations and for setting the poles. Tops of foundations shall be at least twelve inches above grade with a one-inch chamfer all around.

F. Poles shall be complete with a gasketed, covered handhole for wiring. Cover hardware shall be tamper-proof.

G. After final leveling and tightening of pole base securing nuts, installations shall be made tamper-proof by filling at least three (3) threads above the nuts with plastic steel and by placing appropriate locktite compound under and around the bottom nuts.

H. Bracket arms shall be provided by the pole manufacturer and shall be constructed of the same material as the pole on which they are mounted. Steel brackets shall consist of 2-3/8 inch steel tubular arm members welded to a bracket slipfitter. Slipfitter and arm members shall be fabricated from structural quality hot rolled carbon steel with a guaranteed minimum yield strength of 30,000 psi. The bracket shall include an internal weather resistant wiring raceway (1-1/8 inch minimum) and commercial quality steel wedge cap when required. Galvanized finish of steel brackets shall meet all the requirements of ASTM A 123.

I. Platforms shall be provided by the pole manufacturer and shall be constructed of galvanized tubular members to effectively reduce wind drag. The cage shall consist of at least one horizontal steel supporting member, a minimum of 5-1/2 inch OD, 10 gauge material and vertical luminaire supports of 2 inch Schedule

40 pipe. All angles shall conform to ASTM designation A36. The vertical luminaire supports shall be available with horizontal, angle luminaire supports with holes to accommodate luminaire adapter plates or pipe tenons to accommodate specific size slipfitters. All pipe and tubing components shall be 35 KS1 minimum yield strength. The platform shall be caged with vertical members, minimum 46 inches in height with two horizontal 3/16 inch diameter, 7 x 19 galvanized aircraft cables for enclosure and safety support of maintenance person. The floor shall be 3 pound expanded metal grating. The floor shall incorporate a hinged door for access to the cage and shall be capable of closing prior to uncoupling of climbing safety device. The entire basket shall allow for internal wiring from the pole shaft to the luminaire mounting supports. The pole top mounting bracket shall have internal drip shielding for wire entrance. Finish shall meet all the requirements of ASTM A123.

J. Shop drawings for lighting poles shall be accompanied by the manufacturers certification for wind loading. Calculations of pole & bolt requirements shall be included indicating a safety factor of 2.0, based on ASSHTO Standards. The certification shall state the maximum EPA which may be imposed at full pole height and at the specified velocity. The Contractor shall append a list of EPA actually imposed on each pole in the installation. Shop drawings submitted without either one of these documents will be considered unacceptable.

2.5 LIGHT STANDARDS

A. Light Standards for Sports Parking and Vandal lighting use shall be complete assemblies of 40'- 0" high poles with the number of luminaries indicated on the drawings.

B. Poles shall be round tapered aluminum, 40'- 0" high with 4" x 6" hand hole (tamperproof screws), vibration dampener and nut covers at base. Finish of poles shall be dark bronze anodized.

C. Poles shall be provided with single, double, triple or quad arm pole top brackets for the configurations indicated.

D. Poles shall be per Lighting Manufacturer's recommendations or equal to sports lighting poles manufactured by Valmont Industries, Inc.

E. Luminaires shall be heavy duty aluminum weatherproof body with internal aluminum reinforcing back plate. It shall have a removable hinged extruded aluminum lens frame with ¼ turn, captive fasteners for easy lamp accessibility. A one piece E.P.D.M. high temperature gasket shall tightly seal the tempered glass lens and the extruded frame, eliminating bugs and light leaks. The lamp socket shall be a porcelain lamp grip socket with nickel plated screw shell and spring loaded contact. Additional lens protection shall be provided using heavy gauge (.048) framed and welded stainless steel guard (3/4" x 3/4" grid) mounted to the lens frame with 1 inch stand-off bolts and tubing. Guard shall be furnished by luminaire manufacturer.

F. Luminaire reflector system shall be hydro-formed Alzak aluminum, designed to produce IES distribution Types II, III and IV as required.

G. Finish of luminaire shall be pre-treated, primed baked, covered with a high solids polyester finish and baked again. The double finish shall meet or exceed all AAMA requirements for 1000 hour salt spray exposure. Color shall match poles.

PART 3 - EXECUTION

3.1 POLE LOCATIONS

A. All poles locations shall be staked and locations approved by the Department prior to starting any work. Pole locations shown on the drawings are approximate.

3.2 DISTRIBUTION AND AIMING DIAGRAMS

A. The Contractor shall obtain from the manufacturer of the floodlighting luminaries proposed for use on each project, computer generated Illuminance Distribution and Aiming Diagram for each sport indicated. The diagrams shall be submitted for approval with the luminaire shop drawings. Diagrams shall be prepared at a scale of not less than 20 feet to the inch on a grid of 1 inch by 1 inch.

B. Final selection of beam spreads for each floodlight shall be based on the diagrams submitted and approved. Beam spreads used to generate the diagrams shall be indicated for each floodlight submission.

C. The minimum criteria for acceptance shall be as follows:

1. Average maintained illuminance shall meet or exceed current I.E.S Standards.
2. Maximum to minimum illuminance shall not exceed a ratio of 3 to 1 for any sport.
3. Average illuminance of infield shall be at least 1.5 times greater than outfield for softball and baseball fields.

3.3 POLE BASES

A. Provide concrete bases for all lighting poles, as required. Bases shall be as recommended by the pole manufacturer, for the maximum EPA rating of the poles, at the specified wind loading. Pole base details shown on the drawings are the minimum that shall be installed.

B. Concrete shall have a minimum compressive strength of 4000 p.s.i. after 28 days.

3.4 ANCHOR BOLTS

A. Anchor bolts of the hook type and of proper size and length, as required for the various equipment specified hereinafter, shall be furnished and set by the Electrical Contractor, before any concrete is poured.

B. This Contractor shall be responsible for the location and sizes of the anchor bolts. Anchor bolts shall be sized for the maximum EPA rating of the poles, at the specified wind loading, with a minimum yield of 55,000 psi.

C. Anchor bolts shall be of such material and finish as to remain free from rust for the life of the installation.

3.5 NIGHT SET-UP AND FINAL ADJUSTMENTS

A. The Contractor shall layout a grid on the playing areas using the approved aiming diagram using appropriate markers placed on the field. Using the aiming sights provided with the luminaries, the Contractor shall carefully direct each light at the appropriate marker on the field.

B. Final adjustments, if required, shall be made at night in the presence of Department representatives. After final approval of the system, all moveable parts of luminaries shall be secured.

Division 27 Outline Specifications – Communications

SECTION 271500 – COMMUNICATIONS CABLING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. UTP cabling.
2. UTP Cable Hardware
3. UTP Patch Cords
4. Telecommunications outlet/connectors.
5. Communications Equipment Cabinets and Communications Equipment
6. WiFi Kits

B. Related Sections:

1. Division 27 Section 270528 "Pathways for Communications Systems" for horizontal cabling pathways.

1.3 DEFINITIONS

A. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.

B. BICSI: Building Industry Consulting Service International.

C. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.

D. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

E. EMI: Electromagnetic interference.

F. IDC: Insulation displacement connector.

G. LAN: Local area network.

H. MUTOA: Multiuser telecommunications outlet assembly, a grouping in one location of several telecommunications outlet/connectors.

I. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

J. RCDD: Registered Communications Distribution Designer.

K. UTP: Unshielded twisted pair.

1.4 HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.

1. TIA/EIA-568-B.1 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.
2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
3. Bridged taps and splices shall not be installed in the horizontal cabling.
4. Splitters shall not be installed as part of the optical fiber cabling.

B. A work area is the area identified on the drawings.

C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to equipment. The maximum allowable length does not include an allowance for the length of 16 feet in the horizontal cross-connect.

1.5 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. For coaxial cable, include the following installation data for each type used:

a. Nominal OD.
b. Minimum bending radius.
c. Maximum pulling tension.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, for all horizontal cabling and termination equipment.

2. Wiring diagrams to show typical wiring schematics, including the following:

a. Cross-connects.
b. Patch panels.
c. Patch cords.

3. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For splices and connectors to include in maintenance manuals.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.9 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Patch-Panel Units: One of each type.
2. Connecting Blocks: One of each type.
3. Device Plates: One of each type.

1.10 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.

E. Grounding: Comply with ANSI-J-STD-607-A.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of UTP cable for open and short circuits.

1.12 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Project Manager.

B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.13 WARRANTY

A. Twenty-Five (25) Year Extended Product Warranty

1. The 25 Year Extended Product Warranty shall ensure against product defects, that all approved cabling components exceed the specifications of TIA/EIA 568A and ISO/IEC IS 11801, exceed the attenuation and NEXT requirements of TIA/EIA TSB 67 and ISO/IEC IS 11801 for cabling links/channels, that the installation will exceed the loss bandwidth requirements of TIA/EIA TSB 67 and ICO/IEC 11801 for fiber links/channels, for a twenty-five (25) year period. The end-to-end passive product shall be capable of delivering 1Gb/s half-duplex mode/2Gb/s full-duplex mode to the workstation.

2. The Twenty-Five (25) Year Extended Product Warranty shall cover the replacement or repair of defective product(s) and labor for the replacement or repair of such defective product(s) for a twenty-five (25) year period.

B. Twenty-Five (25) Year Application Assurance

1. The Twenty-Five (25) Year Application Assurance shall cover the failure of the wiring system to support the application which it was designed to support, as well as additional applications(s) introduced in the future, up to 1Gb/s parallel transmission schemes, by recognized standards or user forums that use the TIA/EIA or ISO/IEC IS 11801 component and link/channel specifications for cabling, for a twenty-five (25) year period.

C. System Certification

1. Upon successful completion of the installation and subsequent inspection, the customer shall be

provided with a numbered certificate, from the manufacturing company, registering the installation.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569-A

B. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings.
3. Straps and other devices.

C. Conduit and Boxes: Comply with requirements in Division 26 Section 260533 "Raceway and Boxes for Electrical Systems."

1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

D. Comply with requirements in Division 26 Section 260533 "Raceways and Boxes for Electrical Systems."

1. ALL horizontal cabling connected to a CCTV camera shall be installed in min. 3/4" conduit, no exceptions.

2.2 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:

1. Berk-Tek; a Nexans company
2. SYSTIMAX Solutions; a CommScope Inc. brand.
3. Superior Essex and Leviton Network Solutions.

B. 100 Ohm Enhanced Category 6 Unshielded Twisted Pair (UTP) Cable

1. Physical Characteristics:

a. Shall be plenum rated and meet applicable requirements of ANSI/ICEA S- 80-576. All 4 pairs must be insulated with F.E.P. No constructions that use mixed insulation materials will be allowed.
b. The diameter of the insulated conductor shall be .026 in. nominal.
c. Shall consist of (4) 23 AWG twisted pairs.
d. Shall be suitable for the environment in which they are to be installed.
e. The color coding of pairs shall be:

f. Pair 1: W-BL; BL
g. Pair 2: W-O; O
h. Pair 3: W-G; G
i. Pair 4: W-BR; BR
j. The overall diameter of the cable shall be no larger than 0.250 inches.
k. The ultimate breaking strength measured in accordance with ASTM D 4565 shall be 400 N minimum.
l. Cable shall withstand a bend radius of 1 inch at -20 degrees Celsius without jacket or insulation cracking.
m. Cable shall be third party verified to meet ANSI/TIA/EIA-568-B.2-1.

C. All horizontal data station cable and voice cable shall terminate on modular patch panels or 110 cross-connecting blocks in their respective Telecommunications Room or Equipment Room as specified on the project Drawings.

D. All cables in a cable run shall be from the same manufacturer and shall be the same type.

E. A mix of UTP cables from different manufactures shall not be used.

2.3 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Berk-Tek/Ortronics a Nexans company.
2. SYSTIMAX Solutions; a CommScope Inc. brand.
3. Superior Essex and Leviton Network Solutions.

B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

C. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

1. Number of Terminals per Field: One for each conductor in assigned cables.

D. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.

1. Number of Jacks per Field: One for each four-pair UTP cable indicated.

E. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.

F. Patch Cords: Factory-made, 4-pair cables in 36-inch lengths; terminated with 8-position modular plug

at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.

2.4 UTP PATCH CORDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:

1. Berk-Tek a Nexans company.
2. SYSTIMAX Solutions; a CommScope Inc. brand.
3. Superior Essex and Leviton Network Solutions.

B. The contractor shall provide factory terminated and tested UTP and patch cords and equipment cords for the complete cabling system. The UTP patch cables shall meet the requirements of ANSI/TIA/EIA-568-B.2 and ANSI/TIA/EIA-568-B.2-1 for patch cord testing.

C. Copper (UTP) patch cords shall:

1. Use 8 position connector with impedance matched contacts and designed using dual reactance.
2. Be constructed of 100 ohm, 4 pair, 24 AWG, stranded conductor, unshielded twisted pair copper per the requirements of the ANSI/TIA/EIA-568-B.2 and ANSI/TIA/EIA-568-B.2–1 standard.
3. Meet TIA category 6 component specifications in ANSI/TIA/EIA-568-B.2-1
    a. 100% factory tested to meet category 6 performance and
    b. ETL or any other nationally recognized 3rd party verification
4. Be center tuned to category 6 performance specifications by using paired bi-level contact array.
5. Be capable of universal T568A or T568B wiring schemes.
6. Modular connector shall maintain the paired construction of the cable to facilitate minimum untwisting of the wires.
7. Have a performance marking indelibly labeled on the jacket (by the manufacturer).
8. Have the ability to accept color-coded labels and icons to comply with ANSI/TIA/EIA-606-A labeling specifications.
9. Have “snagless” protection for the locking tab to prevent snagging and to protect locking tab in tight locations and provide bend relief.
10. Be available in two standard colors.
11. Be available in 3 foot, 5 foot, 7 foot, 9 foot, and 15 foot standard lengths.
12. Be backwards compatible to Category 3, 5 and 5e.

D. Patch cords shall be furnished by the Contractor as required to meet the design requirement of the project, whether indicated on the project drawings or not.

E. The Contractor shall furnish modular patch cords for each assigned port of any Ethernet patch panel installed as part of the project.

F. Jacket:

1. Data Applications: Blue (unless noted otherwise)
2. Voice Applications: Grey (unless noted otherwise)

2.5 TELECOMMUNICATIONS OUTLET/CONNECTORS

A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.

B. Workstation Outlets: Two -port-connector assemblies mounted in single faceplate.

1. Plastic Faceplate: High-impact plastic.
2. Metal Faceplate: Stainless steel.
3. For use with snap-in jacks accommodating any combination of UTP, optical fiber, and coaxial work area cords.

    a. Flush mounting jacks, positioning the cord at a 45-degree angle.

4. Legend: Factory labeled by silk-screening or engraving for stainless steel faceplates.
5. Legend: Machine printed, in the field, using adhesive-tape label.
6. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

2.6 COMMUNICATIONS EQUIPMENT CABINETS AND EQUIPMENT

A. Each recreational center shall have one new equipment cabinet installed at a location to be directed by the owner.

B. Equipment Cabinet Shall Include

1. Equipment Cabinet

    a. 13U locking wall mount or floor mountable cabinet - Quantity 1,
    b. Color - Black,
    c. 19" mounting rails

2. Uninterruptable Power Supply 2000VA Rack Mounted

    a. Quantity 1

3. 24 Port CAT6 Patch Panel

    a. Quantity 1

4. 24 Port POE Network Switch

    a. 10/100/1000x24 - POE
    b. Managed
    c. Rack mountable

d. Quantity 1

5. Horizontal Cable Management

a. Quantity 1

6. 120V 20A Receptacle

a. Quantity 1

7. Network Video Recorder

a. See Specification Section 282300 "Video Surveillance"

C. Contractor shall furnish and install one new 20A, 120V single phase circuit from an existing electrical panel to a new duplex receptacle within new equipment cabinet for UPS power.

2.7 GROUNDING

A. Comply with requirements in Division 26 Section 260562 "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

B. Comply with ANSI-J-STD-607-A.

2.8 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. Comply with requirements in Division 26 Section 260553 "Identification for Electrical Systems" for labeling requirements.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test UTP cables on reels according to TIA/EIA-568-B.1.

C. Factory test UTP cables according to TIA/EIA-568-B.2.

D. Cable will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring Method: Install cables in raceways except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.

1. Comply with requirements for raceways and boxes specified in Division 26 Section 260533 "Raceway and Boxes for Electrical Systems."

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 INSTALLATION OF PATHWAYS

A. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

B. Comply with requirements in Division 26 Section 260533 "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

C. Install manufactured conduit sweeps and long-radius elbows whenever possible.

3.3 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. MUTOA shall not be used as a cross-connect point.
5. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors:

    a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
    b. Locate consolidation points for UTP at least 49 feet from communications equipment room.

6. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
7. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
8. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending

cables to smaller radii than minimums recommended by manufacturer.

9. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
10. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
11. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
12. In the communications equipment room, install a 10-foot- long service loop on each end of cable.
13. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Group connecting hardware for cables into separate logical fields.

F. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.

2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.

c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.

6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.4 FIRESTOPPING

A. Comply with TIA/EIA-569-A, Annex A, "Firestopping."

B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.5 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 28 Section 282300 "Video Surveillance."

B. Using cable management system software specified in Part 2, develop Cabling Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable and label cable, jacks, connectors, and terminals to which it connects with same designation. At completion, cable and asset management software shall reflect as- built conditions.

C. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration.

D. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

E. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building- mounted device shall be identified with name and number of particular device as shown.
    b. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

F. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.

1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect UTP cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
2. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

5. UTP Performance Tests:

a. Test for each outlet. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:

1) Wire map.
2) Length (physical vs. electrical, and length requirements).
3) Insertion loss.
4) Near-end crosstalk (NEXT) loss.
5) Power sum near-end crosstalk (PSNEXT) loss.
6) Equal-level far-end crosstalk (ELFEXT).
7) Power sum equal-level far-end crosstalk (PSELFEXT).
8) Return loss.
9) Propagation delay.
10) Delay skew.

C. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

D. End-to-end cabling will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

SECTION 282300 – VIDEO SURVEILLANCE AND MOSQUITO TYPE SONIC SECURITY DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes a video surveillance system consisting of cameras, network video recorder, data transmission wiring, and a control station with its associated equipment.

B. Video surveillance system shall be integrated with existing PPR network equipment.

1.3 DEFINITIONS

A. AGC: Automatic gain control.

B. BNC: Bayonet Neill-Concelman - type of connector.

C. B/W: Black and white.

D. CCD: Charge-coupled device.

E. FTP: File transfer protocol.

F. IP: Internet protocol.

G. LAN: Local area network.

H. MPEG: Moving picture experts group.

I. NTSC: National Television System Committee.

J. PC: Personal computer.

K. PTZ: Pan-tilt-zoom.

L. RAID: Redundant array of independent disks.

M. TCP: Transmission control protocol - connects hosts on the Internet.

N. UPS: Uninterruptible power supply.

O. WAN: Wide area network.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Video surveillance system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For video surveillance. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.

3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.

4. UPS: Sizing calculations.

5. Wiring Diagrams: For power, signal, and control wiring (if provided).

6. Storage Device Calculations.

7. Network Bandwidth Requirements and Fiber Optic Channel Link-Loss Budgets .

8. Existing Equipment Frame Elevations, where new equipment is being added.

C. Equipment List: Include every piece of equipment by model number, manufacturer, serial number, location, and date of original installation. Add pretesting record of each piece of equipment, listing name of person testing, date of test, set points of adjustments, name and description of the view of preset positions, description of alarms, and description of unit output responses to an alarm.

1.6 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For video surveillance, cameras, camera-supporting equipment, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

C. Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For cameras, power supplies, infrared illuminators, monitors, videotape recorders, digital video recorders, video switches, and control-station components to include in emergency, operation, and maintenance manuals. Include the following as well:

1.8 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NECA 1.

C. Comply with NFPA 70.

D. Electronic data exchange between video surveillance system with an access-control system shall comply with SIA TVAC, if access-control system is provided.

1.9 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient temperatures of 50 to 95 deg F (10 to 35 deg C) and a relative humidity of 20 to 80 percent, noncondensing.

2. Interior, Controlled Environment: System components, except central-station control unit, installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F (2 to 50 deg C) dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.

3. Interior, Uncontrolled Environment: System components installed in non- temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 3R enclosures.

4. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg F (minus 34 to plus 50 deg C) dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph (137 km/h) and snow cover up to 24 inches (610 mm) thick. Use NEMA 250, Type 4X enclosures.

5. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.

6. Corrosive Environment: System components subject to corrosive fumes, vapors, and wind-driven salt spray in coastal zones. Use NEMA 250, Type 4X enclosures.

7. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Final Acceptance by the City.

B. Warranty Requirements: Contractor shall warrant DPP (or PPR) that the equipment will be free and clear of any lien or encumbrance on the final acceptance date. Contractor shall further warrant for a period of three (3) year from the date of Substantial Completion that the Security System will, under normal use and service, be free from defects and faulty workmanship except as set forth below:

1. Contractor’s obligation under this warranty is to repair or replace defective equipment, parts, and associated labor thereto at its expense. Contractor shall warrant that replacement or repaired equipment furnished hereunder and labor shall be in accordance with current industry standards.

2. PPR is granted a nontransferable fully paid license (Genetec) to use all software furnished by the Contractor as part of furnishing the security system equipment provisions under terms established by the software manufacturer. The Authority will be provided with a copy of all applicable licenses. Contractor shall warrant that it has the right to grant such licenses.

3. A copy of Contractor’s standard warranty agreement must be provided and must match or exceed manufacturer’s warranty, minimum of 3 years.

4. Upgrade of software during warranty period.

5. Provide Service for three (3) years after substantial completion, includes all labor and material cost associated with the repair, with the exception of third party negligence or acts of vandalism.

6. Contractor’s personnel shall respond to all system failures within four (4) hours of the occurring event. All failure shall be corrected within eight (8) hours of the arrival on site of Contractor’s personnel.

PART 2 - PRODUCTS

2.1 GENERAL SYSTEM REQUIREMENTS

A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.

B. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station, control-unit alarm display shall identify tamper alarms and indicate locations.

C. Compatibility: Video Management Software must be compatible with IP video equipment. The contractor, if submitting components from different manufactures must submit with either shop drawings, or product data, statements of compatibility from each manufacturer guaranteeing IP video components are compatible with the IP video management software submitted.

2.2 IP VIDEO SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Genetec
2. Vivotek
3. Axis Communications
4. DVTEL

B. Description:

1. System shall provide high-quality delivery and processing of IP-based video, audio, and control data using standard Ethernet-based networks.

2. System shall have seamless integration of all video surveillance and control functions.

3. Graphical user interface software shall manage all IP-based video matrix switching and camera control functions, two-way audio communication, alarm monitoring and control, and recording and archive/retrieval management. IP system shall also be capable of integrating into larger system environments.

4. System design shall include all necessary compression software for high-performance, dual-stream, MPEG-2/MPEG-4 video and H.264 video. Unit shall provide connections for all video cameras, bidirectional audio, discreet sensor inputs, and control system outputs.

5. All camera signals shall be compressed, encoded, and delivered onto the network for processing and control by the IP video-management software.
6. Camera system units shall be ruggedly built and designed for extreme adverse and urban environments, complying with NEMA Type environmental standards. Where required provide vandal proof exterior camera housings.

7. Encoder/decoder combinations shall place video, audio, and data network stream that can be managed from multiple workstations on the user's LAN or WAN at the same time.

8. All system interconnect cables, workstation PCs, and network intermediate devices shall be provided for full performance of specified system.

2.3 STANDARD IP CAMERAS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Genetec (AutoVu SharpV)
2. Vivotek
3. Axis Communications
4. DVTEL

B. Network Indoor Dome Camera, HD/2Megapixel: Assembled and tested as a complete manufactured unit.

1. Image Sensor - 1/3" Progressive scan CMOS
2. Lens - 2.7-9mm Motorized Verifocal
3. Day/Night Sensor – Electronic or True
4. Minimum Illumination/Light Sensitivity (lux) - 0.5 color, 0.1 black and white
5. Maximum Resolution (pixels) - 1920x1080 (2MP)
6. Video Compression - H.264/MPEG4/M-JPEG
7. Frames per Second - 30
8. Alarm Inputs/Outputs - 2
9. Network Protocol - TCP/IP, HTTP, DHCP, DNS, DDNS, RTP/RTSP, PPPoE, SMTP, NTP
10. Power - PoE or DC Input
11. Vandal Resistant - Yes
12. Digital Pan/Tilt/Zoom
13. 20M IR LED
14. Mounting:

    a. Indoor Ceiling Mount (Vandal Proof)
    b. Wall Mount (Vandal Proof)

C. Network Indoor Dome Camera, HD/3Megapixel: Assembled and tested as a complete manufactured unit.

1. Image Sensor - 1/3" Progressive scan CMOS
2. Lens - 2.7-9mm Motorized Verifocal
3. Day/Night Sensor – Electronic or True
4. Minimum Illumination/Light Sensitivity (lux) - 0.8 color, 0.1 black and white
5. Maximum Resolution (pixels) - 2048x1536 (3MP)
6. Video Compression - H.264/MPEG4/M-JPEG
7. Frames per Second – 30
8. Alarm Inputs/Outputs - 2
9. Network Protocol - TCP/IP, HTTP, DHCP, DNS, DDNS, RTP/RTSP, PPPoE, SMTP, NTP
10. Power - PoE or DC Input
11. Vandal Resistant - Yes
12. Digital Pan/Tilt/Zoom
13. 20M IR LED
14. Mounting:

    a. Indoor Ceiling Mount (Vandal Proof)
    b. Wall Mount (Vandal Proof)

D. Network Outdoor Dome Camera, HD/ (2) Megapixel: Assembled and tested as a complete manufactured unit.

1. Image Sensor - 1/3" Progressive scan CMOS

2. Lens – 2.7-9mm Motorized Verifocal
3. Minimum Illumination/Light Sensitivity (lux) - 0.08 color, 0.1 black and white
4. Maximum Resolution (pixels) - 1920x1080
5. Video Compression - H.264/MPEG4/M-JPEG
6. Frames per Second - 30
7. Intelligent Alarm
8. Network Protocol - TCP/IP, HTTP, DHCP, DNS, DDNS, RTP, RTSP, PPPoE, SMTP, NTP, SNMP, HTTPS, FTP, 802.1x, Qos
9. Power - PoE
10. Outdoor Use - Outdoor Ready
11. Vandal Resistant - Yes
12. Digital Pan/Tilt/Zoom
13. 20M IR LED
14. Heater - Integrated with housing
15. Mounting:

    a. Outdoor Wall Mount (Vandal Proof)
    b. Outdoor Wall Mount on Pole Mount Adapter, Min. Three Clamps (Vandal Proof)

E. Network Outdoor Dome Camera, HD/ (3) Megapixel: Assembled and tested as a complete manufactured unit.

1. Image Sensor - 1/3" Progressive scan CMOS
2. Lens – 2.7-9mm Motorized Verifocal
3. Minimum Illumination/Light Sensitivity (lux) 0.5 color, 0 black and white
4. Maximum Resolution (pixels) - 2048x1536 (3MP)
5. Video Compression - H.264/MPEG4/M-JPEG
6. Frames per Second - 30
7. Intelligent Alarm
8. Network Protocol - TCP/IP, HTTP, DHCP, DNS, DDNS, RTP, RTSP, PPPoE, SMTP, NTP, SNMP, HTTPS, FTP, 802.1x, Qos
9. Power - PoE
10. Outdoor Use - Outdoor Ready
11. Vandal Resistant - Yes
12. Digital Pan/Tilt/Zoom
13. 20M IR LED
14. Heater - Integrated with housing
15. Mounting:

    a. Outdoor Wall Mount(Vandal Proof)
    b. Outdoor Wall Mount on Pole Mount Adapter, Min. Three Clamps(Vandal Proof)

F. Mini Dome Camera, HD/ 2 Megapixel: Assembled and tested as a complete manufactured unit.

1. Image Sensor - 1/3" Progressive scan CMOS
2. Lens - 4mm
3. Day/Night Sensor - Automatic
4. Minimum Illumination/Light Sensitivity (lux) - 0.5 color, 0.1 black and white with dynamic capture, 1.1 color, 0.2 black and white with light finder
5. Maximum Resolution (pixels) - 1920x1080 (2MP)
6. Video Compression - H.264/MPEG4/M-JPEG
7. Frames per Second - 15

8. Intelligent Alarm
9. Network Protocol - TCP/IP, HTTP, DHCP, DNS, DDNS, RTP/RTSP, PPPoE, SMTP, NTP
10. Power - PoE
11. Outdoor Use - Outdoor Ready
12. Vandal Resistant – Yes
13. Mounting:

    a. Indoor Ceiling Mount (Vandal Proof)
    b. Wall Mount (Vandal Proof)

G. Network Outdoor PTZ Camera HD/ 3Megapixel: Assembled and tested as a complete manufactured unit.

1. Image Sensor - 1/3" Progressive scan CMOS
2. Lens - 2.7-9mm Motorized Verifocal
3. Day/Night Sensor - Auto
4. Minimum Illumination/Light Sensitivity: 0.05LUX at (F1.6, on color), 0.01LUX at (F1.6, on black and white)
5. Maximum Resolution (pixels) - 2048x12536 (3MP)
6. Video Compression - H.264/MPEG4/M-JPEG
7. Frames per Second min– 30
8. Alarm Inputs/Outputs – 7/2
9. Network Protocol - TCP/IP, HTTP, DHCP, DNS, DDNS, RTP/RTSP, PPPoE, SMTP, NTP
10. Power - PoE or DC Input
11. Vandal Resistant - Yes
12. PTZ Function: 360deg. Endless pan range and -20deg to 90der. Tilt range
13. 20M IR LED
14. Mounting:

    a. Indoor Ceiling Mount (Vandal Proof)
    b. Wall Mount (Vandal Proof)

H. Network Indoor Dome Camera (360deg. or fish eye lens), HD/2Megapixel: Assembled and tested as a complete manufactured unit.

1. Image Sensor – 1/1.8" Progressive scan CMOS
2. Lens – 1.27mm, F2.8 angle of view 180 deg. (wall mount) 360 deg. (ceiling mount).
3. Day/Night Sensor - Auto
4. Minimum Illumination/Light Sensitivity: 0.05 LUX at (F1.2, AGC on color), 03 LUX at (F2.8, AGC on color), 0.0 LUX black and white
5. Maximum Resolution - 3072x2048
6. Video Compression - H.264/MPEG4/M-JPEG
7. Frames per Second - 50
8. Network Protocol - TCP/IP, HTTP, DHCP, DNS, DDNS, RTP/RTSP, PPPoE, SMTP, NTP
9. Power - PoE or DC Input
10. Vandal Resistant - Yes
11. Mounting:

    a. Indoor Ceiling Mount (Vandal Proof)
    b. Wall Mount (Vandal Proof)

2.4 VIDEO DECODERS

A.

1. Network - IPv4 or IPv6

2. Power - PoE, DC

3. Monitor Support - Up to 2 DVI or Analog

4. Network Configurable

5. Camera Viewing capability only, no control

2.5 POWER SUPPLIES

A. Low-voltage power supplies matched for voltage and current requirements of cameras and accessories, and of type as recommended by manufacturer of camera and lens.

B.

1. Enclosure: NEMA 250, Type 3.

2. Input - 115VAC

3. Output - 16 fuse protected outputs:

   a. 12VDC or 24VDC
   b. 4A total continuous supply
   c. 3.5A rated outputs

4. Temperature Operating Range - 0 to 49 C

5. Input/Output LED Indicators

6. On/Off Switch

7. Locking Enclosure

2.6 CAMERA-SUPPORTING EQUIPMENT

A. Manufacturers: Subject to compliance with requirements of:

1. Genetec

B. Minimum Load Rating: Rated for load in excess of the total weight supported times a minimum safety factor of two.

C. Mounting Brackets for Fixed Cameras: Type matched to items supported and mounting conditions. Include manual pan-and-tilt adjustment.

D. Protective Housings for Fixed Cameras: Steel enclosures with internal camera mounting and connecting provisions that are matched to camera/lens combination and mounting and installing arrangement of camera to be housed.

1. Tamper switch on access cover sounds an alarm signal when unit is opened or partially disassembled. Central-control unit shall identify tamper alarms and indicate location in alarm display.

2. Camera Viewing Window: Polycarbonate window, aligned with camera lens.

3. Duplex Receptacle: Internally mounted.

4. Alignment Provisions: Camera mounting shall provide for field aiming of camera and permit removal and reinstallation of camera lens without disturbing camera alignment.

5. Built-in, thermostat-activated heater units. Units shall be automatically controlled so the environmental limits of the camera equipment are not exceeded.

6. Sun shield shall not interfere with normal airflow around the housing.

7. Mounting bracket and hardware for wall or ceiling mounting of the housing. Bracket shall be of same material as the housing; mounting hardware shall be stainless steel.

8. Finish: Housing and mounting bracket shall be factory finished using manufacturer's standard finishing process suitable for the environment.

2.7 MONITORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. NEC Display (security monitor not TV)

2. Samsung (security monitor not TV)

3. Sharp (security monitor not TV)

4. LG (security monitor not TV)

5. TATUNG (security monitor not TV)

B. Monitors shall be sized per the drawings. If size is not specified, the size shall be 26” to 32" minimum.

C. Monitors shall be mounted within a see through vandal proof enclosure. Vandal proof enclosure shall be lockable and wall mountable.

2.8 NETWORK VIDEO RECORDERS/VIDEO SERVERS

A. Manufacturers: Subject to compliance with requirements, provide products:

1. Genetec

B. Internal 12 TB min hard disk.

1. Contractor shall provide storage calculations based on quantity of cameras and recording parameters, 40TB shall be the minimum size NVR acceptable, contractor shall increase size based on number of cameras maintaining 20% spare capacity for recording and expansion.
2. Video and audio recording over TCP/IP network.
3. Video recording of MPEG-2 and MPEG-4 streams.
4. Video recording up to 48 Mbps for internal storage and up to 100 Mbps for external storage.
5. Duplex Operation: Simultaneous recording and playback.
6. Continuous and alarm-based recording.
7. Full-Featured Search Capabilities: Search based on camera, time, or date.
8. Automatic data replenishment to ensure recording even if network is down.
9. Digital certification by watermarking.
10. Internal RAID storage of up to 40 TB.
11. Full integration with LAN, Intranet, or Internet through standard Web browser or video management software, see next section.
12. Integrated Web server FTP server functionality.
13. Network video recording/storage devices shall be sized to store video at 2MP for 30 days with 20% capacity remaining, 30 fps, record on motion. Multiple storage devices shall be required as necessary. At a minimum, one storage device per facility will be required.

C. Minimum Device Requirements:

1. OS Windows 10 Enterprise LTSB.

2. Intel Core i5-8500 3.00GHz

3. RAM 16 GB DDR4

4. Onboard 1GB Network adapter

D. Each NVR shall be supplied with a keyboard and mouse for IP camera control at the viewing station. The Keyboard shall be connected directly to the NVR. The keyboard shall allow user logon, display selection, monitor configuration and camera control.

E. Contractor shall configure all new cameras for each building or each specified location for viewing, recording and playback on the NVR. Each NVR setup will be unique and configuration will be determined by the Department of Public Property. Contractor shall submit NVR and recording setup and configuration of cameras for review and approval.

F. NVR shall be mounted with a vandal proof enclosure. Vandal Proof enclosure shall be lockable and mountable.

2.9 POWER OVER ETHERNET (POE) POWER INJECTORS

A. Minimum Device Requirements:
1. Ports - 16 (min.) actual device quantities on drawings, use 24 port if necessary.

2. Power Input - 115VAC.

3. Max Power - 30W per port, Total Power 300W.
4. 19" Rack Mountable

2.10 MOSQUITO TYPE SONIC SECURITY DEVICES

A. Mosquito Sonic Devices Model Number–MK 4 with Multi-Age as manufactured by Moving Sound Technologies, or PPR approved equal.

B. Devices shall be secured with Standard Security Cage as manufactured by Moving Sound Technologies, or PPR approved equal.

C. Devices shall be connected to existing electrical panel and circuited through a new time clock. Electromechanical timer model number Tork 7200 or PPR approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.

B. Examine roughing-in for LAN, WAN, and IP network before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 WIRING

A. Comply with requirements in Division 26 – Raceways and Boxes for Electrical Systems. If Division 26 is not provided, install wiring per below.

B. Wiring Method: Install cables in raceways unless otherwise indicated.

1. Except raceways are not required in accessible indoor ceiling spaces and attics.

2. Except raceways are not required in hollow gypsum board partitions.

3. Conceal raceways and wiring except in unfinished spaces.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

D. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

E. For LAN connection and fiber-optic and copper communication wiring, comply with Section 271500-1.4 "Horizontal Cabling Description."

F. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

3.3 VIDEO SURVEILLANCE SYSTEM INSTALLATION

A. Install cameras and infrared illuminators level and plumb.

B. Install cameras with an 84-inch minimum clear space below cameras and their mountings to the finished floor or grade. Change type of mounting to achieve required clearance. For exterior camera mount cameras on building exteriors or steel poles to match exterior lighting system poles.

C. Set pan unit and pan-and-tilt unit stops to suit final camera position and to obtain the field of view required for camera. Connect all controls and alarms, and adjust.

D. Install power supplies and other auxiliary components at control stations unless otherwise indicated.

E. Install tamper switches on components indicated to receive tamper switches, arranged to detect unauthorized entry into system-component enclosures and mounted in self-protected, inconspicuous positions.

F. Avoid ground loops by making ground connections only at the control station.

1. For 12- and 24-V dc cameras, connect the coaxial cable shields only at the monitor end.

G. Identify system components, wiring, cabling, and terminals.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections:

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.

2. Pre-testing: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:

a. Prepare equipment list described in "Informational Submittals" Article.
b. Verify operation of auto-iris lenses.
c. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.

d. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet (17 to 23 m) away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
e. Set and name all preset positions; consult Owner's personnel.
f. Set sensitivity of motion detection.
g. Connect and verify responses to alarms.
h. Verify operation of control-station equipment.

3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.

4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

5. Video surveillance system will be considered defective if it does not pass tests and inspections.

6. Prepare test and inspection reports and submit to PPR for review.

3.5 LABELING OF CAMERA DEVICES AND CONTROL SYSTEMS

A. Contractor to provide a recommended Labeling System to Project Coordinator prior to camera installation.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits for this purpose at 6 months and 12 months. Tasks shall include, but are not limited to, the following:

1. Check cable connections.

2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed.

3. Adjust all preset positions; consult Owner's personnel.
4. Recommend changes to cameras, lenses, and associated equipment to improve Owner's use of video surveillance system.

5. Provide a written report of adjustments and recommendations.

6. Cleaning per Section 3.7

3.7 CLEANING

A. Clean installed items using methods and materials recommended in writing by manufacturer.

B. Clean video-surveillance-system components, including camera-housing windows, lenses, and monitor screens.

3.8 DEMONSTRATION/TRAINING

A. Provide a minimum of 8 hours of training to Owner's maintenance personnel to adjust, operate, and maintain video-surveillance equipment.

END OF SECTION

SECTION 28 31 11

ADDRESSABLE FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SYSTEM DESCRIPTION

A. Noncoded, UL-certified addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
2. Include voltage drop calculations for notification appliance circuits.
3. Include battery-size calculations.
4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
5. Include control equipment, and cabling to interface with existing system.

C. Qualification Data: For qualified Installer.

D. Field quality-control reports.

E. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
    a. Frequency of testing of installed components.
    b. Frequency of inspection of installed components.
    c. Requirements and recommendations related to results of maintenance.
    d. Manufacturer's user training manuals.
5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.

F. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.5 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning with Substantial Completion, provide software support for one year.

C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within one year from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Honeywell Silent Knight
2. Honeywell Fire Lite

2.2 FIRE ALARM CONTROL PANEL

A. General Requirements for Fire-Alarm Control Unit:
1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.
   a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
   b. Software architecture shall be open protocol and non-proprietary.
   c. Include a real-time clock for time annotation of events on the event recorder and printer.
2. Addressable initiation devices that communicate device identity and status.
   a. Smoke sensors shall additionally communicate sensitivity setting.
   b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
3. Addressable control circuits for operation of mechanical equipment or other devices.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 3 line(s) of 40 characters, minimum.

2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

C. Circuits:

1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class B for fire alarm circuits on each floor.
   a. Initiating Device Circuits: Style B.
   b. Notification Appliance Circuits: Style Y.
   c. Signaling Line Circuits: Style 4.

D. Printout of Events: On receipt of signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble) and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including same information for device, location, date, and time. Commands initiate the printing of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.

E. Door Control for Security Doors: Release electric locks on doors in the egress path upon receipt of a fire-alarm signal.

F. HVAC System Interface: Shutdown designated HVAC equipment at the unit upon receipt of a fire-alarm signal.

G. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

H. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed lead calcium.

I. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.3 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Double-action mechanism requiring two actions to initiate an alarm, breaking-glass or plastic-rod pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key- or wrench-operated switch.

2.4 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.

B. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.

1. Rated Light Output:

a. 15/30/75/110 cd, selectable in the field.

2. Mounting: Wall mounted unless otherwise indicated.
3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
4. Flashing shall be in a temporal pattern, synchronized with other units.
5. Strobe Leads: Factory connected to screw terminals.
6. Mounting Faceplate: Factory finished, color shall match that of existing notification appliances.

C. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.

2.5 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be two-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).
3. Each sensor shall have multiple levels of detection sensitivity.
4. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
5. Auxiliary Relay: Rated to interrupt motor or damper control circuit.

2.6 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. Rating: 24-V ac or dc, to be selected higher based on door holding force.

B. Material and Finish: Match door hardware.

2.7 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.
1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.8 ADDRESSABLE INTERFACE DEVICE

A. Monitor Module: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.

B. Relay Module: Microelectronic relay module, NRTL listed for use in providing a system address for control of other systems or equipment upon receipt of a fire alarm signal, including, but not limited to:
1. Fan shutdown
2. Security door electric locks

3. To elevator controller to initiate elevator recall
4. To circuit-breaker shunt trip for power shutdown
5. To DDC control panel for signal to emergency operations mode.

2.9 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Communication from field panel to “head end equipment” is by fiber loop using multi-mode fibers (4) two loops to connect to campus system.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:
   1. Verification that both telephone lines are available.
   2. Programming device.
   3. LED display.
   4. Manual test report function and manual transmission clear indication.
   5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:
   1. Address of the alarm-initiating device.
   2. Address of the supervisory signal.
   3. Address of the trouble-initiating device.
   4. Loss of ac supply or loss of power.
   5. Low battery.
   6. Abnormal test signal.
   7. Communication bus failure.

E. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.10 WIRE AND CABLE

A. Wire and cable for fire alarm systems shall be UL listed and labeled as complying with NFPA 70, Article 760.

B. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG or size as recommended by system manufacturer.

C. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.
   1. Low-Voltage Circuits: No. 16 AWG, minimum.
   2. Line-Voltage Circuits: No. 12 AWG, minimum.

3. Multiconductor Cable: NFPA 70 Type MC, copper conductors, TFN/THHN conductor insulation, copper drain wire, copper armor with outer jacket with red identifier stripe, UL listed for fire alarm installation.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Install wall-mounted equipment, with tops of cabinets not more than 72 inches above the finished floor.

C. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

D. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling.

E. Surface mounted devices: Provide manufacturer standard surface mounted back box, color to match that of associated device.

F. All wire and cable shall be installed in raceway. Raceway shall be painted red and labeled Fire Alarm.

3.2 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 8 Section "Door Hardware." Connect hardware and devices to fire-alarm system.
   1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.
   2. Alarm-initiating connection to elevator recall system and components.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Electrical Identification."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.4 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:
   1. Visual Inspection: Conduct visual inspection prior to testing.
      a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
      b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
   2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
   3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
   4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
   5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
   6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

C. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

D. Fire-alarm system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

F. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

G. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION

SECTION 311000

SITE CLEARING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Protection of existing vegetation to remain.
2. Removing above-grade site improvements.
3. Disconnecting, capping or sealing, and abandoning site utilities in place.
4. Disconnecting, capping or sealing, and removing site utilities.

B. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the LEED Green Building Rating System, of the US Green Building Council. Refer to Section 018110, SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

C. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 015713 – TEMPORARY EROSION AND SEDIMENT CONTROL
2. Section 312000 – EARTH MOVING

1.3 SUBMITTALS

A. Product Data: For each type of product listed, include construction details and materials.

1.4 QUALITY ASSURANCE

A. Experienced Workers: Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Codes and Standards: Perform work in compliance with applicable requirements of governing authorities having jurisdiction. Construction operations shall be carried out in a manner such that soil erosion, air pollution, and water pollution is minimized. State, County, and Municipal laws concerning pollution abatement shall be followed, including all applicable City of Philadelphia, Philadelphia Water Department, and PA DEP codes and regulations.

1.5 PROCEDURES

A. Site Access: Minimize interference with adjoining walks and other adjacent occupied or used facilities during site-clearing operations. Maintain accessibility as required by drawings and requirements of the Owner.

1. The contractor is required to maintain access to existing buildings at all times.
2. Provide alternate routes around closed or obstructed access ways and walks during each phase of construction.

B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises per Owner direction. Reuse item as indicated on Construction Documents.

C. Notify PA One Call for area where Project is located before site clearing.

D. Protection of persons and property:

1. Barricade open depressions and holes occurring as part of this work and post warning lights on property adjacent to or with public access.
2. If applicable, operate warning lights during hours from dawn to dusk each day and as otherwise required.
3. Protect structures, utilities, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by operations under this Section.
4. Certain present underground utilities may be indicated on the drawings in their approximate locations. The Contractor shall exercise extreme caution in excavation in the immediate vicinity of these utilities so that they may not be damaged or their service interrupted. It is mandatory that these utilities be kept in continuous operation and the Contractor will be held responsible for any inconvenience or financial loss to the Owner resulting from carelessness or ineptness of the Contractor in executing this part of the work.
5. Any sewers, pipes, conduits or systems in active use encountered during excavation are to be protected or diverted as directed by the Engineer and left in satisfactory working condition.
6. Sewers, pipes or conduits that have been abandoned may be cut off and securely capped or plugged at the limits of excavation.
7. It shall be the duty of the Contractor to ascertain from the Owner or utility owner where such services are in active use, or have been abandoned before proceeding as specified.
8. The Contractor shall exercise due caution not to damage present manhole, inlet basins, or other items of underground construction which are to remain.

E. Protect existing trees outside of construction limits. Refer to Section 31 13 19, “Temporary Tree and Plant Protection”.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

G. Materials Ownership

1. All debris shall be hauled offsite.
2. Topsoil shall be removed and stockpiled on site.
3. Material to be retained/recycled by the Owner shall be removed and stored per the direction of the Owner.
4. The Contractor shall remove from the site, recycle, or dispose of all building materials and wastes in accordance with the PaDEP Solid Waste Management regulations 25 PA Code 260, et seq. and 281.1 et seq.
5. Except for materials indicated to remain Owner’s property, cleared materials shall become Contractor’s property and shall be removed from the site and disposed of in a legal manner.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Locate and clearly flag trees and vegetation to remain or to be relocated.

D. Protect existing site improvements to remain from damage during construction.

E. Restore damaged improvements to their original conditions, as acceptable to the Owner.

3.2 TREES AND PLANT PROTECTION

A. Refer to Section 31 13 19, “Temporary Tree and Plant Protection” for requirements.

3.3 UTILITIES

A. Locate, identify, disconnect and seal or cap off all utilities indicated to be removed.

1. If required, arrange to shut off indicated utilities with utility companies or Owner.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to the requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's written permission.

3.4 CLEARING AND GRUBBING

A. Existing topsoil to be removed and hauled off-site.

B. Existing vegetation

1. Do not remove trees, shrubs, and other vegetation indicated to remain.
2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
3. Use only hand methods.

C. No burning is allowed.

3.5 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, walls, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

3.6 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property, unless otherwise directed.

B. Recycling: All locally recyclable materials should be separated and disposed of at local recycling facility

END OF SECTION 311000

SECTION 312000

EARTH MOVING

PART 1 – GENERAL

1.1 SUMMARY

A. The work of this section includes all earthwork and related and incidental operations, including:

1. Site protection, erosion and sediment control, site clearing, and sitework clearing.
2. Preparing of subgrade for walkways and pavements, and sitework clearing.
3. Drainage fill course for support of building slabs is included as part of this work.
4. Excavating and backfilling of trenches within building lines.
5. Dewatering as required to keep excavations free of water and soil erosion during construction period.
6. Preparing subgrades for slabs on grade.
7. Excavating and backfilling for building structures.

B. Excavating and backfilling for underground mechanical and electrical utilities and buried mechanical and electrical appurtenances shall be by the mechanical or electrical contractor.

C. Related Sections
1. Section 015713, “Temporary Erosion and Sediment Sedimentation Controls”.

1.2 General earthwork requirements shall conform to the following minimum standards:

A. Provide positive drainage away from all structures.

B. Unless otherwise noted, minimum slope shall be ¼ inch per foot or 2% and a maximum slope shall not exceed 3:1 (h:v) or 33% for non-paved surfaces. Paved surfaces shall have a minimum grade or 1% and have positive drainage off of the pavement.

C. Grades on designated handicapped accessible areas/routes shall comply with the provisions of the Americans with Disabilities Act.

D. Notify the PPR immediately if slope requirements cannot be met. At no time will slopes in excess of those above the maximum allowed, be accepted, unless prior approval is received in writing by PPR.

E. Grade earthen, non-paved, surfaces to a smooth finish. Slope lawn areas in swales to a gentle crown along the centerline.

F. Grade all seeded fine lawn areas flush with finish grade. Adjust finished grade to the proper depth where sod abuts paved areas.

G. Grade all tree/shrub/groundcover planting beds to 3 inches below top of abutting curbs, paving, or lawn areas to allow for mulching.

H. Adjust existing and new manhole, catch basins, and drains rim/grate elevations to new grade elevations (pavement or soil).

I. Finished surfaces shall be graded smooth and even with no abrupt or awkward changes in grade.

J. Provide properly compacted subgrades of native soil or approved fill. Native soils, fill, or subgrades deemed insufficient shall be removed and replaced with appropriate material. Subgrades shall be inspected by a qualified inspector to ensure compaction requirements are met. Submit test reports and field logs to PPR for review and for record.

K. Existing on-site soils should be evaluated for both suitability for use in construction as well as environmentally for contaminants by licensed and qualified professionals such geotechnical engineers and environmental scientists. Many sites throughout the City include various types of urban fill. In some cases there may be abandoned structures below grade. These soils and features should be evaluated before design and engineering newly planned features. Also, environmental due diligence and/or testing should be completed near the beginning of design and engineering to ascertain if on-site materials are clean or regulated. Testing of existing on-site soils and materials shall comply with the requirements of Pennsylvania Department of Environmental Protection requirements for fill management whether it is determined to be clean or regulated. Submit geotechnical testing and environmental due diligence reports to PPR for review and for record.

L. Any soil materials leaving the site or being brought to the site shall comply with the Pennsylvania Department of Environmental Protection requirements for fill management.

M. Environmental due diligence: investigative techniques, including, but not limited to, visual property inspections, electronic data base searches, review of property ownership, review of property use history, sanborn maps, environmental questionnaires, transaction screen, analytical testing, environmental assessments or audits. Submit all environmental due diligence reports to PPR for review and for record.

N. Exported fill materials will be tested as per the Management of Fill Policy (2020) to determine whether the materials meet the analytical criteria for Clean Fill.

O. The materials that meet the criteria for clean fill do not require special handling. However, a Clean Fill Certification Form FP-1001 must be submitted to PADEP and retained by the owner of the property receiving the fill. PPR and Rebuild will not prepare Clean Fill Certifications.

P. Fill material that does not qualify as clean fill is regulated fill. Regulated fill is waste and must be managed in accordance with the municipal or residual waste regulations in 25 pa code chapters 287 residual waste management or 271 municipal waste management, whichever is applicable.

Q. Designers and contractors shall comply with the Pennsylvania Underground Utility Line Protection Law, Act 287 of 1974, as amended by Act 50 of 2017. This includes contacting the Pennsylvania One Call System or 811 as required by law.

R. Designers and contractors, in additional to complying with the Pennsylvania Underground Utility Line Protection Law requirements shall research available utility records from the project owner for the site or facility. Upon evaluation of these records the designer or contractor can evaluate the need for extensive underground utility locating depending the project. The designer or contractor shall determine the need and level of underground utility located needed for the project in conformance with the American Society of Civil Engineers (ASCE) National Consensus Standard – ASCE C-I 38-02, Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data. The designer or contractor shall determine the Quality Level of utility located required by the project, Levels D, C, B, or A. The costs associated with underground utility locating services shall be evaluated and balanced with the available utility information, conditions in the field, the type of project being proposed, the risks associated with utility conflict and/or damage, and the ability of a utility locator to obtain information. These evaluations shall be done in consultation with Philadelphia Parks and Recreation.

1.3 ACTION SUBMITTALS

A. Test Reports: Submit the following reports in addition to other test reports described in subsequent sections directly to the Landscape Architect from the testing services, with a copy to the Contractor and the Owner:

1. Test reports on borrow material, including USCS classification (grain size, liquid limit, plastic limit, and natural water content), Clean Fill certification, and optimum moisture-maximum density curve for standard Proctor.
2. Verification of suitability of each footing subgrade material, in accordance with specified requirements.
3. Field reports; in-place soil density tests.
4. One optimum moisture-maximum density curve for each type of soil encountered. One USCS classification (grain size, liquid limit, plastic limit, and natural water content), Clean Fill certification and optimum moisture-maximum density curve for standard Proctor for each fill and backfill material.
5. Report of actual unconfined compressive strength and/or results of bearing tests of each strata tested.

1.4 QUALITY ASSURANCE

A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Codes and Standards: Perform work in compliance with applicable requirements of governing authorities having jurisdiction and follow Geotechnical recommendations. Construction operations shall be carried out in a manner such that soil erosion, air pollution, and water pollution is minimized. State, County, and Municipal laws concerning pollution abatement shall be followed.

1. The Standards for Soil Erosion and Sediment Control in Pennsylvania, as published by the Pa. Department of Environmental Protection, shall be applicable where the work is not specifically detailed on the accompanying drawings or by local requirements.
2. Earthwork recommendations outlined in the Project's current Geotechnical Engineering Report shall be followed unless otherwise noted.

C. The Contractor shall take action to remedy unforeseen erosion conditions and to prevent damage to adjacent properties as a result of increased runoff and/or sediment displacement. Stockpiles of wood chips, hay bales, crushed stone, and other mulches shall be held in readiness to deal immediately with emergency problems of erosion. All erosion control checks and structures shall be inspected weekly and after heavy rainfalls, and if damaged, repaired or replaced.

D. A Geotechnical Testing Agency shall be retained by the Contractor to perform soil testing and inspection services for quality control during earthwork and site grading operations.

1. The Contractor shall submit data demonstrating the qualifications of the Geotechnical Testing Agency for approval by the Architect.
2. The Geotechnical Testing Agency shall be qualified according to ASTM E 329 to conduct soil materials and rock definition testing as documented according to ASTM D 3740 and ASTM E 548.
3. The Geotechnical testing agency shall have on staff a professional engineer who is legally authorized to practice in the jurisdiction where the Project is located and who is experienced in providing geotechnical engineering.
4. The Geotechnical Testing Agency shall perform the tests and provide the services specified below and submit test reports to the Owner and Landscape Architect. All test reports must be signed and sealed by the qualified professional engineer responsible for their preparation.
5. Testing shall be performed in the presence of a county/city representative.

E. Field Engineering: A Surveyor shall be retained by the Contractor to provide field engineering services required for proper completion of the work including but not necessarily limited to layout work and setting of grades, slopes and levels:

1. The Contractor shall submit data demonstrating qualifications of persons proposed to be engaged for field engineering services for approval by the Architect.
2. The surveyor shall submit documentation verifying that layout, grades, slopes and levels are in conformance with the drawings and specifications.
3. The Contractor shall locate and protect control points and reference points throughout the progress of work.

1.5 REFERENCES

A. Annual Book of ASTM Standards, 2005; American Society for Testing and Materials, Philadelphia, PA.

B. Standard Specifications of the Pennsylvania Department of Transportation, Pub. 408, latest edition.
C. Management of Fill Policy, Pennsylvania Department of Environmental Protection, January 1, 2020 (Document No. 258-2182-773).

1.6 PROJECT CONDITIONS

A. Site Information

1. Existing data was used for the basis of the design and are available to the contractor for information only. Existing conditions are not intended as representations or warranties of accuracy or continuity. The Owner will not be responsible for interpretations or conclusions drawn from this data by Contractor.
2. Test borings and other exploratory operations may be performed by contractor, at the Contractor's option; however, no change in the Contract Sum will be authorized for such additional exploration.

B. Site Protection: Comply with requirements specified in Temporary Erosion and Sediment Controls, Section 01 57 13, prior to the start of, and throughout, earthwork operations.

1. Before beginning site and sitework clearing or any other construction activity, Contractor shall set up and maintain temporary fencing along the limits of construction indicated on the drawing, staked out by the Contractor, and shall notify Architect.
2. This temporary fencing shall describe the area of protection of existing soils/vegetation to remain. Under no conditions shall this line be penetrated by any construction vehicle or construction process, including storage of materials, waste, or fill, or for any purpose without the written consent of the Architect or Owner.
3. Temporary fencing shall be maintained in good condition throughout the work and shall be removed when work is completed.
4. Vegetation in protected areas which is damaged due to construction activities shall be replaced or otherwise restored to the satisfaction of the Architect and at no cost to the Owner.
5. Barricade open excavations occurring as part of this work and post with warning lights.

Operate warning lights as recommended by authorities having jurisdiction.

6. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
7. Perform excavation by hand within dripline of large trees to remain. Protect root systems from damage or dry out dryout to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap.
8. No vehicles shall be driven or parked under the canopy of trees nor shall material be stored or any construction activity take place under canopies except that directly related to work there.

C. Protection of Existing Utilities

1. Locate existing underground utilities in the area of the work prior to the beginning of the work. Where utilities are to remain in place, provide suitable protection where required before starting work and maintain protection throughout the course of the work. Do not interrupt existing utilities without written approval from the utility owner.

    a. Provide minimum of 48-hour notice to the Landscape Architect and receive written notice to proceed before interrupting any utility.

2. Should uncharted or incorrectly charted utilities be encountered during excavation, consult the utility owner immediately for directions. Cooperate with the Owner and public and private utility companies in keeping their respective services and facilities in operation.
3. Restore damaged utilities to their original condition to the satisfaction of and at no cost to the Owner. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active.

D. Use of Explosives: Use of explosives is not permitted without the prior approval of the Architect.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Class 4, Type A Geotextile: Per PENNDOT Publication 408, Section 735 with AOS 70-100 U.S. Sieve.

2.2 SOIL MATERIALS

A. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP.

B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, 0L, OH, and PT.

C. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1-1/2 inch sieve and not more than 10 percent passing a No. 4 sieve and 0% passing No. 200 sieve.

D. Topsoil: Topsoil stripped and stockpiled on the site should be used for fine grading. Topsoil is defined as soil existing as top layer of earth on the site, which produces heavy growths of crops, grass or other vegetation. If there is not sufficient stripped and stockpiled topsoil, furnish additional topsoil as needed conforming to the requirements specified in Section 32 93 00, Plants.

E. Fill and Backfill Materials:

1. Fill must have a bearing capacity of at least 3,000 pounds per square foot (PSF) when compacted to 95% of the maximum dry density (ASTMD-1557 or ASTM D-698 for trenches or other small spaces where large compaction equipment is not used).
2. Ordinary fill material shall be clean and free of high organic top soil, peat or muck, masonry materials, broken concrete or asphalt, stones larger than six inches, frozen lumps, trash, and other debris that would interfere with compaction or cause settlement.
3. Fill material shall be of a moisture content suitable for compaction, specifically within +/- 2% of the optimum moisture content per the standard Proctor test (ASTM D698) and shall be obtained from a location that is normally dry and well-drained.
4. Select fill material shall be PENNDOT No. 2A per PENNDOT Section 703.2.
5. Should it be necessary to import fill material from off-site, the Contractor shall furnish certified report(s) of the testing laboratory showing the analysis of a representative sample of the material he proposes to use. A separate report shall be furnished for each source of material, <u>including USCS classification (grain size, liquid limit, plastic limit, and natural water content), Clean Fill certification, and optimum moisture-maximum density curve for standard Proctor.</u> The Contractor shall furnish the reports to the Engineer for approval. Imported fill shall be well-graded granular material similar to PADOT 2A <u>or crushed, recycled concrete with a gradation similar to PADOT 2A.</u>
6. Structural Fill: Clean bank run sand and gravel containing non-plastic fines for that portion passing a No. 40 U.S. Standard sieve. Conform to the following gradation.

U.S. STANDARD SIEVE SIZE	PERCENT PASSING
4 inch	100
No. 4	30 to 100
No. 200	0 to 12<u>35</u>

a. Material Availability: Borrow areas for structural fill material are not available on the site. Provide off-site materials of the quality specified and quantities required. Obtain material from a single source if possible.

7. Crushed Stone: Angular, washed natural stone; free of shale, clay, friable materials and debris; graded in accordance with ANSI/ASTM C136 within the following limits:

U.S. STANDARD SIEVE SIZE	PERCENT PASSING
3/4 inch	95 to 100
5/8 inch	75 to 100
3/8 inch	55 to 85
No. 4	35 to 60
No. 16	15 to 35
No. 40	10 to 25
No. 200	5 to 10

8. Sand: Natural river or bank sand; dry, washed, free of silt, clay, loan, friable or soluble materials and organic matter; graded in accordance with ANSI/ASTM C136 within the following limits:

U.S. STANDARD SIEVE SIZE	PERCENT PASSING
No. 4	100
No. 14	10 to 100
No. 50	5 to 90
No. 100	4 to 30
No. 200	0

9. Dense Graded Aggregate: Broken stone, crushed gravel or blast furnace slag conforming to the following gradation:

U.S. STANDARD SIEVE SIZE	PERCENT FINER BY WEIGHT
1 inch	100
3/4 inch	55 to 90
No. 4	25 to 60
No. 50	5 to 25
No. 200	3 to 12

10. Pea Gravel: Natural stone; washed, well rounded, clean, free flowing, free of clay, shale, organic matter; 1/4 inch minimum to 5/8 inch maximum size.
11. Porous Fill: Crushed stone aggregate conforming to the following gradation:

U.S. STANDARD SIEVE SIZE	PERCENT FINER BY WEIGHT
1 inch	100
3/4 inch	90
3/8 inch	30
No. 4	5
No. 8	0

12. Ballast: Coarse, crushed stone aggregate conforming to the gradation of Table C. and properties specified in PADOT 703.2

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions under which earthwork and site grading is to be performed and notify the Architect in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.2 SITE PROTECTION MEASURES

A. All temporary erosion and sediment control measures indicated on the drawings and as specified in Section 01 57 13 and all temporary fencing shall be in place before beginning any earthwork or sitework.

B. Construction operations shall be carried out in a manner such that soil erosion and air and water pollution are minimized. State and local laws concerning pollution abatement shall be followed.

C. The General Contractor shall be responsible for all soil erosion and sediment control and site protection during the construction period and shall provide barriers and other measures and devices to ensure that these specifications are complied with.

D. Preventative measures against sinkhole formation:

1. Provide positive drainage away from building areas and exposed rock at all times during construction.
2. Avoid ponding water or concentrations of surface flows except where designated on the drawings.
3. Prevent runoff water from flowing onto exposed subgrades. Close excavations as soon as possible after exposure. Foundation concrete should be placed the same day that excavation is completed.
4. Backfill shall be compacted and be no more permeable than adjacent subgrade.

E. Contractor shall notify the Architect before any work is begun on the site to review temporary erosion control measures, site protection, permanent stormwater management features, and the sequence of construction.

F. Permanent stormwater management features and additional temporary erosion control measures as indicated on drawings shall be constructed after clearing and stripping of topsoil and are to be in place before the beginning of other construction activities.

G. No water which transports sediment resulting from earth moving, demolition, or other construction activities shall be permitted to discharge beyond the limits of disturbance or grading indicated on the drawings.

3.3 SITE PREPARATION

A. Following the setting up of temporary fencing, tree protection and temporary erosion control measures as specified, remove trees, shrubs, grass and other vegetation or obstructions which interfere with new construction. Completely remove stumps of trees and shrubs which are located within ten feet of proposed new construction, including buildings, roads, etc. to at least one foot below finish grade.

B. Strip all topsoil to the full depth of the topsoil horizon, minimum 6 inches, from the area to be disturbed by new earthwork or construction.

1. Keep topsoil reasonably free from subsoil, debris, and stones larger than two inches.
2. Stockpile topsoil for future use in location to be approved by the Architect. If so directed by the Architect, create separate stockpiles for different stripped areas.
3. Prevent erosion of stockpiles, as specified in Section 015713.

3.4 EXCAVATION

A. Excavation is unclassified and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.

B. The Contractor shall perform excavation to the dimensions and elevations indicated on the drawings for all buildings and structures and work incidental thereto. For excavation of infiltration beds, see Section 33 41 00 – Storm Utility and Structures and Section 33 31 00 Sanitary Sewerage Utility Piping.

C. Excavated materials to be reused for topsoil, backfill, or other purposes shall be piled away from the edge of the excavated area a sufficient distance to prevent overloading the bank, and graded in such a way as to prevent surface water from entering the excavated area. Excess material from excavation not suitable or required for backfill or other purposes shall be hauled from the site as excavated and disposed of legally.

Exposed subgrades outside of ultimate stormwater infiltration or bioretention areas shall be proof rolled with heavy pneumatic-tired equipment in the presence of the Geotechnical Testing Agency to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades. At minimum, a triaxle dump truck (loaded) with minimum tire pressure of 100 psi (Gross Vehicle Weight of 75,000 lb) should be used.

Excavate and replace soft or unstable areas of subgrade and replace with approved compacted fill as directed by the Geotechnical Testing Agency. The Contractor should refer to the pavement subgrade over excavation detail should soft or unstable areas be encountered. Over excavation should consist of 1' min to 3' max depth in areas identified as unsuitable by proof rolling, the placement of Class 4, type A geotextile, and backfilled with compacted dense graded aggregate. Use select fill material specified in 2.2.E. as PADOT 2A per 703.2 or approved crushed, recycled concrete of similar gradation.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Geotechnical Testing Agency.

E. Rock Excavation: The following classifications of excavation will be made when rock is encountered:

1. Earth Excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.
2. Rock excavation for trenches and pits includes removal and disposal of materials and obstructions encountered that cannot be excavated with a track-mounted power excavator, equivalent to Caterpillar Model No. 2l5C LC, and rated at not less than 115 HP flywheel power and 32,000-pound drawbar pull and equipped with a short stick and a 42-inch wide, short tip radius rock bucket rated at 0.81 cubic yard (heaped) capacity. Trenches in excess of l0 feet in width and pits in excess of 30 feet in either length or width are classified as open excavation.
3. Rock excavation in open excavations includes removal and disposal of materials and obstructions encountered that cannot be dislodged and excavated with modern, track-mounted, heavy-duty excavating equipment without drilling, blasting, or ripping. Rock excavation equipment is defined as caterpillar Model No. 973 or equivalent track-mounted loader, rated at not less than 210 HP flywheel power and developing minimum of 45,000- pound breakout force (measured in accordance with SAE J732).

    a. Typical of materials classified as rock are boulders 1/2 cu. yd. or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits.

    b. Intermittent drilling, blasting, or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.
4. Do not perform rock excavation work until material to be excavated has been cross-sectioned and classified by Geotechnical Testing Agency. Such excavation will be paid on basis of contract conditions relative to changes in work.
5. Rock payment lines are limited to the following:

    a. Two feet outside of concrete work for which forms are required, except footings.

    b. One foot outside perimeter of footings.

c. In pipe trenches, 6 inches below invert elevation of pipe and 2 feet wider than inside diameter of pipe, but not less than 3 feet minimum trench width.

d. Outside dimensions of concrete work where no forms are required.

e. Under slabs on grade, 6 inches below bottom of concrete slab.

F. Excavation for Structures

1. Excavation shall extend two (2) feet from the neat lines of structures to the face of bank or shoring to allow working space and inspection, except where concrete is to be deposited directly against excavated surfaces.
2. Conform to elevations and dimensions shown within a tolerance of 0.10 feet.
3. All loose material shall be removed from excavations, and bottoms shall be carefully leveled to grade.
4. Do not excavate to full depth when rain or freezing conditions are imminent. Protect completed foundation soil surface from frost.
5. The Contractor shall furnish 48 hours advance notification to the Geotechnical Testing Agency of times when footing excavations are to be completed so that the bearing quality of bottoms may be inspected and/or tested. Place no forms or concrete before approval of the excavation by the Geotechnical Testing Agency.
6. The Geotechnical Testing Agency shall inspect the open excavation to verify the bearing capacity of supporting undisturbed soil. Natural and fill soils are to have a minimum bearing capacity of 3,000 psf (pounds per square foot).
7. If the Geotechnical Testing Agency determines that unsatisfactory soil is present, or that bearing capacity at the indicated elevation is inadequate, continue excavation and replace with approved compacted load-bearing structural fill material as directed by the Geotechnical Testing Agency. Such excavation shall be classified as additional work and payment shall be made in accordance with the General Conditions.
8. If foundation subgrade is found to be unstable or directly on rock, the existing soils/rock shall be removed to a minimum depth of two feet below the proposed bottom elevation, or to a depth where firm to stiff natural soils or rock is encountered. Replace undercut areas with approved compacted load-bearing structural fill material in accordance with these specifications and as directed by the Geotechnical Engineer.

G. Excavation for Trenches

1. Trenches shall be of minimum width necessary to lay pipes and shall be excavated to exact depth and grade. Trench bottoms shall have proper and uniform grade between inverts.
2. Bottoms of all trenches shall be trimmed by hand, so that the lower one-third of pipe is
3. continuously supported on undisturbed or compacted soil with the slope of the pipe uniform between established elevations. Bottoms of all trenches shall be hand recesses at bells, pipe couplings, valves and other protuberances.

4. Where rock or shale is encountered, the trench shall be excavated deeper as indicated below, and a layer of rock-free gravel (1/4-inch maximum size) shall be hand tamped over the trench bottom. This bed shall be a minimum of 4 inches thick for pipes 8 inches and smaller, 6 inches for pipes 10 to 20 inches, and 9 inches for pipes 24 inches and larger. Additional similar material shall be packed around the pipe to a depth of approximately 1/2 of the diameter of the pipe.
5. Whenever wet or otherwise unstable soil that is incapable of properly supporting the pipe is encountered in the bottom of the trench, such soil shall be removed to the depth required and the trench backfilled to the proper grade with a coarse sand, fine gravel, or other approved material.

H. Excavation for Pavements

1. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

I. Stability of Excavations

1. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.
2. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
3. Shoring and Bracing: Silty on-site soils are considered Type B per OSHA excavation regulations. The sidewalls of excavations deeper than 4 feet must be sloped, benched, or adequately shored per OSHA regulations. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

    a. Provide permanent steel sheet piling or pressure-creosoted timber sheet piling wherever subsequent removal of sheet piling might permit lateral movement of soil under adjacent structures. Cut off tops a minimum of 2'-6” below final grade and leave permanently in place.

J. Dewatering

1. The contractor shall pump out or otherwise remove any water which may be found in the excavation, and he shall provide drainage ditches, under-drains, flumes, well points, and pumping equipment, as necessary, to keep the excavation entirely clear of water while the foundations are being built or other operations are being performed requiring a dry condition. Do not use trench excavations as temporary drainage ditches.

2. All discharge resulting from de-watering of excavations shall be collected and diverted to facilities for removal of sediment or into a sediment filter bag and discharged over a level vegetated area. Such facilities shall be reviewed and approved by the Engineer before their construction. Water shall be conveyed to areas specified by the Engineer on-site. No water shall be run directly to streams or drains.

K. Cold Weather Protection

1. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.5 FILLING AND BACKFILLING

A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section.

1. Under grassed areas, use satisfactory excavated or borrow material.
2. Under walks and pavements, use subbase material, satisfactory excavated or borrow material or a combination.
3. Under steps, use subbase material.
4. Under footings and foundations use select fill material or approved imported load-bearing structural fill material.
5. Under building slabs, use drainage fill material.
6. Under piping and conduit and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation. Shape excavation bottom to fit bottom 90 degrees of cylinder.
7. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.

    a. Concrete is specified in Division 3.
    b. Do not backfill trenches until tests and inspections have been made and backfilling is authorized by Geotechnical Testing Agency. Use care in backfilling to avoid damage or displacement of pipe systems.

8. Provide 4-inch-thick concrete base slab support for piping or conduit less than 2'-6” below surface of roadways. After installation and testing of piping or conduit, provide minimum 4- inch-thick encasement (sides and top) of concrete prior to backfilling or placement of roadway subbase.

B. Backfill excavations as promptly as progress of the Work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, damp proofing, waterproofing, and perimeter insulation.
2. Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.

3. Removal of concrete formwork.
4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
5. Removal of trash and debris from excavation.
6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

C. Placing and compacting

1. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
2. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.
3. Place backfill and fill materials in layers not more than 8<u>10</u> inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 <u>6</u> inches in loose depth for material compacted by hand-operated tampers.
4. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
5. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required
6. elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.
7. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Geotechnical Testing Agency if soil density tests indicate inadequate compaction.

a. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density, in accordance with ASTM D698:

Under structures, building slabs and steps, pavements, and utilities compact top 12 inches of subgrade and each layer of backfill or fill material at 98 percent maximum density.

<u>Under walkways, pavements, and utilities compact top 6 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.</u>

Under vegetated or unpaved areas, compact top 6 inches of subgrade and each layer of backfill or fill material at 85 percent maximum density.

Under walkways, pavements, and utilities compact top 6 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.

Under bioretention areas, no compaction shall be permitted. Areas of the bioretention area compacted during the course of construction shall be harrowed or disced to restore permeability in accordance with Bioretention area specifications. If permeability cannot be restored, over-excavation and backfill with clean, open-graded stone may be required.

b. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.

1) Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
2) Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.
3) If aeration does not reduce the moisture content to an acceptable level, admixtures (lime, fly-ash, cement, or dry granular soil) will be required to modify moisture and aid in compaction. If admixtures are used, laboratory testing must be performed to determine the appropriate admixture(s) amounts, maximum dry density, and optimum moisture content.

3.6 FIELD QUALITY CONTROL

A. Notify Geotechnical Testing Agency for inspection and approval of subgrades and fill layers before subsequent construction is permitted thereon. Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.
B. Perform field density tests in accordance with ASTM D1556 (sand cone method) or ASTM D 2167 (rubber balloon method), as applicable.

1. Field density tests may also be performed by the nuclear method in accordance with ASTM D2922 ASTM D6938, providing that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D1556. In conjunction with each density calibration check, check the calibration curves furnished with the moisture gages in accordance with ASTM D3017.
2. If field tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the Geotechnical Testing Agency.

C. Footing Subgrade: For each strata of soil on which footings will be placed, perform at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata when acceptable to Engineer.

D. Paved Areas: Perform at least one field density test of subgrade for every 2,000 sq. ft. of paved area or building slab, but in no case fewer than three tests. In each compacted fill layer, perform one field density test for every 2,000 sq. ft. of overlaying building slab or paved area, but in no case fewer than three tests.

E. Foundation Wall Backfill: Perform at least one test for each 50 feet or less of wall length, but not fewer than two three tests.

F. Backfill at Retaining Wall: Perform at least one test for each 50 feet or less of wall length but not fewer than two three tests.

G. Trench Backfill: Perform at least one test for each 50 feet or less of trench length, but not fewer than two three tests.

H. If in opinion of Geotechnical Testing Agency, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, perform additional compaction, or remove and replace compacted fill material until specified compaction is achieved.

3.7 GRADING

A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:

1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevations.
2. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.
3. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with
finish surface not more than 1/2 inch above or below required subgrade elevation.

C. Grading Surface of Fill under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2 inch when tested with a 10-foot straightedge. The Surveyor shall verify that grades, slopes, and levels are in conformance with the drawings and specifications.

D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

1.8 PAVEMENT SUBBASE COURSE

A. General: Subbase course consists of placing subbase material, in layers of specified thickness, over subgrade surface to support a pavement base course.

1. Refer to other Division 32 sections for paving specifications.

B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.

C. Shoulders: Place shoulders along edges of subbase course to prevent lateral movement.

D. Construct shoulders of acceptable soil materials, placed in such quantity to compact to thickness of each subbase course layer. Compact and roll at least a 12-inch width of shoulder simultaneous with the compaction and rolling of each layer of subbase course.

E. Placing: Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.

1. When a compacted subbase course is indicated to be 6 inches thick or less, place material in a single layer. When indicated to be more than 6 inches thick, place material in equal layers, except no single layer more than 6 inches or less than 3 inches in thickness when compacted.

3.9 TEMPORARY SEEDING

A. Temporary seeding and mulching shall be required on all freshly graded areas immediately following earthmoving procedures. Seed-free straw or salt hay mulch shall be applied at a rate of 1 ton per acre (40 lbs. per 1000 square feet) over temporary seeded areas. Straw bale barriers shall be placed in swale areas until vegetation is established.
B. Temporary seeding shall consist of sod, a blend of turf-type tall fescue and Kentucky Blue Grass (100 percent by weight) or equivalent and shall be placed at 30 lbs per acre or 10 lbs per 1,000 square feet.
C. Should temporary seeding not be possible or not establish itself properly, mulch as described above, pending fine grading or permanent seeding.

3.10 FINISH GRADING

A. Spreading of planting soil and finish grading shall be coordinated with the work of the Landscape Contractor and the seeding dates described in Section 32 93 00, Plants. No work shall be performed until after verification of slopes and grades as described in this Section and until after approval by the Architect.

B. Verify that the rough grades meet requirements for tolerances, materials, and compaction.

C. Correct washouts, swales, berms, and other irregularities to provide a smooth, uniform surface without low places where water will stand.

D. Surface of subgrades shall be loosened and made friable by cross-discing or harrowing to a depth of 2" (inches). Stones and debris more than 1-1.5" (inches) in any dimension shall be raked up and grade stakes and rubbish removed.

E. Planting Soil shall be per Section 32 91 15, Soil Preparation.

F. Permanent seeding work shall be begun within one week of the completion of fine grading. If grading is completed at a time of the year when seeding work is not to be done or if this is otherwise not possible, mulch entire area with seed-free salt straw or salt hay at a rate of one ton per acre. Anchor mulch with a mulch binder approved by Architect.

G. Any discrepancies which occur due to misgrading or to disturbance or erosion shall be regraded and re-rolled to the satisfaction of the Architect.

3.11 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Removal to Designated Areas on Owner's Property: Transport acceptable excess excavated material to designated soil storage areas on Owner's property. Stockpile soil or spread as directed by Architect.

B. Removal from Owner's Property: Remove waste materials, including unacceptable excavated material, trash, and debris, and legally dispose of it off Owner's property. The Contractor is responsible for obtaining a legal disposal site and necessary permits (as required) for disposal of excess earthwork materials and debris. The Contractor also agrees to hold the Owner harmless from all damages, fines, etc. arising out of improper disposal, if not otherwise provided by law.

3.12 CERTIFICATION

A. Upon completion of this portion of the work, and as a condition of its acceptance, deliver to the Architect written reports from the soils engineer and the surveyor.

1. The Geotechnical Testing Agency shall certify that the compaction requirements have been obtained. State in the report the area of fill or embankment, the compaction density obtained, and the type or classification of fill material placed.
2. The Surveyor shall certify that the layout, grades, slopes, and levels are in conformance with the drawings and specifications as outlined in this Section.

END OF SECTION 312000

SECTION 321216

ASPHALT PAVEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Bituminous paving repairs and milling for existing pavements including subgrade preparation, impervious bituminous base course, paving for new sections, and asphalt edge restraint.

B. Related Requirements:

1. Section 31 20 00, “Earth Moving”.

1.3 ACTION SUBMITTALS

A. Submit a list of materials proposed to be provided for work under this Section including the name and address of the materials producer and the location from which the material is to be obtained. Provide asphalt mix designs to Owner.

B. Submit certificates, signed by the materials producer and the paving subcontractor, stating that materials meet or exceed the specified requirements.

1.4 QUALITY ASSURANCE

A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work in this Section.

B. Codes and Standards: Perform work in compliance with applicable requirements of governing authorities having jurisdiction and follow Geotechnical recommendations.

C. All materials, methods of construction, and workmanship shall conform to applicable requirements of PennDOT Form 408 Specifications, latest edition, unless otherwise specified.

1.5 JOB CONDITIONS

A. Protect adjacent work from splashing of paving materials. Remove all stains from exposed surfaces of paving, structures, and grounds. Remove all waste and spillage.

B. Protect paving against traffic and markings until surface has properly cured.

C. Provide temporary barriers, warning lights, and other protection as necessary. Remove when no longer required.

D. Do not damage or disturb existing improvements or vegetation. Provide suitable protection where required before starting work and maintain protection throughout the course of the work.

E. After final rolling, no vehicular traffic of any kind shall be permitted on the pavement until cooling and hardening has taken place, and in no case less than six hours. Provide barriers to prevent vehicular use.

F. Restore damaged improvements, including existing paving on or adjacent to the site that has been damaged as a result of construction work, to their original condition or repair as directed to the satisfaction of the Owner at no additional cost.

1.6 SAFETY AND TRAFFIC CONTROL

A. Notify and cooperate with local authorities and other organizations having jurisdiction (such as PennDOT and Philadelphia Streets Dept.) when construction work will interfere with existing roads and traffic.

B. Provide temporary barriers, signs, warning lights, flagmen, and other protections as required to assure the safety of persons and vehicles around the construction area and to organize the smooth flow of traffic.

1.7 WEATHER LIMITATIONS

A. Do not place bituminous paving mixtures when surfaces are wet or when the temperature of either the air or the surface on which the mixture is to be placed is 40°F or lower.

1.8 GRADE CONTROL

A. Use steel-wheel and pneumatic-tire rollers upon application. Sealers for cracks, seams, and patches to follow emulsified asphalt class E-8 Sec. 702.

B. Establish and maintain required lines and elevations. Finished surfaces shall be true to grade and even, free of roller marks and free of low spots to form puddles. All areas must drain.

C. Contractor shall perform a water test on finished surfaces and any areas retaining water shall be corrected in an approved manner without additional cost to the Owner.

1.9 REFERENCES

A. Annual Book of ASTM Standards, latest edition; American Society for Testing and Materials, Philadelphia, PA.

B. Commonwealth of Pennsylvania Department of Transportation (PennDOT), Publ. 408, latest edition.

C. Standards of the American Association of State Highway and Transportation Officials (AASHTO).

PART 2 - PRODUCTS

2.1 MATERIALS

A. Coarse aggregates shall meet the size and grading requirements as defined in Size and Grading Requirements for Coarse Aggregates - Table B, PennDOT Publ. 408, or Table 4, AASHTO Specifications, Part I, 13th Ed., 1982 or later, unless otherwise specified.

B. Stone base course for impervious paving shall be No. 2A aggregate conforming to PennDOT Publication 408, or AASHTO No. 3.

C. Bituminous binder course for impervious paving shall be Superpave PG64-22 Binder Course conforming to PennDOT Publication 408.

D. Wearing course for impervious paving shall be Superpave PG64-22 Wearing Course conforming to PennDOT Publication 408.

E. Asphalt Joint and Crack Sealing materials per Section 469, PennDOT Publication 408.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADE

A. Stone Base course for New Impervious Paving

1. Subgrade Preparation without subsurface infiltration bed
   a. Stripping of Topsoil: Strip grass and topsoil as required from areas to be paved and stockpile.

b. Proof-rolling: the subgrade shall be rough graded and proof-rolled with a self-propelled compactor weighing ten (10) tons or greater until the upper six (6) inches are densified to 95% maximum standard density as defined by ASTM D-698.
c. Filling and Compacting: Fill and compact any dented or depressed areas. Roll and crossroll subgrade until thoroughly compacted to proper profile. All fill shall be clean subgrade and shall be placed in eight (8) inch lifts and compacted to 95% standard modified density as defined by ASTM D-698. Contractor shall provide Owner with soil test measurements to confirm required density.

2. Base course Placement
   a. Base course of PennDOT No.2A aggregate shall be rolled thoroughly to a hard, even, unyielding surface that does not creep or wave under the roller. Compacted thickness of base course shall be as shown on the drawings.

B. Binder and Wearing Courses for Impervious Bituminous Paving

1. Impervious paving shall match existing paving in color, texture, and appearance.
2. Impervious paving shall conform to PennDOT Specifications for materials and methods of construction.
3. Paving shall consist of two layers:
   a. Binder course shall be to the thickness shown on the drawings.
   b. Wearing course shall be to thickness shown on the drawings.
4. Finished paving shall be true and even, free of low spots or bumps. All areas must drain to established drainage points. No puddles will be permitted. Correct puddling with repaving as required. Paving adjacent to existing paving shall match existing grade and contour levels.
5. Merge new paving evenly with existing paving. Joints between new and existing paving to remain shall have the vertical face of the existing paving painted with a thin coat of asphaltic cement prior to placing of the hot mix and shall be raked against the joint and thoroughly tamped with hot tampers.

C. Thicknesses

1. Walkways and Trails:
   a. Minimum Asphalt Thickness: 3.5 inches total thickness in two (2) layers/lifts:
      i. Wearing Course: 1.5 inches thick PennDOT ID-2 Wearing meeting PennDOT Pub 408
      ii. Binder Course: 2 inches thick PennDOT ID-2 Binder meeting PennDOT Pub 408
   b. Minimum Stone Base: 6” compacted gravel base (PennDOT 2A modified or approved equal).
   c. Subgrade: Compacted and un-yielding to 95% minimum Standard Proctor ASTM D698
2. Drive Aisles and Parking Areas:
   a. Minimum Asphalt Thickness: 4 inches total thickness in two (2) layers/lifts:

i. Wearing Course: 1.5 inches thick PennDOT ID-2 Wearing meeting PennDOT Pub 408
ii. Binder Course: 2.5 inches thick PennDOT ID-2 Binder meeting PennDOT Pub 408

b. Minimum Stone Base: 6” compacted gravel base (PennDOT 2A modified or approved equal)
c. Subgrade: Compacted and un-yielding to 95% minimum ASTM D698 Standard Proctor

3. Asphalt sport courts
a. Wearing Course: 1.5 inches thick PennDOT ID-2 ¼” gradation wearing meeting PennDOT Pub 408
b. Binder Course = 2.5 inches thick PennDOT ID-2 Binder meeting PennDOT Pub 408
c. Minimum Stone Base: 6” compacted gravel base (PennDOT 2A modified or approved equal)
d. Subgrade: Compacted and un-yielding to 95% minimum ASTM D698 Standard Proctor

D. Repair of Damaged Paving

1. Any existing paving on or adjacent to the site that has been damaged as a result of construction work shall be repaired to the satisfaction of the Owner without additional cost to the Owner.

E. Asphalt Milling

1. Milling shall be executed as per the requirements of Section 491 of PennDOT Publication 408.

F. Asphalt Joint and Crack Sealing materials per Section 469, PennDOT Publication 408.

1. Asphalt Joint and Crack Sealing shall be executed as per the requirements of Section 469 of PennDOT Publication 408.

G. Striping

1. Sweep and clean surface to eliminate loose material and dust.
2. Install in accordance with PennDOT Specifications.

H. Field Quality Control

1. Testing and Inspection: Employ at Contractor's expense an inspection firm acceptable to the Owner to perform soil compaction testing and inspection services, staking and layout control, and testing and inspection of site grading, pavement work, and concrete work. Inspection and list of tests shall be reviewed and approved in writing by the Owner prior to starting construction. All test reports must be signed by a PA licensed engineer.
2. Test in-place base and surface course for compliance with requirements for thickness and surface smoothness. Repair or remove or replace unacceptable work as directed by the Contracting Officer.
3. Surface Smoothness: Test finished surface for smoothness and even drainage, using a ten-foot straightedge applied parallel with and at right angles to centerline of paved area. Check surfaced areas at intervals as directed by the Owner. Surface will not be accepted if exceeding the following tolerances for smoothness:
   a. Surface course: 3/16 inch
4. If, in the opinion of the Owner, based upon reports of the testing service and inspection, the work is below that which has been specified, additional work and testing will be required until satisfactory results are obtained.
5. Grade Control: Establish and maintain required lines and elevations. The Owner shall be notified for review and approval of final stake lines for the work before construction work is to begin.

END OF SECTION 321216

SECTION 321313

CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Curbs and gutters.
   2. Walks.
   3. Site stairs.
   4. Site concrete pads.

1.3 CONCRETE STANDARDS

A. Concrete paving shall conform to the following minimum standards:
   1. Minimum Strength: 4,000 psi at 28 days.
   2. Provide sealed/caulked expansion joints.
   3. Provide control joints at a spacing as required to prevent cracking within panels.
   4. Finish shall be non-slip broom type finish.
   5. Joints shall be tooled prior to broom finishing to eliminate “window pane” appearance. Sawcut joints are not preferred. If designer/contractor wishes to utilize sawcut joints prior approval shall be obtained from Philadelphia Parks and Recreation.
   6. Concrete paving shall conform to the following standards:
      a. ACI 117 – Specification for Tolerance for Concrete Construction and Materials
      b. ACI 318 – Building Code Requirements for Reinforced Concrete
      c. PennDOT 408 – Construction Specifications
      d. PennDOT RC-67M – Curb Ramp and Sidewalk Construction Details
   7. Concrete shall contain either a water-reducing, plasticizing admixture or a high-range water-reducing admixture. All concrete shall contain an air-entraining admixture to provide 5%-7% air entrainment. Maximum chloride content shall be 0.15%. Maximum water/cement ratio shall be 0.45. Maximum design slump of 3 inches without super plasticizers. Aggregate size shall be 3/4 of an inch with a designation of 4S per ASTM C33.
   8. Reinforcing: PPR prefers most pavements be unreinforced to facilitate future repairs and/or replacements. In some cases, reinforcing is required either by site conditions or by design requirements such as some sprayground elements require reinforcing. If reinforcing is provided if shall meet the following:

a. Welded wire fabric shall be galvanized and comply with ASTM A185.
b. Reinforcing steel bars shall be grade 60 per ASTM A615.

9. Submit mix design to the owner's representative for approval. The owner's representative may reject design mix for non-compliance.
10. Moist cure all concrete work and commence moist curing as soon as finishes will not be marred. Insulating blankets waterproofed kraft paper, or polyethylene film as per ASTM C171 shall be used to keep the concrete continuously moist during the curing process.

1.4 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified ready-mix concrete manufacturer and testing agency.

B. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Admixtures.
4. Curing compounds.
5. Bonding agent or epoxy adhesive.
6. Joint fillers.

C. Material Test Reports: For aggregates. Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

D. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

B. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

C. Concrete Testing Service: Engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures.

D. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.
2. Build mockups of concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Architect and not less than 96 inches (2400 mm) by 96 inches (2400 mm).
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to concrete paving, including but not limited to, the following:
   a. Concrete mixture design.
   b. Quality control of concrete materials and concrete paving construction practices.
2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete paving subcontractor.

1.8 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet (30.5 m) or less. Do not use notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.2 REINFORCEMENT

A. PPR prefers most pavements be unreinforced to facilitate future repairs and/or replacements. In some cases, reinforcing is required either by site conditions or by design requirements such as some sprayground elements require reinforcing. If reinforcing is provided it shall meet the following:

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.

C. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) plain-steel bars. Cut bars true to length with ends square and free of burrs.

D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150, white portland cement Type I or Type II; color as required to produce concrete color approved by Architect. Supplement with the following:
   a. Fly Ash: ASTM C 618, Class C or Class F.
   b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, Class 4S, uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.

2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: Potable and complying with ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.4 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry or cotton mats.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.5 RELATED MATERIALS

A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork in preformed strips.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:

1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. Chemical Surface Retarder: Water-soluble, liquid, set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch (3 to 6 mm).

2.6 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301 (ACI 301M), for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 4500 psi (24.1 MPa).
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
3. Slump Limit: 3 inches (75 mm).

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 6 percent for 5/8-inch (16-mm) nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture; high-range, water-reducing admixture; high-range, water- reducing and retarding admixture; or plasticizing and retarding admixture in concrete as required for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. All concrete shall contain an air-entrancing admixture to provide 5%-7% air entrainment.

F. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of Portland cement, which would otherwise be used, by not less than 40 percent.

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch (13 mm) according to requirements in Section 312000 "Earth Moving."

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
2. Provide tie bars at sides of paving strips where indicated.
3. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet (15.25 m) unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
   During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch (6-mm) radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch (6-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 (ACI 301M) requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 (ACI 301M) by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement dowels and joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.

2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

K. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control
temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

L. Minimum Paving Thicknesses

1. Pedestrian Walkways: Minimum 4 inches thick, no reinforcement, on 4 inches compacted crushed aggregate (PennDOT 2A Modified or 2B Clean Aggregate or AASHTO No. 57 Stone or equivalent).
2. Vehicular and Access Drives: Minimum 6 inches thick on 6 inches compacted crushed aggregate (PennDOT 2A Modified or 2B Clean Aggregate or AASHTO No. 57 Stone or equivalent). Specification of reinforcement shall be evaluated based upon vehicular use. Thickness should be evaluated based on vehicle weights, axil loading, amount of usage, and local soil conditions and increased above the minimum if conditions warrant. Designer shall provide thickness.
3. Driveway Aprons and Sidewalks within Rights of Way: Follow Department of Streets standards of construction.
4. Spraygrounds: 6 inches thick on 6 inches of compacted crushed aggregate (PennDOT 2A Modified or 2B Clean Aggregate or equivalent). Reinforcement shall be per sprayground equipment manufacturer’s recommendations/specifications. Thickening of slabs and or foundations for sprayground features shall be per sprayground equipment manufacturer’s recommendations/specifications.

M. Drainage: Pavements shall have positive drainage off of the surface. Provide a minimum cross pitch of

1. 1.0% and a maximum cross pitch of 2.0%. Plaza and sprayground areas shall have maximum grades of 2.0% in any direction.

N. Tolerances for Paving

1. Pavements in longitudinal direction, the gap below a 10 ft unleveled straightedge resting on high spots shall not exceed 1/8 inch.

2. Pavements in transverse direction, the gap below a 10 ft unleveled straightedge resting on high spots shall not exceed 1/4 inch.
3. Ramps, sidewalks, and intersections, in any direction, the gap below a 10 ft unleveled straightedge resting on high spots shall not exceed 1/4 inch.
4. In no case shall grades on any pavements either designated or intended to be accessible per the Americans with Disabilities Act (ADA) exceed the grade maximums noted in the ADA or ADA Accessibility Guidelines (ADAAG).

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Finish shall be non-slip broom type finish
2. Joints shall be tooled prior to broom finishing to eliminate “window pane” appearance. Sawcut joints are not preferred. If designer/contractor wishes to utilize sawcut joints prior approval shall be obtained from Philadelphia Parks and Recreation.

3.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Moist cure all concrete work and commence moist curing as soon as finishes will not be marred. Insulating blankets waterproofed kraft paper, or polyethylene film as per ASTM C171 shall be used to keep the concrete continuously moist during the curing process.

3.9 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch (19 mm).
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).

3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/2 inch (13 mm).
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches (13 mm per 300 mm) of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch (25 mm).
6. Vertical Alignment of Dowels: 1/4 inch (6 mm).
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches (6 mm per 300 mm) of dowel.
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or 5000 sq. ft. (465 sq. m) or fraction thereof of each concrete mixture placed each day.
    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when it is 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
    a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with Portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 321723

PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Painted markings & colored pavement coating applied to asphalt paving.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Barrett Playground, 641 Lindley Avenue, Philadelphia, PA 19120.

1. Review methods and procedures related to marking asphalt paving including, but not limited to:

a. Pavement aging period before application of pavements markings & colored pavement coatings.

b. Review requirements for protecting pavement markings & colored pavement coatings, including restriction of traffic during installation period.

1.4 ACTION SUBMITTALS

A. Product Data: Include technical data and tested physical and performance properties.

B. Shop Drawings:

1. Indicate pavement markings, colors, and dimensions to adjacent work.

C. Samples: Submit manufacturer's color samples of color coating.

D. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.

E. Manufacturer's Project References: Submit manufacturer's list of successfully completed asphalt basketball & multi-purpose court surface color coating system projects, including project name, location, and date of application.

F. Applicator's Project References: Submit applicator's list of successfully completed asphalt basketball & multi-purpose court surface color coating system projects, including project name, location, type, and quantity of color coating system applied, and date of application.

G. Warranty Documentation: Submit manufacturer's standard warranty.

H. Authorized Installer Certificate: Submit manufacturer's authorized installer certificate.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for alkyd materials, 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:

1. California Sports Surfaces / Plexipave System
   150 Dascomb Road, Andover MA 01810
   T: 978-623-9980
   www.plexipave.com

2. StreetBond
   Chris Shaw, Sales Development Representative
   Mobile: 732-783-8584
   Email: chris.shaw@gaf.com
   https://www.gaf.com/en-us/products/streetbond-sb150-pavement-coatings

3. SportMaster Sport Surfaces
   Steve Illes, Route Sales Representative
   Mobile: 610-709-4831
   Email: sealmaster.stevei@gmail.com
   https://www.sportmaster.net/

2.2 PAVEMENT COATING MATERIALS

A. Plexipave System
   1. Patching Mix (California Court Patch Binder) – for use in patching cracks, holes, depressions, and other surface imperfections. Acrylic resin blended with Portland Cement and silica sand.
   2. Crack Filler (California Crack Filler) – for use in filling fine cracks. Acrylic resin heavily filled with sand.
   3. Acrylic Filler Course (California Acrylic Resurfacer) – for use as a filler for new or existing asphalt surfaces. The acrylic filler shall be blended with approved silica sand at the job site. Acrylic resin (no vinyl copolymerization constituent). The product shall contain not less than 3.5% attapulgite.
   4. Acrylic Color Playing Surface (Plexichrome Ultra Performance/Plexipave Color Base) – for use as the finish color and texture. Plexichrome and Plexipave Color Base are blended at the job site to achieve the correct surface texture. Factory Fortified Plexipave may be used as an alternative material.
      a. Plexichrome Ultra Performance – acrylic resin (no vinyl copolymerization constituent) with selected light fast pigments).
      b. Plexipave Color Base – acrylic resin containing no vinyl copolymerization constituent. Contains not more than 63% rounded silica sand.
   5. Line Paint (California Line Paint) – for use as the line marking on the court/play surface. 100% acrylic resin containing no alkyds or vinyl constituents. Texturing shall be rounded silica sand.
   6. Water – for use in dilution/mixing shall be clean and potable.
   7. All surfacing materials shall be non-flammable and have a VOC content of not less than 100g/L.
   8. Local sands are not acceptable in the color playing surface. Sands must be incorporated at the manufacturing location to ensure quality and stability.
   9. Colors: TBD based on manufacturer color card.

B. StreetBond SB150
   1. Two-part premium epoxy-modified, acrylic, waterborne coating specifically designed for application on asphalt pavements.
   2. StreetBond Colorant: Highly concentrated, high-quality, UV stable pigment blend to add color to StreetBond SB150 coatings. One unit of Colorant shall be used with one pail of StreetBond coating material.
   3. Colors: TBD based on manufacturer color card.

C. SportMaster Color Coating ColorPlus System
   1. 100% acrylic emulsion coating, mixed on-site with silica sand and water.
   2. SportMaster Textured Line Paint: Pigmented, 100% acrylic emulsion line paint for marking on asphalt sports courts.
   3. Colors: TBD based on manufacturer color card.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that pavement is dry and in suitable condition to begin pavement coating in accordance with manufacturer's written instructions. Pavement surface shall be free from all foreign matter, including dirt, dust, de-icing materials, and chemical residue.

B. Proceed with pavement coating only after unsatisfactory conditions have been corrected.

3.2 PAVEMENT COATING

A. Do not apply pavement coating until layout, colors, and placement have been verified with Landscape Architect.

B. Allow asphalt paving to age for a minimum of 30 days before starting application of pavement coating.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply pavement coating per manufacturer’s recommendations.

3.3 PROTECTING AND CLEANING

A. Protect pavement coating from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 321723

PLAYGROUND PROTECTIVE SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Unitary, seamless surfacing.

1.3 DEFINITIONS

A. Definitions in ASTM F2223 apply to Work of this Section.

B. Critical Height: Standard measure of shock attenuation according to ASTM F2223; same as "critical fall height" in ASTM F1292. According to ASTM F1292, this approximates "the maximum fall height from which a life-threatening head injury would not be expected to occur."

C. SBR: Styrene-butadiene rubber.

D. Unitary Surfacing: A protective surfacing of one or more material components bound together to form a continuous surface; same as "unitary system" in ASTM F2223.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Color Sample Box

C. Shop Drawings: For each type of protective surfacing.

1. Include plans, sections, placement and penetration details, and attachment to substrates.

2. Include accessories and edge terminations.

3. Include patterns and colors as shown on the Drawings.

4. Include fall heights and use zones for equipment and structures specified in Section 116800 "Play Equipment and Structures," coordinated with the critical heights for protective surfacing.

D. Samples for Color Selection: TBD by Landscape Architect after review of manufacturer Colors.

1. Provide, at a minimum, 12 by 12-inch square or round samples of requested Color combinations for Colors 1, 2, 3, and 4 to Landscape Architect for color selection.

2. Landscape Architect may request Color Combinations for Colors 1, 2, 3, and 4.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of unitary surfacing product.

1. Product Liability Insurance Certificate.
2. IPEMA Certification.

C. Field quality-control reports.

D. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For playground protective surfacing to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer. The installer must have installed a minimum of ten (10) applications.

B. Manufacturer Qualifications: Manufacturer must be in business for a minimum of five (5) years.

1. Surface must be IPEMA certified.

C. Approved Samples for each Color Combination (#1-4) shall be used as Quality Mock-Up for comparison with finished installation.

1. Finished Installation shall match Approved Samples.

1.8 WARRANTY

A. Special Warranty: Manufacturer and Installer agree to repair or replace components of protective surfacing that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Reduction in impact attenuation as measured by reduction of critical fall height.

b. Deterioration of protective surfacing and other materials beyond normal weathering.

2. Warranty Period: Five (5) years from date of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Materials must be delivered in good condition, in original unopened packages with labels intact.

B. Store all materials protected from weather and at temperatures not less than 32 degrees F for any twelve (12) hour duration.

1.10 JOB CONDITIONS

A. Ambient air temperatures shall be 45 degrees F or greater and rising at the time of installation of the surface and shall remain at 33 degrees F or greater for at least 24 hours after application.

B. Adjacent materials and the surface shall be protected during installation, while curing and unattended, from weather and other damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain protective surfacing materials from single source and from single manufacturer.

1. Provide geosynthetic accessories of each type of source recommended by manufacturer of protective surfacing materials.

2.2 PERFORMANCE REQUIREMENTS

A. Impact Attenuation: Critical fall height tested according to ASTM F1292 for equipment as specified in the Drawings.

B. Accessibility Standard: Minimum surfacing performance according to ASTM F1951.

2.3 UNITARY, DUAL-DENSITY, SEAMLESS SURFACING (Poured-in-Place (PIP) Rubber Safety Surface)

A. Description: Manufacturer's standard, site-mixed and applied, two-layer material with wearing layer over cushioning layer, with combined, overall thickness as required, tested for impact attenuation according to ASTM F1292 and for accessibility according to ASTM F1951.

1. Manufacturers: Subject to compliance with requirements, available manufacturer's offering products that may be incorporated into the Work include, but are not limited to the following:

a. Surface America, Inc.
P.O. Box 157, Williamsville, NY 14231
Phone: 800-999-0555
www.surfaceamerica.com

1) Local Representative:
Recreation Resource USA, LLC
503 N. Walnut Road, #200, Kennett Square, PA 19348
Phone: 610-444-4402
www.recreation-resource.com

b. Softline Solutions
Phone: 1-877-362-3133
www.softlinesolutions.net

c. DuraPlay, Inc.
150 Brownson Lane, Driftwood, TX 78619
Phone: 512-847-2473
www.duraplay.com

2. Wearing Layer: EPDM rubber or Thermoplastic Vulcanizate (TPV).

a. A manufactured rubber having density of 1mm to 4mm.

b. Colors: as approved by Landscape Architect based on samples provided by the Contractor.

c. Design: where colored pattern is required, provide as indicated on Drawings.

3. Cushioning Layer: Recycled black SBR particles.

a. Shall be cryogenically processed.

b. Shall be 3/8-inch shredded mesh or 6/20 mesh and contain less than 4% dust.

c. Shall be packed in suitable bags to protect SBR from moisture.

d. Base mat thickness: 1-inch to 4-3/4-inches, depending on critical fall height of playground and fitness equipment (see Drawings).

Binder: Elastic polyurethane pre-polymer, MDI based, low odor, capable of excellent weathering and binding characteristics. Binder shall contain no TDI Monomers.

4. Critical Height: As indicated on Drawings.

5. Overall Thickness: As indicated on Drawings.

6. Primer: A single-component moisture cured polyurethane primer.

2.4 TECHNICAL INFORMATION

A. Applicable Standards:

1. Shock attenuation under ASTM F1292: GMAX less than 200.

2. Head Injury Criteria: less than 1,000.

3. Non-slip characteristics under ASTM E303.

4. IPEMA Certified.

5. Flammability under 8S-5696 and ASTM D2859.

6. Tensile strength (ASTM D412): 60 psi.

7. Tear resistance (ASTM D624): 140%.

B. Chemical Properties:

1. Cushioning Layer: 85% SBR rubber buffings, 15% polyurethane binder.

2. Wearing Layer: 78% EPDM or TPV rubber granules, 22% polyurethane binder.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for subgrade elevations, slope, and drainage and for other conditions affecting performance of the Work.

1. Verify that substrates are sound and without high spots, ridges, holes, and depressions.

B. Hard-Surface Substrates: Verify that substrates are satisfactory for unitary, protective surfacing installation and that substrate surfaces are uniformly sloped to drain within recommended tolerances according to protective surfacing manufacturer's written requirements for cross-section profile.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates to receive surfacing products according to protective surfacing manufacturer's written instructions.

3.3 INSTALLATION OF SEAMLESS SURFACING

A. Mix and apply components of seamless surfacing according to manufacturer's written instructions to produce uniform, monolithic, and impact-attenuating protective surfacing of required overall thickness.

1. Substrate Primer: Apply primer over prepared substrate with a short nap roller at the rate of 300 square feet per gallon, or at manufacturer's standard spreading rate.

a. Prime entire concrete surface of Play Mound.

b. Do not over saturate the substrate.

c. Prime adjacent vertical barriers such as playground and fitness equipment support legs, curbs, or other edging that will contact the surfacing system.

d. DO NOT APPLY PRIMER OVER COMPACTED STONE SUBSTRATE.

2. Poured Cushioning Layer: Spread evenly over compacted stone substrate and primed substrate to form a uniform layer applied at manufacturer's standard spreading rate in one continuous operation, with a minimum of cold joints.

a. Apply mixed binder / SBR at desired thickness 1/8-inch higher than measuring bar.

b. Using a steel pool trowel, even binder / SBR mixture. Be sure to continuously lubricate trowel with soapy water. Do not saturate surface with lubricant.

c. As the mixture is leveled, apply a downward pressure onto the surface so that the mixture compacts tightly.

d. Check surface to be level.

e. Allow to dry for ten (10) to twelve (12) hours, or until no indentations can be made by foot traffic.

3. Intercoat Primer: Over cured cushioning layer, apply primer at manufacturer's standard spreading rate.

4. Wearing Layer: Spread over primed base course to form a uniform layer applied at manufacturer's standard spreading rate in one continuous operation and, except where color changes, with no cold joints. Finish surface to produce manufacturer's standard wearing-surface texture.

   a. Apply mixed binder / granule at nominal 1/2-inch thickness.

   b. Using a steel pool trowel, spread even rubber / granule mixture. Be sure to continuously lubricate trowel with soapy water.

   c. As the mixture is leveled, apply a downward pressure onto the surface so that the mixture compacts tightly.

   d. Check surface to be level.

   e. Design: Where colored pattern is specified, place colored design material as soon as previously placed material is sufficiently cured, using primer specified by manufacturer.

      1) Cold joints must be cut and primed prior to installing a different color surface.

   f. **Allow to cure for a minimum of twenty-four (24) to forty-eight (48) hours prior to usage. At the end of minimum curing period, verify that the top surface is sufficiently dry and firm to allow foot traffic and use without damage to the surface. DO NOT ALLOW FOOT TRAFFICE OR USE OF THE SURFACE UNTIL IT IS SUFFICIENTLY CURED.**

5. Edge Treatment: As indicated on Drawings. Fully adhere edges to substrate with full coverage of substrate. Maintain fully cushioned thickness required to comply with performance requirements.

3.4 PROTECTION

A. It is the responsibility of the Contractor to provide security to protect the surface from foot traffic or vandalism during the forty-eight (48) cure period.

END OF SECTION 321816.13

SECTION 323100

FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:
   1. Mechanical screens at roof areas.

B. Principal Products:
   1. Chain link fencing.
   2. Fencing attachment to support structure.

C. Related Requirements:
   1. Section 018113: Sustainable design requirements.
   2. Section 018114: VOC limits and product emission requirements.
   3. Section 018119: Construction indoor air quality management.
   4. Section 055000: Metal fabrications.

1.2 ACTION SUBMITTALS

A. Product Data:
   1. Fence fabric.
   2. Posts.
   3. Fittings and hardware.

B. Shop Drawings:
   1. Plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.
   2. Elevations: Show panel configuration.

C. Samples:
   1. Fence Fabric: 12 by 12 inches long.

1.3 INFORMATIONAL SUBMITTALS

A. Delegated Design Submittals: Provide sealed calculations and shop drawings.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:
   1. Gate hardware.
   2. Gate operators.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Installers: Manufacturer trained and certified.

B. Mockups: Construct 10 foot length minimum size.
   1. Mockups Location: Field.

1.6 FIELD CONDITIONS

A. Existing Conditions: Verify field measurements before fabrication. Show field measurements on Shop Drawings.

1.7 WARRANTY

A. Manufacturer Warranty:
   1. Fences and Gates: Warrant against product, installation, and total system failure.
      a. Failure includes:
         1) Faulty operation of gate operator and controls.
         2) Deterioration of metals, metal finishes, and other materials beyond normal weathering.
      b. Warranty Period - Fabric: 30 years.

PART 2 - PRODUCTS

2.1 PERFORMANCE

A. Delegate design to manufacturer or fabricator licensed Professional Engineer.
   1. Chain link fencing infill in roof screening walls and ceiling.

B. Structural Design Criteria: See Structural Drawings.

C. Allowable Deflection:
   1. Chain Link Post and Rail Framing: 1/360 of span, maximum.

2.2 CHAIN-LINK FENCES AND GATES

A. Chain-Link Fences and Gates - General: Follow CLFMI Product Manual.

B. Chain-Link Fabric:
   1. Manufacturers:
      a. Ameristar Fence Products.
      b. Master-Halco, Inc.
      c. Merchants Metals.
   2. Steel Wire Fabric: 0.148 inch diameter wire, 1 inch diamond mesh.
      a. Zinc-Coated Fabric: ASTM A392 Class II, 2.0 oz./sq.ft.
   3. Selvage: Twisted top and bottom.

C. Fence Framing:
   1. Material: Round steel pipe .
   2. Post and Rails: ASTM F1083.
      a. Height: See Drawings.
      b. Line Posts: 1.9 inches diameter, minimum.
      c. End, Corner, and Pull Posts: 2.375 inches diameter, minimum.
      d. Top, Middle, and Bottom Rails: 1.66 inches diameter.
   3. Finish: ASTM F1083, Hot-dip galvanized.

D. Manual Swinging Gates: ASTM F900, single swing.
   1. Frames: Welded corners; match end post profile.
   2. Hardware: Hinges, latches, stops and keepers.
      a. Hinges: 180 degree outward.
   3. Fabric: Match adjoining fence.

E. Fittings: ASTM F626, materials and finish compatible with framing.
   1. Post caps.
   2. Rail and brace ends.
   3. Tension and brace bands.
   4. Tension bars.
   5. Truss rod assemblies.
   6. Barbed wire arms.
   7. Tie Wires, Clips, and Fasteners:
      a. Standard Straight, Preformed Hook or Pigtail Round Wire Ties: 0.148 inch metallic coated steel.
      b. Interlocking Preformed Flat Aluminum Band Ties.
   8. Hog rings.

2.3 MATERIALS

A. Steel and Iron.
   1. Plates, Shapes, and Bars: ASTM A36.
   2. Bars: ASTM A29 Grade 1010, hot-rolled.
   3. Tubing: ASTM A500.
   4. Steel Sheet: ASTM A653, Grade 33 Structural Quality, G90 galvanizing.
   5. Castings: Either gray or malleable iron.
      a. Gray Iron: ASTM A48, Class 30.
      b. Malleable Iron: ASTM A47.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Selected per AWS for metal being welded and structural requirements.

B. Concrete Fill: 3,000 psi concrete specified in Section 033000.

C. Grout: ASTM C1107, factory-packaged nonmetallic, shrinkage-resistant exterior use grout.

D. Separation Coating: Bituminous paint; SSPC-Paint 12.

PART 3 - EXECUTION

3.1 PREPARATION

A. Locate and mark position of posts. Space line posts equally at 10 foot maximum intervals or as shown on Drawings.

3.2 INSTALLATION

A. Chain-Link Fence Installation:
   1. Posts and Fabric: ASTM F567.
   2. Gates: Mount gates on gate posts. Install hinges, latches, catches, drop bolt retainers and locking clamps.
   3. Adjust gates for smooth unimpeded operation.
   4. Slat Inserts: Weave through chain link fabric.

3.3 FIELD QUALITY CONTROL

A. Field Tests and Inspections: Engage inspectors to perform tests and inspections and prepare reports. Allow inspectors access to work areas.
   1. Failed Test Retest Cost: Contractor responsibility.

B. Inspections: Follow CLFMI Field Inspection Guide.

C. Non-Conforming Work: Make corrections or replace, and re-test.

END OF SECTION

SECTION 323113

CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Chain-link fences.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM) Standards as listed in Specification.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product. Provide manufacturer's data showing installation and limitations in use.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
      a. Fence and gate posts, rails, and fittings.
      b. Chain-link fabric, reinforcements, and attachments.

B. Shop Drawings: For each type of fence and gate assembly.
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Include accessories and hardware

C. Certifications: Provide signed manufacturer's material certification that products are in compliance with current ASTM standards.

D. Samples for Verification: For each type of component with factory-applied finish, prepared on Samples of size indicated below:
   1. Polymer-Coated Components: In 6-inch lengths for components and on full-sized units for accessories.
   2. Fence fabric: 12-inch by 12-inch sample of each type of fence fabric.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer, testing agency and factory-authorized service representative.

B. Product Certificates: For each type of chain-link fence and gate.

C. Product Test Reports: For framework strength according to ASTM F1043, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Field quality-control reports.

E. Sample Warranty: For special warranty.

1.7 WARRANTY

A. All work under this section shall be warranted against defects in materials and workmanship for not less than five (5) years from the date of Substantial Completion.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: For each type of product required for the Work of this section, provide products from one source with resources to provide chain link fences and gates of consistent quality in appearance and physical properties.
   1. Manufacturer shall specialize in manufacturing chain link fence products with a minimum five (5) years of experience in successfully producing chain link fencing fabrications equivalent to that indicated for Project.

B. Installer Qualifications: Company with demonstrated successful experience installing similar projects and products in accordance with ASTM F567 and have at least five years demonstrated experience.

C. Coordinate Work with Work of other sections. Verify dimensions and Work of other trades which adjoin materials of this section before installing items specified.

D. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
   1. Include minimum 8-foot length of fence complying with requirements.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle materials and products in strict compliance with manufacturer's written instructions and industry standards.

B. Deliver materials to site in undamaged condition. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Store products indoors in manufacturer's original containers and packaging with labels clearly identifying product name and manufacturer.

C. Materials shall be stored in such a manner to ensure proper protection against damage, weather, vandalism and theft. Store materials off the ground to provide protection against oxidation caused by ground contact.

1.10 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of property lines, walls, curbs, ramps, sleeves, and other construction to which fence must fit or meet by actual field measurements before fabrications and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

PART 2 - PRODUCTS

2.1 CHAIN LINK FENCE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Northeast Fence & Iron Works, Inc.
   8451 Hegerman Street
   Philadelphia, PA 19136
   www.northeastfence.net

2. Master Halco.
   3010 Lyndon B Johnson Freeway, Suite 800
   Dallas, TX 75234
   www.masterhalco.com

3. Stephens Pipe and Steel, LLC.
   300 Streibeigh Lane,
   Montoursville, PA 17754

www.spsfence.com

4. Products from other qualified manufacturers having a minimum five (5) years' experience manufacturing chain link fencing may be accepted if approved by Landscape Architect in writing. Fencing submitted must meet specifications for design, size, gauge of metal parts and fabrication, and fence style and height.

2.2 CHAIN-LINK FENCE FABRIC

A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:
   1. Fabric Height: As shown on Drawings.
   2. Steel Wire for Fabric: 9 gauge (0.148 inch).
      a. Mesh Size: 2 inches.
      b. Polymer-Coated Fabric: ASTM F668, Class 2b over zinc -coated steel wire.
         1) Color: Black in accordance with ASTM F934.
   3. Selvage: Knuckled at both selvages.

2.3 FENCE FRAMEWORK

A. All material shall be new and products of recognized reputable manufacturers. Used, re-rolled, or re-galvanized materials will not be accepted.

B. Framework, including posts and rails, shall be standard weight, Schedule 40, hot dip galvanized round steel pipe complying with ASTM F1083. Comply with ASTM F1043, external and internal zinc coating Type A, consisting of not less than 1.8 oz/ft^2 zinc, and the following requirements.

   1. Fence Height: As indicated on Drawings.
   2. Terminal/Corner Posts: 2 7/8" O.D.
   3. Line Posts: 2 3/8" O.D.
   4. Rails and Braces: 1 5/8" O.D.
   5. Polymer (polyester) coating fused and adhered to the exterior zinc coating with minimum thickness of 3 mils per ASTM F1043.
      a. Color: Black in accordance with ASTM F934, unless otherwise approved by Owner.

2.4 TENSION WIRE

A. Polymer-Coated Steel Wire: 0.177-inch diameter, tension wire according to ASTM F1664, Class 2b over zinc-coated steel wire.
   1. Color: Black in accordance with ASTM F934.

2.5 FITTINGS

A. Provide fittings according to ASTM F626.

B. Post Caps: Provide for each post.

C. Rail and Brace Ends: For each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:
   1. Top Rail Sleeves: Hot-dip galvanized pressed steel complying with pressed-steel or round-steel tubing not less than 6 inches long.
   2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails to posts.

E. Tension and Brace Bands: Pressed steel.

F. Tension Bars: Steel, length not less than 2-inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.

G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.

H. Tie Wires, Clips, and Fasteners: According to ASTM F626.
   1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:
      a. Hot-Dip Galvanized Steel: 9-gauge 0.148-inch diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.

I. Finish:
   1. Polymer coated color fittings: In compliance with ASTM F626.
      a. Color: Black in accordance with ASTM F934, unless otherwise approved by Owner.

2.6 CONCRETE

A. Concrete for post footings shall be normal weight concrete with not less that 3,500 psi at 28 days, 3-inch slump, and 1-inch maximum aggregate size.

2.7 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements.
   1. Do not begin installation before final grading is completed unless otherwise permitted by Landscape Architect.
   2. Verify layout information for chain link fences and gates shown on Shop Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 CHAIN-LINK FENCE INSTALLATION

A. Install chain-link fencing according to ASTM F567 and more stringent requirements specified.
   1. Install fencing on established boundary lines inside property line.

B. Post Setting: Form or core drill holes not less than 3/4 inch larger than outside diagonal dimension of post.
   1. Set posts plumb in concrete footings in accordance with ASTM F567. Minimum footing depth shall be per manufacturer's recommendations, but no less than 3 feet. Minimum footing diameter shall be per manufacturer's recommendations, but no less than 12-inches. For swing gate posts, the foundation diameter shall be not less than 18-inches. Top of concrete footing shall be as indicated on Drawings, crowned to shed water away from posts.
   2. Concrete Fill: Place concrete around posts to dimensions indicated on Drawings and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
   3. Posts set in grouted core drilled footers are permissible only if shown by Engineer's analysis to be sufficient in strength for the application.

a. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink grout, mixed and placed to comply with grout manufacturer's written instructions. Finish and slope top surface of grout to drain water away from post

C. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more. For runs exceeding 500 feet, space pull posts an equal distance between corner or end posts.

D. Line Posts: Space line posts uniformly as shown on Drawings.

E. Post Bracing and Intermediate Rails: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.

1. Locate horizontal braces at midheight of fabric 72 inches or higher, on fences with top rail, and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

F. Tension Wire: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24-inches o.c. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:

1. Extended along top and bottom of fence fabric. Install top tension wire through post cap loops. Install bottom tension wire within 6-inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.

G. Top Rail: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

H. Intermediate and Bottom Rails: Secure to posts with fittings.

I. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

J. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts, with tension bands spaced not more than 15-inches o.c.

K. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach

other end to chain-link fabric according to ASTM F626. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts at 12-inches o.c. and to braces at 24-inches o.c.

3.4 ADJUSTING

A. Touch up, repair, and replace damaged products before Substantial Completion.

3.5 CLEANING

A. Contractor shall clean jobsite and legally dispose of excess materials.

END OF SECTION 323113

SECTION 323300

SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Benches.
   2. Tables.
   3. Receptacles.
   4. Bike Racks.
   5. Bollards.
   6. Drinking Fountain.

B. Related Requirements:
   1. Section 312000 "Earth Moving" for excavation for installing concrete footings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified.

C. Product Schedule: For site furnishings, use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For site furnishings to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain site furnishings from the following approved manufacturers:

1. DuMor, Inc.
   P.O. Box 142, Mifflintown, PA 17059
   Phone: 1-800-598-4018
   www.dumor.com

   a. Local Representative:
      General Recreation, Inc.
      P.O. Box 440, Newtown Square, PA 19073
      Phone: 1-800-726-4793

2. Elkay
   Phone: 1-800-476-4106
   www.elkay.com

2.2 SITE FURNISHINGS

A. See Site Furnishings Schedule on Drawings for product information.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.

B. Verify that substrates are stable and capable of supporting the weight of items covered under this section.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

C. Install site furnishings level, plumb, true, and securely anchored positioned at locations indicated on Drawings.

D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.

E. Install in conformance to applicable ADA guidelines and Owner's established accessibility policies.

END OF SECTION 323300

SECTION 329113

SOIL PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes planting soils, specified according to performance requirements of the mixes, including Structural Soil.

B. Related Requirements:
   1. Section 329200 Turf and Grasses for placing planting soil for turf and grasses.
   2. Section 329300 Plants for placing planting soil for plantings.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM) Standards as listed in Specification.

1.4 DEFINITIONS

A. AAPFCO: Association of American Plant Food Control Officials.

B. Amendment: Product added to soil to improve physical qualities. Amendments are classified as Inorganic, Organic (Compost), and Fertilizers.

C. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.

D. Bulk Density: An indicator of soil compaction calculated as the dry weight of soil by its volume typically expressed in g/cm^3.

E. CEC: Cation exchange capacity.

F. Coarse Sand: Sharp natural or manufactured fine aggregate.

G. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth. Compost shall be weed-free.

H. Debris: Elements including, but not limited to, concrete, concrete masonry, wood, excavated rock and rock fragments, rubble, overburden soils, abandoned utility structures, trash, refuse, and litter.

I. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.

J. Fertilizer: Amendment used for the purpose of adjusting soil nutrient composition and balance.

K. Imported Soil: Soil that is transported to Project site for use. Imported soil shall be weed-free.

L. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.

M. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.

N. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."

O. Planting Soil: Imported soil or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. Planting soil shall be weed-free.

P. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.

Q. Scarify: Loosening and roughening the surface of soil and subsoil prior to adding additional soil on top.

R. SSSA: Soil Science Society of America.

S. STA: Seal of Testing Assurance, as issued by United States Composting Council.

T. Structural Soil: Engineered soil medium able to be compacted for pavement design, loading requirements and installation yet permits plant root growth.

U. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

V. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

W. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.

X. USCC: U.S. Composting Council.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at the Project Site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include manufacturer recommendations for application and use.
   2. Include test data substantiating that products comply with requirements in this Section.
   3. Include sieve analyses for aggregate materials.
   4. Material Certificates: For each type of imported soil and soil amendment and fertilizer before delivery to the site, according to the following:
      a. Manufacturer's qualified testing agency's certified analysis of standard products.
      b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.
      c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.
      d. Compost: A copy of the producer’s STA certification as issued by the USCC.

B. Soil(s) and Compost products must be tested by an independent soil testing laboratory. Laboratory must meet requirements listed in Section 1.8. Laboratory test data must be dated within 6 months of delivery to Project Site.
   1. Test reports shall be provided to Landscape Architect no less than two (2) weeks prior to Project Installation.

C. Samples: For each bulk-supplied material, including Soil and Compost, a one (1) gallon volume of each in resealable plastic bags labeled with content, source, and date obtained. Each Sample shall be typical of material to be furnished and provide an accurate representation of composition, color, and texture.
   1. Samples are required to be provided to Landscape Architect no less than two (2) weeks prior to Project Installation.

D. Structural Soil:

1. Basis of Design Product: Structural Soil shall be CU-Structural Soil®, or approved equal, based on specific site requirements in combination with testing regiment limits defined for Structural Soil.
   a. CU-Structural Soil® CU-Structural Soil is a proprietary material patented by Cornell University (US Patent #5,849,069) and marketed under the registered trademark, CU-Structural Soil. Only licensed companies are authorized to produce this material, meeting the specifications described in this text. For a list of licensed CU-Structural Soil producers, call AMEREQ, INC. at 800-832-8788.
2. At least thirty (30) days prior to ordering materials, the installing contractor shall submit to the Landscape Architect representative samples, certificates, manufacturer's literature and test results for materials specified below. No materials shall be ordered until the required samples, certificates, manufacturer's literature, producer's current license and test results have been reviewed and approved by the Landscape Architect. The Landscape Architect reserves the right to reject any material that does not meet CU-Structural Soil specifications, or specifications for approved equal. Delivered materials shall closely match the approved samples.
3. Submit from licensed producer, $^1/_2$ cubic foot representative sample of clay loam, one cubic foot representative sample of crushed stone, and one cubic foot representative sample of CU-Structural Soil mix for approval. In the event of multiple source fields for clay loam, submit a minimum of one set of samples per source field or stockpile. The samples of all clay loam, crushed stone, and CU-Structural Soil shall be submitted to the engineer as a record of the soil color and texture.
4. Submit soil test analysis reports for sample of clay loam from an independent soil-testing laboratory. The testing laboratory for particle size and chemical analysis may include a public agricultural extension service agency.
   a. Submit a mechanical analysis of the clay loam sample and particle size analysis including the following gradient of mineral content:

USDA Designation	**Size in millimeters (mm)**
Gravel	+2mm
Sand	0.05 – 2mm
Silt	0.002 – 0.05mm
Clay	minus 0.002mm

Sieve analysis shall be performed and compared to USDA Soil Classification System.

Sieve analysis shall be done by a combined hydrometer and wet sieving using sodium hexametaphosphate as a dispersant in compliance with ASTM D422 after destruction of organic matter by hydrogen peroxide.

   b. Submit a chemical analysis, performed in accordance with current AOAC Standards, including the following:

1) pH and buffer pH.
2) Percent organic matter as determined by the loss of ignition of oven dried samples. Test samples shall be oven dried to a constant weight at a temperature of 230 degrees F, plus or minus 9 degrees.
3) Analysis for nutrient levels by parts per million.
4) Soluble salt by electrical conductivity of a 1:2 soil/water sample measured in Millimho per cm.
5) Cation Exchange Capacity (CEC).
6) Carbon/Nitrogen Ratio.

5. Submit one cubic foot sample of crushed stone which will be used in production of CU-Structural Soil.
   a. Provide particle size analysis:

USDA Designation	**Size in millimeters (mm)**
3”	+76mm
2-1/2”	63-76mm
2”	50-63mm
1-1/2”	37-50mm
1”	25-37mm
3/4"	19-25mm
Fine Gravel	2-19mm

   b. Provide the manufacturers analysis of the loose and rodded unit weight.
   c. Losses from LA Abrasion tests- not to exceed 40%.
   d. Minimum 90% with 2 or more fractured faces.
   e. Percent pore space analysis.
6. At the Landscape Architect’s discretion, the sample of CU-Structural Soil may be tested for the following:
   a. Compaction in accordance with ASTM D698 / AASHTO T99.
   b. California Bearing Ratio in accordance with ASTM D1883: soaked CBR shall equal or exceed a value of 50.
   c. Measured dry-weight percentage of stone in the mixture.
7. The approved CU-Structural Soil sample shall be the standard.
8. Any deviation from the specified crushed stone and clay loam specifications for CU-Structural Soil shall be approved by Amereq, Inc.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For each testing agency.

B. Preconstruction Test Reports: For preconstruction soil analyses specified in Preconstruction Testing section.

C. Field quality-control reports.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.

1. Laboratories: Subject to compliance with requirements, qualified independent soil testing services include, but are not limited to:

a. A. McNitt and SerenSoil Testing, LLC
1338 Deerfield Drive, State College, PA 16803
Phone: 610-360-5985
Email: andy@turfsoiltesting.com; tom@turfsoiltesting.com
www.turfsoiltesting.com

b. Penn State College of Agricultural Sciences, Agricultural Analytical Services Lab
111 Ag Analytical Services Lab, University Park, PA 16802
Phone: 814-863-0841
Email: aaslab@psu.edu
www.agsci.psu.edu

c. Rutgers Soil Testing Laboratory
Rutgers, The State University of New Jersey
57 US Highway 1, New Brunswick, NJ 08901-8554
Phone: 848-932-9295
Email: soiltest@njaes.rutgers.edu
https://njaes.rutgers.edu/soil-testing-lab/

2. Multiple Laboratories: At Contractor's option, work may be divided among qualified testing laboratories specializing in physical testing, chemical testing, and fertility testing.
3. All soil testing shall be at the expense of the Contractor.

B. Structural Soil:
1. Qualifications for Supplier and Installer.
a. Supplier shall provide certification that structural soil meets or exceeds requirements of CU-Structural Soil.
b. The work of this section should be performed by a contracting firm which has a minimum of five years' experience. Proof of this experience shall be submitted.

1.9 PRE-CONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction soil analyses on existing on-site soil and imported soil.

B. Sample Collection and Labeling: Have samples taken and labeled by Contractor under the direction of the testing agency.
   1. Coordinate sample collection schedule with Landscape Architect.
   2. Number and Location of Samples: Minimum number of representative soil samples to be determined by testing agency for each soil to be used or amended for landscaping purposes.
   3. Procedures and Depth of Samples: To be determined by testing agency.
   4. Labeling: Label each sample with the date, location keyed to a site plan or other location system, visible soil condition, and sampling depth.

C. Physical Testing:
   1. Soil Texture: Soil-particle, size-distribution analysis by the following methods according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods":
      a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.
      b. Hydrometer Method: Report percentages of sand, silt, and clay.
   2. Bulk Density: Analysis according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
   3. Total Porosity: Calculate using particle density and bulk density according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
   4. Water Retention: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
   5. Saturated Hydraulic Conductivity: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods"; at 85 percent compaction according to ASTM D698 (Standard Proctor).

D. Chemical Testing:
   1. CEC: Analysis by sodium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
   2. Clay Mineralogy: Analysis and estimated percentage of expandable clay minerals using CEC by ammonium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
   3. Metals Hazardous to Human Health: Test for presence and quantities of RCRA metals including aluminum, arsenic, barium, copper, cadmium, chromium, cobalt, lead, lithium, and vanadium. If RCRA metals are present, include recommendations for corrective action.
   4. Phytotoxicity: Test for plant-available concentrations of phytotoxic minerals including aluminum, arsenic, barium, cadmium, chlorides, chromium, cobalt, copper, lead, lithium, mercury, nickel, selenium, silver, sodium, strontium, tin, titanium, vanadium, and zinc.

E. Fertility Testing: Soil fertility analysis according to standard laboratory protocol of SSSA NAPT NEC-67, including the following:
   1. Percentage of organic matter.
   2. CEC, calcium percent of CEC, and magnesium percent of CEC.
   3. Soil reaction (acidity/alkalinity pH value).
   4. Buffered acidity or alkalinity.
   5. Nitrogen ppm.
   6. Phosphorous ppm.
   7. Potassium ppm.
   8. Manganese ppm.
   9. Manganese-availability ppm.
   10. Zinc ppm.
   11. Zinc availability ppm.
   12. Copper ppm.
   13. Sodium ppm**.**
   14. Soluble-salts ppm.
   15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
   16. Other deleterious materials, including their characteristics and content of each.

F. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3-Chemical Methods."

G. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.
   1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1,000 sq. ft. for 6-inch depth of soil.
   2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight per 1000 sq. ft. for 6-inch depth of soil.

H. Compost Testing: The Compost supplier shall test all Compost products within 90 calendar days prior to the application. Samples shall be collected using STA sample collection protocol.
   1. Sample collection protocol can be obtained from:

      United States Composting Council (USCC)
      4250 Veterans Memorial Highway, Suite 275, Holbrook, NY 11741
      Phone: 631-737-4931
      www.compostingcouncil.org

   2. The sample shall be sent to an independent STA Program approved laboratory. The compost supplier shall pay for the test. A copy of the approved independent STA Program

laboratory test report shall be submitted to the Landscape Architect prior to initial application of the Compost.

1.10 POST-CONSTRUCTION TESTING

A. Post-Construction Testing Service: Engage a qualified testing agency to perform post-construction analyses on amended planting soil with compost incorporated.
   1. Notify Landscape Architect seven (7) days in advance of the dates and times when laboratory samples will be taken.

B. Post-Construction Soil Analyses: For each amended soil, perform testing on soil samples and furnish soil analysis and a written report by a qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.
   1. Have testing agency identify and label samples and test reports according to sample collection and labeling requirements.

C. Fertility Testing:
   1. Percentage of organic matter.
      a. Organic matter content must be 4% minimum.
   2. CEC, calcium percent of CEC, and magnesium percent of CEC
   3. Soil reaction (acidity / alkalinity pH value).
      a. pH levels must be between 5.5 and 7.0. Lower pH by using elemental sulfur product. Peat moss or copper sulfate may not be used to lower pH.
   4. Buffered acidity or alkalinity.
   5. Nitrogen ppm.
   6. Phosphorus ppm.
   7. Potassium ppm.
   8. Manganese ppm.
   9. Manganese-availability ppm.
   10. Zinc ppm.
   11. Zinc-availability ppm.
   12. Copper ppm.
   13. Sodium ppm.
   14. Soluble-salts ppm.
      a. Soluble-salts measurement must be less or equal to 2 mmho/cm.
   15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
   16. Other deleterious materials, including their characteristics and content of each.
   17. Percolation test to ensure adequate drainage and proper mixing of compost.

D. Recommendations: The analysis tests shall show recommendations for soil additives or fertilizers to correct soil mixes' deficiencies as necessary.

E. Deficiencies: Nutrient deficiencies shall be corrected at time of installation.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.

B. Bulk Materials:
   1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
   2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
   3. Do not move or handle materials when they are wet or frozen.
   4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

C. Structural Soil:
   1. Delivered CU-Structural Soil shall be at or near optimum compaction moisture content as determined by AASHTO T 99 (ASTM D 698) and should not be placed in frozen, wet or muddy sites.
   2. Protect CU-Structural Soil from exposure to excess water and from erosion at all times. Do not store CU-Structural Soil unprotected. Do not allow excess water to enter site prior to compaction. If water is introduced into the CU-Structural Soil after grading, allow water to drain to optimum compaction moisture content.
   3. All areas to receive CU-Structural Soil shall be inspected by the installing contractor before starting work and all defects such as incorrect grading, compaction, and inadequate drainage shall be reported to the engineer prior to beginning this work.

PART 2 - PRODUCTS

2.1 PLANTING SOIL

A. Planting Soil: Existing, on-site surface soil with the duff layer, if any, retained; and stockpiled on site and modified to produce viable planting soil, or imported, naturally formed or manufactured soil from off-site sources consisting of fertile, friable, naturally fine sandy loam, (USDA classification for soil consisting of less than 20 percent clay, 10-40 percent silt and 45-75 percent fine sand, particle 0.10-0.25 mm.) pH range of 6.5 to 7, 4-10 percent organic material, and with sufficient structure to give good tilth and aeration
   1. Using preconstruction soil analyses and materials specified in other articles of this Section, amend existing, on-site surface soil to become planting soil complying with the requirements.
   2. For off-site sources, take imported, unamended soil from sources that are naturally well-drained sites where topsoil occurs at least 4 inches deep (not from agricultural land, bogs,

or marshes) and that do not contain undesirable organisms or disease-causing plant pathogens. Imported soil shall not include:

a. Soils defined regionally by the Natural Resources Conservation Service web soil survey as prime farmland, unique farmland, or farmland of statewide or local importance.
b. Soils from other greenfield sites.
c. Sphagnum peat moss.

3. Soil shall not contain any noxious weeds or invasive plants, including, but not limited to, quackgrass, Johnsongrass, Japanese hops, mile-a-minute, vetch, artemsia/mugwort, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass.
   a. Soil shall be weed and weed-seed free. Contractor is responsible for weed maintenance activities as described in maintenance requirements sections of Section 329200 Turf and Grasses and Section 329300 Plants.
4. Planting Soil shall not include any of the following as these materials are unacceptable and unsuitable for plant growth:
   a. Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
   b. Stones, roots, plants, sod, clay lumps, and pockets of coarse sand 1-inch or larger.
5. Amend existing or imported soil with materials specified in other articles of this Section to become planting soil complying with the following requirements:
   a. Particle Size Distribution by Separates:
      - Fine Sand: 40% to 75% percent by dry weight.
      - Silt: 10% to 40% percent by dry weight.
      - Clay: Less than 20% percent by dry weight.
   b. Percentage of Organic Matter: Minimum 4% by volume.
   c. Soil Reaction: pH of 5.5 to 7.5.
   d. CEC of Clay Fraction: Maximum 15 meq/100 mL at pH of 7.0.
   e. Soluble-Salt Content: 2 dS/m or less, measured by Electrical Conductivity (EC).
   f. RCRA Metals: Below maximum limits established by the EPA.
   g. Phytotoxicity: Below phytotoxicity limits established by SSSA.
6. Acceptable ranges for base saturation percentages are:

Element	**Desired % Range**	**Ideal %**
Ca	60-70%	68%
Mg	10-20%	12%
K	2-5%	5%
Na	0.5-3%	0.75%
Other bases (variable)	2-4%	3.75%
Exchangeable Hydrogen	10-15%	10.5%

B. Topsoil: ASTM D5268, fertile, friable, naturally fine sandy loam, (USDA classification for soil consisting of less than 20 percent clay, 10-40 percent silt and 45-75 percent fine sand, particle 0.10-0.25 mm.) pH range of 5.5 to 7.5, 4-10 percent organic material.
   1. Topsoil Source: Reuse surface soil stockpiled on site where available. Do not stockpile Topsoil more than 6-feet high. Verify stability of stockpiled surface to produce Topsoil. Clean surface soil of roots, plants, sod, stone, clay lumps, and other extraneous materials harmful to plant growth.
   2. Unacceptable Properties: Topsoil shall be cleaned of the following unacceptable materials:
      a. Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, litter or other extraneous materials that are harmful to plant growth.
      b. Stones 1-inch or larger in any dimension, noxious seeds, sticks, brush, roots, plants, sod, clay lumps, and pockets of coarse sand.
      c. Topsoil shall not contain any noxious weeds or invasive plants, including, but not limited to, quackgrass, Johnsongrass, Japanese hops, mile-a-minute, vetch, artemsia/mugwort, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass.
         1) Soil shall be weed and weed-seed -free. Contractor is responsible for weeding as described in maintenance requirements sections of Section 329200 Turf and Grasses and Section 329300 Plants.

2.2 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
   1. Class: T, with a minimum of 99 percent passing through a No. 8 sieve and a minimum of 75 percent passing through a No. 60 sieve.

B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 sieve and a maximum of 10 percent passing through a No. 40 sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Perlite: Horticultural perlite, soil amendment grade.

E. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 sieve.

F. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C33/C33M.

G. Diatomaceous Earth: Horticultural diatomaceous earth, soil amendment grade.

2.3 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's STA and as follows:
   1. Feedstock: Compost may be derived from: agricultural, food, or industrial residuals; biosolids (treated sewage sludge); yard trimmings; source-separated or mixed solid waste. The product shall contain no substances toxic to plants and shall be reasonably free (< 1% by dry weight) of man-made foreign matter. The compost will possess no objectionable odors and shall not resemble the raw material from which it was derived. Do not use compost that has received the addition of liming agents or ash by-products. The product shall be certified through the USCC's STA Program.
   2. Reaction: pH of 6.0 to 8.0.
   3. Soluble-Salt Concentration: Less than 5 dS/m.
   4. Moisture Content: 30 to 65 percent by weight.
   5. Particle Size: 100 percent passing through a 1/2-inch sieve.
   6. Compost not conforming to the above requirements or taken from a source other than those tested and accepted shall be immediately removed from the project and replaced at no cost to the Owner.

2.4 FERTILIZERS

A. To be coordinated with Planting Amendments approved by Landscape Architect, and as required by soil analysis and recommendations.

B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
   1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

2.5 SUPPLIERS

A. Subject to compliance with requirements, available suppliers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Laurel Valley Soils
      705 Penn Green Road, Landenberg, PA 19350-9204
      Phone: 610-268-5555
      Email: info@laurelvalleysoils.com
      www.laurelvalleysoils.com

   2. Organic Mechanics Soil Company, LLC
      P.O. Box 272, Modena, PA 19358
      Phone: 610-380-4598
      Email: mark@organicmechanicsoil.com; eric@organicmechanicsoil.com
      www.organicmechanicsoil.com

2.6 CU-STRUCTURAL SOIL

A. Basis of Design Product: Structural Soil shall be CU-Structural Soil, or approved equal based on specific site requirements in combination with testing regiment limits defined for Structural Soil.
   1. CU-Structural Soil is a proprietary material patented by Cornell University (US Patent #5,849,069) and marketed under the registered trademark, CU-Structural Soil. Only licensed companies are authorized to produce this material, meeting the specifications described in this text. For a list of licensed CU-Structural Soil producers, call AMEREQ, INC. at 800-832-8788.

B. Clay Loam
   1. Soil shall be a "loam" with a minimum clay content of 20% or a "clay loam" based on the "USDA classification system" as determined by mechanical analysis (ASTM D-422) and it shall be of uniform composition, without admixture of subsoil. It shall be free of stones, lumps, plants and their roots, debris and other extraneous matter. It shall not contain toxic substances harmful to plant growth. Clay loam shall contain not less than 2% or more than 5% organic matter as determined by the loss on ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230 degrees F., plus or minus 9 degrees.
   2. Mechanical analysis for the loam or clay loam shall be as follows:

Textural Class	**% of Total Weight**
Gravel	Less than 5%
Sand	20-45%
Silt	20-50%
Clay	20-40%

   3. Chemical analysis: Meet, or be amended to meet the following criteria:
      a. pH between 5.5 to 6.5.
      b. Percent organic matter 2% - 5% by dry weight.
      c. Adequate nutrient levels.
      d. Soluble salt less than 1.0 mmho/cm.
      e. Cation Exchange Capacity (CEC) greater than 10.
      f. Carbon/Nitrogen ratio less than 33:1.
   4. Loam or clay loam shall not come from USDA - classified prime farmland.

C. Fertilizer
   1. Should nutrient analysis suggest that the loam or clay loam need additional nutrients, it shall be amended in accordance with Soil Analysis and for the specific plants specified on the Plant Schedule.

D. Sulfur
   1. Sulfur shall be a commercial granular, 96% pure sulfur, with material and analysis appearing on the labeled container.
   2. Sulfur used to lower pH shall be a ferrous sulfate formulation.

3. Application rates shall be dependent on soil test results.

E. Lime
1. Agricultural lime containing a minimum of 85% carbonates.
2. Application rates shall be dependent on soil test results.

F. Crushed Stone
1. The size of the crushed stone shall be 3/4-inches to 1-1/2-inches allowing for 5% – 10% being greater than 1.5 inches, and 5% – 10% less than 0.75 inches.
2. Acceptable aggregate dimensions will not exceed 2.5:1.0 for any two dimensions.
3. Minimum 90% with two or more fractured faces.
4. Results of Aggregate Soundness Loss test shall not exceed 18%.
5. Losses from LA Abrasion tests shall not exceed 40%.

G. Hydrogel
1. Hydrogel shall be a coated potassium propenoate-propenamide copolymer.
    a. Basis of Design Product: (Gelscape® Hydrogel Tackifier,) as manufactured by Amereq, Inc. 800-832-8788 or approved equal..
        1) Non-toxic (FHSA standard), non-phytotoxic.
        2) 7-7.5 pH

H. Water
1. The installing contractor shall be responsible to furnish his own supply of water (if needed) free of impurities, to the site.

I. Composition
1. A uniformly blended urban tree mixture of crushed stone, clay loam and Gelscape® Hydrogel Tackifier, as produced by an Amereq-licensed company or approved equal, mixed in the following proportion:

Material	**Unit of Weight**
Specified Crushed Stone	100 units dry weight
Specified Clay Loam	20-25 units (to achieve min. CBR of 50)
Gelscape® Hydrogel Tackifier or approved equal	0.035 units dry weight
Moisture	ASTM D698 / AASHTO T-99 optimum moisture

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate placing of planting soil and fertilizers with requirements in this Section and to requirements of other Specification sections.

B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.

C. Proceed with placement only after unsatisfactory conditions have been corrected.

D. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff of airborne dust to adjacent properties and walkways.

3.2 PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

A. General: Apply and mix unamended soil with amendments on-site to produce required planting soil, or apply manufactured soil on site in its final, blended condition. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Subgrade Preparation: Till subgrade to a minimum depth of 4-inches. Remove stones larger than 1-1/2-inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
   1. Apply, add soil amendments, and mix approximately half the thickness of unamended soil over prepared, loosened subgrade according to "Mixing" Paragraph below. Mix thoroughly into top 2-inches of subgrade. Spread remainder of planting soil.

C. Mixing: If amending soil on site, spread unamended soil to total depth indicated on Drawings, but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
   1. Amendments: Apply soil amendments and fertilizer, if required, evenly on surface, and thoroughly blend them with unamended soil to produce planting soil.
      a. Mix lime and sulfur with dry soil before mixing fertilizer.
      b. Mix fertilizer with planting soil no more than seven days before planting.
   2. Lifts: Apply and mix unamended soil and amendments in lifts not exceeding 8-inches in loose depth for material compacted by compaction equipment, and not more than 4-inches in loose depth for material compacted by hand-operated tampers.

D. Compaction: Compact each blended lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D698.

E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.3 PLACING STRUCTURAL SOIL OVER EXPOSED SUBGRADE

A. Testing:
   1. All CU-Structural Soil mixing shall be performed at the licensed producer's yard using appropriate soil measuring, mixing and shredding equipment of sufficient capacity and

capability to assure proper quality control and consistent mix ratios. No mixing of CU-Structural Soil at the project site shall be permitted.

2. Maintain adequate moisture content during the mixing process. Soils and mix components shall easily shred and break down without clumping. Soil clods shall easily break down into a fine crumbly texture. Soils shall not be overly wet or dry. The licensed producer shall measure and monitor the amount of soil moisture at the mixing site periodically during the mixing process.
3. Raw materials shall be mixed off-site, only at the licensed producer's facility, on a flat asphalt or concrete paved surface to avoid soil contamination.
4. Should the independent laboratory test results of the clay loam reveal a need to amend it, to meet specifications, the amending materials should be added to the clay loam following the rates and recommendations provided by the Soil Analysis and for the specific plants specified on the Plant Schedule.

B. Underground Utilities and Subsurface Conditions
   1. The installing contractor shall notify the Landscape Architect of any subsurface conditions which will affect the contractor's ability to install the CU-Structural Soil.
   2. The installing contractor shall locate and confirm the location of all underground utility lines and structures prior to the start of any excavation.
   3. The installing contractor shall repair any underground utilities or foundations damaged during the progress of this work.

C. Site Preparation
   1. Do not proceed with the installation of the CU-Structural Soil material until all walls, curb footings and utility work in the area have been installed. For site elements dependent on CU-Structural Soil® for foundation support, postpone installation of such elements until immediately after the installation of CU-Structural Soil.
   2. Install subsurface drain lines as shown on the plan drawings prior to installation of CU-Structural Soil material.
   3. Excavate and compact the proposed subgrade to depths, slopes and widths as shown on the drawings. Maintain all required angles of repose of the adjacent materials as shown on the drawings. Do not over excavate compacted subgrades of adjacent pavement or structures.
   4. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope parallel to the finished grade and/or toward the subsurface drain lines as shown on the drawings.
   5. Clear the excavation of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete washout silts or other material harmful to plants have been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Fill any over excavation with approved fill and compact to the required subgrade compaction.
   6. Do not proceed with the installation of CU-Structural Soil until all utility work in the area has been installed. All subsurface drainage systems shall be operational prior to installation of CU-Structural Soil.

7. Protect adjacent walls, walks and utilities from damage. Use 1/2-inch plywood and/or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.
    a. Clean up all trash and any soil or dirt spilled on any paved surface at the end of each working day.
    b. Any damage to the paving or architectural work caused by the installing contractor shall be repaired, as directed by the Landscape Architect.
8. Maintain all silt and sediment control devices required by applicable regulations.
9. Provide adequate methods to assure that trucks and other equipment do not track soil from the site onto adjacent property and the public right of way.

D. Installation of CU-Structural Soil Material
1. Install CU-Structural Soil in 6-inch lifts and compact each lift.
2. Compact all materials to at least 95% Proctor Density from a standard compaction curve AASHTO T 99 (ASTM D 698). No compaction shall occur when moisture content exceeds maximum as listed herein. Delay compaction if moisture content exceeds maximum allowable and protect CU-Structural Soil during delays in compaction with plastic or plywood as directed by the Landscape Architect.
3. Bring CU-Structural Soil to finished grades as shown on the drawings. Immediately protect the CU-Structural Soil from contamination by toxic materials, trash, debris, water containing cement, clay, silt or materials that will alter the particle size distribution of the mix with plastic or plywood as directed by the Landscape Architect.
4. The Landscape Architect may periodically check the material being delivered, prior to installation for color and texture consistency with the approved sample provided by the installing contractor as part of the submittal for CU-Structural Soil. If the Landscape Architect determines that the delivered CU-Structural Soil varies significantly from the approved samples, the Landscape Architect shall contact the licensed producer.
5. Contractor shall maintain weight tickets showing source of material. Landscape Architect may review at its discretion that the delivered structural soil was produced by the approved CU-Structural Soil licensee by inspecting weight tickets showing source of material. If tickets are not provided or installed soil is found to be non-compliant, it shall be removed by the Contractor and replaced with approved soil material at no additional cost to School District of Philadelphia.
6. CU-Structural Soil should not be stockpiled long-term. Any CU-Structural Soil not installed immediately should be protected by a tarp or other waterproof covering.

E. Fine Grading
1. After the initial placement and rough grading of the SCU-Structural Soil but prior to the start of fine grading, the installing contractor shall request review of the rough grading by the Landscape Architect. The installing contractor shall set sufficient grade stakes for checking the finished grades.
2. Adjust the finish grades to meet field conditions as directed. Provide smooth transitions between slopes of different gradients and direction. Fill all dips with CU-Structural Soil and remove any bumps in the overall plane of the slope.

a. The tolerance for dips and bumps in CU-Structural Soil areas shall be a 3-inch maximum deviation from the Drawings.

3. All other fine grading shall be inspected and approved by the Landscape Architect prior to the installation of other items to be placed on the CU-Structural Soil.

F. Acceptance Standards

1. The Landscape Architect will inspect the work upon the request of the installing contractor. Request for inspection shall be received by the Landscape Architect at least 10 days before the anticipated date of inspection.

G. Clean Up

1. Upon completion of the CU-Structural Soil installation operations, clean areas within the contract limits. Remove all excess fills, soils and mix stockpiles and legally dispose of all waste materials, trash and debris. Remove all tools and equipment and provide a clean, clear site. Sweep, do not wash, all paving and other exposed surfaces of dirt and mud until the paving has been installed over the CU-Structural Soil material. Do no washing until finished materials covering CU-Structural Soil material are in place.

3.4 PROTECTION

A. Protection Zone: Identify protection zones as indicated on Drawings.

B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Vehicle traffic.
4. Foot traffic.
5. Erection of sheds or structures.
6. Impoundment of water.
7. Excavation or other digging unless otherwise indicated.

C. If planting soil or subgrade is over-compacted, disturbed, contaminated by foreign or deleterious materials or liquids, or has weeds present, remove the planting soil and contamination; restore the subgrade as directed by Landscape Architect and replace contaminated planting soil with new planting soil.

3.5 CLEANING

A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.

B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.
   1. Legally dispose of excess subsoil and unsuitable materials off-site.

END OF SECTION 329113

SECTION 329200

TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Seeding.
   2. Sodding.
   3. Turf renovation.
   4. Erosion-control materials.

B. Related Requirements:
   1. Section 329113 Soil Preparation for information regarding planting soils.
   2. Section 329300 Plants for trees, shrubs, ground covers, and other plants.

1.3 REFERENCES

A. Association of Official Seed Analysts (AOSA) “Rules for Testing Seeds.”

B. Turfgrass Producer’s International (TPI) “Guideline Specifications to Turfgrass Sodding.”

1.4 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Invasive Plant/Species: Plant that is non-native to the ecosystem under consideration and whose presence causes or is likely to cause environmental, economic, or human harm.

C. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

D. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

E. Planting Soil: Existing, on-site soil; imported soil or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 Soil Preparation and drawing designations for planting soils.

F. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. At conference, Landscape Contractor and General Contractor shall review Philadelphia Parks & Recreation's current edition of integrated pest management plan.

1.6 ACTION SUBMITTALS

A. Planting & Installation Schedule: Submit proposed planting and installation schedule, indicating dates for completion of work items, soil testing, and installation of each type of turfgrass during normal seasons for such work in area of site.
   1. Correlate Plant & Installation Schedule with specified maintenance periods to provide maintenance from date of Substantial Completion. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.
   2. Submit letter notifying General Contractor and Landscape Architect of completion of planting work and requesting inspection to determine acceptability for Substantial Completion and beginning of Warranty Period.
   3. Submit letter to General Contractor and Landscape Architect requesting a final inspection of planting work for Final Acceptance at end of Warranty Period.

B. Turf and/or Plant Maintenance Schedule: Depending on Project conditions, submit proposed turf maintenance (and/or plant maintenance for seeded non-turf areas), indicating frequency of maintenance visits and scheduled maintenance activities to occur during visits. See Part 3 for more information on required Turf/Plant Maintenance activities.
   1. Turf/Plant maintenance schedule shall be specific to distinct planting conditions on site. Examples of planting conditions are project specific and may include, but are not limited to:
      a. Seeded Turfgrass areas.
      b. Sodded Turfgrass areas.
   2. At a minimum, Turf/Plant Maintenance Schedule shall include:
      a. Weekly maintenance visits and description of maintenance activities for each planting area.

b. Weeding and invasive species control and removal practices.
c. Watering schedule and practices.
d. Tools to be used for maintenance.
e. Timing of initial and second cuttings of seeded non-turf areas.
f. Timing of Turf Postfertilization.
g. Timing of Turf Aeration.

3. As part of Turf/Plant Maintenance schedule, Work Logs shall be submitted to Owner on a weekly basis. See Part 3 for more information.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Landscape Contractor.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
1. Landscape Contractor shall submit Certification of Grass Seed as part of project submittals and provide Certification of Grass Seed to General Contractor and upon delivery to Project Site. Grass seed delivered to Project Site without proof of Certification or Certification that is different from approved submittal will be rejected and immediately removed from the site.

C. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.
1. Landscape Contractor shall submit Certification of Seed mixture for sod as part of project submittals and provide Certification of Seed mixture for sod to General Contractor upon delivery to Project Site. Sod delivered to Project Site without proof of Certification or Certification that is different from approved submittal will be rejected and immediately removed from the site.

D. Product Certificates: For fertilizers, from manufacturer.

E. Pesticides and Herbicides: Applicator License number and product label and manufacturer's application instructions specific to Project and in accordance with Philadelphia Parks & Recreation integrated pest management practices.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Philadelphia Parks & Recreation for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

1.9 QUALITY ASSURANCE

A. Landscape Contractor Qualifications: A qualified Landscape Contractor whose work has resulted in successful turf establishment.
   1. Professional Membership: Landscape Contractor shall be a member in good standing of either the National Association of Landscape Professionals or AmericanHort.
   2. Experience: Engage an experienced Installer who has completed turf installation to the extent indicated for this Project and with a record of successful lawn establishment for a minimum of three (3) years.
   3. Landscape Contractor's Field Supervision: Require Landscape Contractor to maintain an experienced full-time supervisor on Project site when work is in progress.
   4. Pesticide Applicator: State-licensed, commercial.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in Turfgrass Producers International (TPI) "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.

C. Bulk Materials:
   1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
   2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
   3. Accompany each delivery of bulk materials with appropriate certificates.

1.11 FIELD CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion. Planting windows shall be reviewed at start of construction and may be adjusted depending on climate conditions (average seasonal temperatures, annual rainfall, and significant weather events) in the year of planting. Seeding or sodding not within these periods noted below requires approval in writing from Landscape Architect.
   1. Seeding:
      a. Spring Planting: March 15 – May 31

b. Fall Planting: August 15 – November 15

2. Sodding:
   a. Spring Planting: March 1 – May 31
   b. Fall Planting: September 1 – November 15

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.12 MAINTENANCE SERVICE

A. Maintenance Service Turf: Provide maintenance by skilled employees of Landscape Contractor. Maintain as required in Part 3 and per approved Turf Maintenance schedule. Begin maintenance activities immediately after each area is planted and continue until acceptable turf is established, but not for less than the following periods beginning from date of Substantial Completion and acceptance of Work for the entire project by Philadelphia Park & Recreation:
   1. Seeded Turf: Ninety (90) days from date of Substantial Completion of entire project.
      a. When initial maintenance period has not elapsed before end of planting season, or turf is not fully established, continue maintenance during next planting season.
   2. Sodded Turf: Thirty (30) days from date of Substantial Completion of entire project.
      a. When initial maintenance period has not elapsed before end of planting season, or turf is not fully established, continue maintenance during next planting season.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species for Turf Lawns:
   1. Quality, State Certified: State-certified seed of grass species as listed below for solar exposure.
   2. The seed mixes provided below are for reference purposes only for Full Sun, Sun and Partial Shade, and Shade conditions. Seed mixes shall be project specific and may differ from composition below.
   3. Full Sun, Cool-Season Grass: Kentucky bluegrass (*Poa pratensis*), a minimum of three cultivars.
   4. Sun and Partial Shade: Cool-Season Grass Mixture, proportioned by weight as follows:
      a. 50 percent Kentucky bluegrass (*Poa pratensis*).
      b. 30 percent chewings red fescue (*Festuca rubra* variety).

c. 10 percent perennial ryegrass (*Lolium perenne*).
d. 10 percent redtop (*Agrostis alba*).

5. Shade, Cool-Season Grass: Proportioned by weight as follows:
   a. 50 percent chewings red fescue (*Festuca rubra* variety).
   b. 35 percent rough bluegrass (*Poa trivialis*).
   c. 15 percent redtop (*Agrostis alba*).
6. Other seed mixtures as approved by Landscape Architect and Philadelphia Parks & Recreation.

C. Seed Species for Non-Turf Areas (Meadows, Bio-retention areas, Swales or Other Planting Areas)
1. Quality, State Certified: State-certified seed of grass species.
2. Proprietary or Custom Seed Mix specified by species and cultivars and approved by Landscape Architect and Philadelphia Parks & Recreation.

2.2 TURFGRASS SOD

A. Turfgrass Sod: Certified, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.

B. The sod species provided below are for references purposes only for Full Sun, Sun and Partial Shade, and Shade conditions. Sod shall be project specific and may differ from recommendations below.
1. Turfgrass Species, Cool-Season Grass: Sod of grass species as follows, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
2. Full Sun: Kentucky bluegrass (*Poa pratensis*), a minimum of three cultivars.
3. Sun and Partial Shade: Proportioned by weight as follows:
   a. 50 percent Kentucky bluegrass (*Poa pratensis*).
   b. 30 percent chewings red fescue (*Festuca rubra* variety).
   c. 10 percent perennial ryegrass (*Lolium perenne*).
   d. 10 percent redtop (*Agrostis alba*).
4. Shade: Proportioned by weight as follows:
   a. 50 percent chewings red fescue (*Festuca rubra* variety).
   b. 35 percent rough bluegrass (*Poa trivialis*).
   c. 15 percent redtop (*Agrostis alba*).
5. Other sod mixture as approved by Landscape Architect and Philadelphia Parks & Recreation.

2.3 SOIL AMENDMENTS

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
   1. Composition:
      a. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
   1. Composition:
      a. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

C. Lime: ASTM C602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
   1. Class: T, with a minimum of 99 percent passing through a No. 8 sieve and a minimum of 75 percent passing through a No. 60 sieve.

D. See Section 329113 Soil Preparation, for soil testing requirements. Application of Soil Amendments shall be per Pre- and Post-Construction soil testing recommendations.

2.4 PLANTING SOIL

A. See Section 323913 Soil Preparation.

2.5 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley. Do not use field hay as it may contain weed seeds.

2.6 PESTICIDES

A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for specific project conditions, and in accordance with School District of Philadelphia's Integrated Pest Management Plan and practices. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

2.7 EROSION-CONTROL MATERIALS

A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.

B. Silt Sock: Tubular shaped erosion and sediment control device comprised of a biodegradable fabric exterior filled with all natural wood fiber.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
   1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
   2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
   3. Uniformly moisten excessively dry soil that is not workable, or which is dusty.
   4. Verify there are no invasive plants present in the area to be planted. If present, invasive plants shall be removed prior to plant installation.

B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
   1. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils, discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, and to separate seeded areas from other planting areas.

C. Clean all tools, equipment, and work materials prior to beginning work each day to prevent spread of diseases or contamination.

3.3 TURF AREA PREPARATION

A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 Soil Preparation.

B. Newly Graded Subgrades: Loosed subgrade to a minimum depth of 8-inches. Remove stones larger than 1-1/2-inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Philadelphia Parks & Recreation's property.
   1. Spread planting soil to a depth of 6-inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
      a. Reduce elevation of planting soil to allow for soil thickness of sod.

C. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
   1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
   2. Loosen surface soil to a depth of at least 6-inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 6-inches of soil. Till soil to a homogeneous mixture of fine texture.
   3. Remove stones larger than 1-1/2-inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Philadelphia Parks & Recreation's property.

D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2-inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

A. Prepare area as specified in "Turf Area Preparation" Article.

B. For erosion-control blanket, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

C. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

D. Where two or more different seed mixes are adjacent or seed mix is adjacent to sod or other planting areas, install silt sock at boundary of seed mix(es) to prevent seed migration between seeded and/or planted areas. Dig in silt sock at seeding boundary so top of silt socks is min. 6" above finished grade. Silt sock shall be removed at end of Maintenance Period as identified in Part 1.
   1. Landscape Contractor shall dig in and stake silt sock on slopes exceeding 1:6. Stakes shall be installed per manufacturer's recommendations at a spacing no greater than 10'.

3.5 SEEDING

A. Sow seed using cultipacker type spreading machine, unless otherwise approved by Landscape Architect and Phila. Do not drop seed when wind velocity exceeds 5 mph.
   1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
   2. Do not use wet seed or seed that is moldy or otherwise damaged.
   3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at recommended rate based on seed mix.

C. If directed by Landscape Architect or Philadelphia Parks & Recreation, rake seed lightly into top 1/8-inch of soil, roll lightly, and water with fine spray.

D. Seeding of slopes greater than 1:4 is not permitted, unless authorized by Philadelphia Parks & Recreation. See 3.6 Sodding for more information.

E. Protect seeded areas with slopes between 1:6 and 1:4 with erosion control fiber mesh installed and stapled according to manufacturer's written instructions.

F. Protect seeded areas with slopes less than 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2-inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
   1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.

G. Protect all seeded areas from hot, dry weather or drying winds by applying compost mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16-inch**,** and roll surface smooth.

3.6 SODDING

A. Lay sod within 24 hours of harvesting unless a suitable preservation method is accepted by Landscape Architect prior to delivery time. Do not lay sod if dormant or if ground is frozen or muddy.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. Tamp and roll lightly to ensure contact with soil, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
   1. Lay sod across slopes at or exceeding 1:4.
   2. Anchor sod on slopes exceeding 1:6 with anchors as recommended by sod manufacturer but not less than two anchors per sod strip to prevent slippage.

C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2-inches below sod.

3.7 TURF RENOVATION

A. Renovate existing turf where indicated or where existing turf is damaged due to construction activities.

B. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
   1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
   2. Install new planting soil as required.

C. Remove sod and/or seed and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.

D. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.

E. Mow, dethatch, core aerate, and rake existing turf.

F. Remove all weeds and/or invasive plants before seeding. Where weeds or invasive species are present, submit procedures for invasive plant or weed removal for review and approval by Philadelphia Parks & Recreation prior to removal activities. Selective herbicides may only be used in in accordance with Philadelphia Parks & Recreation’s integrated pest management plan and only with written approval of Philadelphia Parks & Recreation. Do not use pre-emergence herbicides.

G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Philadelphia Parks & Recreation’s property.

H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6-inches.

I. Apply soil amendments and initial fertilizer required for establishing new turf and mix thoroughly into top 4-inches of existing soil. Install new planting soil to fill low spots and meet finish grades.
   1. Soil Amendment(s): Apply soil amendment(s) according to requirements of Section 329113 Soil Preparation.
   2. Initial Fertilizer: Slow-release fertilizer applied according to manufacturer's recommendations.

J. Apply seed and protect with straw mulch and sod as required for new turf.

K. Water newly planted areas and keep moist until new turf is established.

3.8 TURF AND PLANT MAINTENANCE

A. General: Maintain and establish turf and seeded areas by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf or plantings. Roll, regrade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

B. Record all maintenance activities in a Work Log. Landscape Contractor's personnel shall submit Work Logs upon completion of each turf maintenance visit to Philadelphia Parks & Recreation. Work Logs shall include time and date of Work, number of hours spent at the site, and a description of maintenance tasks performed during the maintenance visit, in addition to other items listed in Specifications.
   1. Notify Philadelphia Parks & Recreation at least 48 hours prior to each Maintenance visit.

C. Regular Turf and Plant Maintenance Activities: At a minimum, perform the following activities during each Turf and/or Plant Maintenance visit.
   1. Watering: Loss of turf or plants due to inadequate watering will be considered negligence of maintenance services and will require replacement at no cost to Philadelphia Parks & Recreation. A watering plan shall be submitted as part of Action Submittals.
      a. Watering Frequency: Water all newly seeded or sodded areas with fine spray at a minimum rate of 1-inch per week, unless greater than 1-inch of precipitation has occurred at Project site within previous 7 days. If maintenance personnel elects not to perform watering due to previous precipitation, documentation must be provided to Philadelphia Parks & Recreation showing amount of precipitation on site for past 7 days.
         1) Contractor may install and maintain temporary piping, hoses, and/or turf-watering equipment to convey water from approved sources and keep turf or planting area uniformly moist to a depth of 4-inches.
      b. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.

c. Watering activities and timeframes shall be recorded in Work Logs.

2. Maintain an invasive plant and weed-free installation. Invasive plants and weeds shall be removed as part of regular maintenance activities throughout duration of Turf Maintenance period. If weeds or invasive species are observed, submit procedures for invasive plant and weed removal for review and approval by Philadelphia Parks & Recreation prior to removal activities. Identify invasive species and record removal procedures within Work Logs.
3. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
4. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
5. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Follow Philadelphia Parks & Recreation's integrated pest management practices to minimize the use of pesticides and reduce hazards.
6. Mow turf as soon as top growth is tall enough to cut. Lawn mowing shall occur on a regular basis, typically weekly unless conditions do not permit. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Ensure mower blades are sharp and provide a clean cut. Schedule initial and subsequent mowings to maintain the following grass height:
   a. Mow to a height of 3 to 3.5-inches.
   b. If using a mulching mower, lawn clippings may be left on the lawn to decompose.
7. Turf Postfertilization: Apply slow-release fertilizer after initial mowing and when grass is dry.
   a. Use fertilizer that provides actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.
8. Turf Aeration: Aerate lawn prior to end of Maintenance period.

D. For seeded areas that are not turfgrass (such as Meadows and bio-retention areas), cut back grasses early in the season when vegetation reaches 12-inches in height to a height of 6-inches. Return and cut back when vegetation reaches 12-inches in height to a height of 8-inches.

3.9 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Landscape Architect or Philadelphia Parks & Recreation:
   1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
   2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.10 PESTICIDE APPLICATION

A. Herbicides and other chemical products *shall not* be applied unless specifically approved in writing by Philadelphia Parks & Recreation in accordance with Philadelphia Parks & Recreation's integrated pest management practices.
   1. Herbicides and other chemical products shall only be applied by a Licensed Applicant and shall not occur without approval by Philadelphia Parks & Recreation.

B. Notify Philadelphia Parks & Recreation before each application is performed.

C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.11 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Philadelphia Parks & Recreation's property.

C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

D. Remove nondegradable erosion-control measures and silt socks between seed mixes or sod at end of grass establishment period. Repair any plant beds or lawns damaged as a result of erosion control measure removal.

END OF SECTION 329200

SECTION 329300

PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Trees (Understory).
   2. Shrubs.
   3. Fertilizers.
   4. Mulches.
   5. Tree Watering Bags.

B. Related Requirements:
   1. Section 329113 "Soil Preparation" for information regarding planting soil.
   2. Section 329200 "Turf and Grasses" for turf (lawn).

1.3 REFERENCES

A. American National Standards Institute (ANSI):
   1. Z60.1 – American Standards for Nursery Stock
   2. A300 – Standards for Tree Care Operations

B. United States Department of Agriculture (USDA):
   1. Plant Hardiness Zone Map

C. American Society for Testing and Materials (ASTM) Standards as listed in Specification.

1.4 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than sizes indicated; wrapped with burlap, tied, rigidly supported,

and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

C. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

D. Finish Grade: Elevation of finished surface of planting soil.

E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

F. Planting Area: Areas to be planted.

G. Planting Soil: Imported soil or manufactured soil that has been modified with soil amendments and/or fertilizers to produce a soil mixture best for plant growth. See Section 329115 "Soil Preparation (Performance Specification)" for drawing designations for planting soils.

H. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

I. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

J. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.

K. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.5 COORDINATION

A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
   1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Plant Materials: Contractor shall provide a confirmed Plant Schedule verifying quantities, sizes, quality, and sources for all specified plant materials.

a. Contractor shall provide confirmed Plant Schedule to Landscape Architect a minimum of six (6) weeks prior to anticipated Plant Installation.

2. Plant Photographs: For plant material not tagged in field by Landscape Architect, include color photographs in digital format of each required species and size of plant material as it will be furnished to Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 10 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.
   a. Landscape Architect reserves the right to reject plant material based on photographs that do not meet specification requirements or appear damaged, diseased, or otherwise unhealthy.

B. Samples for Verification: For each of the following:
   1. Plant Material: Bill of sale indicating full scientific name, quantity, plant size, and name of growing nursery for all plant material.
   2. Organic and Compost Mulch: 1-quart (1-L) volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.

C. Planting & Installation Schedule: Submit proposed planting and installation schedule, indicating dates for completion of work items, plant tagging, soil testing, digging of woody plants, and installation of each type of landscape work during normal seasons for such work in area of site.
   1. Correlate Plant & Installation Schedule with specified maintenance periods to provide maintenance from date of Substantial Completion. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.
   2. Submit letter notifying Owner and Landscape Architect of completion of planting work and requesting inspection to determine acceptability for Substantial Completion and beginning of Warranty Period.
   3. Submit letter to Owner and Landscape Architect requesting a final inspection of planting work for Final Acceptance at end of Warranty Period.

D. Plant Maintenance Schedule: Submit proposed plant maintenance schedule, indicating frequency of maintenance visits and scheduled maintenance activities to occur during visits.
   1. Plant maintenance shall include watering of plants. Loss of plants due to inadequate watering will be considered negligence of maintenance services and will require plant replacement at no cost to Owner.
   2. A one-year watering plan shall be submitted as part of Plant Maintenance Schedule.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis of standard products.
2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

C. Sample Warranty: For special warranty.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.
1. Professional Membership: Installer shall be a member in good standing of either the National Association of Landscape Professionals or AmericanHort.
2. Experience: Engage an experienced Installer who has completed planting work similar in material, design, and extent to that indicated for this Project and with a record of successful plant establishment for a minimum of three (3) years.
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Pesticide Applicator: State-licensed, commercial.

B. Nursery Qualifications: A nursery specializing in growing and cultivating the plant specified in this Section with a minimum of six (6) years' experience.
1. Nurseries shall be members of the American Association of Nurserymen and Pennsylvania Landscape and Nurserymen's Association, or equivalent State organization(s).
2. Nurseries shall be within same plant hardiness zone and having similar climate conditions as Project Site. Zone shall be as defined on United States Department of Agriculture Plant Hardiness Zone Map.
    a. Nursery shall be located within 75-miles of Project site. Plant sources greater than this distance will not be accepted without written approval by Landscape Architect.

C. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

D. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
   1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
   2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

E. Plant Material Observation: Landscape Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality.
   1. Landscape Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
   2. Notify Landscape Architect of sources of planting materials at least seven days in advance of delivery to site.

F. Substitutions: Substitutions will only be considered after review of plant availability with Landscape Architect. Submit request for substitutions in writing to Landscape Architect. **Substitutions will only be accepted with written approval by Landscape Architect.**

1.10 HARVESTING, DELIVERY, STORAGE, AND HANDLING

A. Tree Tagging: Landscape Architect may accompany Contractor to nursery to select and tag trees. Landscape Architect may choose to select and tag shrubs.
   1. Landscape Architect shall select plants for proper visual formation. Contractor shall inspect selected plants for disease and other requirements of Contract Documents. Prior to nursery trip, Contractor shall have pre-selected Nursery(s) to ascertain the sufficient plants in size and species required, and provided the confirmed Plant Schedule to Landscape Architect.
   2. The Landscape Architect may tag trees and shrubs of each species as a representative sample. Trees and shrubs delivered to the Project site without tags, and shrubs that do not equally match the quality of tagged samples, shall be rejected.

B. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.

C. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

E. Handle planting stock by root ball.

F. The Contractor must verify that one of the following methods is used to protect plant material in transit:
1. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
    a. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.
2. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

G. Deliver plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
2. Do not remove container-grown stock from containers before time of planting.
3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

H. All plant material must have labels showing botanical name on each individual plant. Plants without labels will rejected by Landscape Architect and shall be removed immediately from the Project Site.

I. Notify the Landscape Architect at least three (3) business days in advance of start of Work.

J. The Landscape Architect reserves the right to reject plant materials not meeting the above requirements.

1.11 FIELD CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work. Hand excavate, as required. Maintain grade stakes until parties concerned mutually agree upon removal.

B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
   1. Spring Planting: March 15 – June 15
   2. Fall Planting: September 1 – November 15
   3. Planting outside of designated timeframes above may only occur with written approval from Landscape Architect.
   4. Planting between June 16 to August 31 is not permitted.

C. Plant trees after finished grades are established and before planting lawns, unless approved otherwise by Landscape Architect.
   1. When planting trees after lawn, protect lawn areas and promptly repair damage caused by planting operations.

D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

E. Utilities: Determine location of above-grade and underground utilities and perform Work in a manner which will avoid damage. Hand excavate, as required. Maintain grade stakes until parties concerned mutually agree upon removal.
   1. Notify Owner no fewer than three (3) days in advance of proposed interruption of each service or utility.
   2. Do not proceed with interruption of services or utilities without Owner’s written permission.

F. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or other obstructions, notify Landscape Architect before planting.

1.12 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Death and unsatisfactory growth, including resulting from lack of adequate maintenance during warranty period.
      b. Structural failures including plantings falling or blowing over.

c. Faulty performance of tree stabilization edgings and tree grates.
d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Periods: From date of Substantial Completion and acceptance of Work by Owner.
   a. Trees, Shrubs, Vines, and Ornamental Grasses: Twelve (12) months.
   b. Ground Covers, Biennials, Perennials, and Other Plants: Twelve (12) months.
3. Include the following remedial actions as a minimum:
   a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
   b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
   c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.
   d. Provide extended warranty for period equal to original warranty period, for replaced plant material.
   e. At end of Warranty Period, cut bindings around base of trunks and remove loose materials. Redistribute, add, and/or replace mulch as needed.

1.13 MAINTENANCE SERVICE

A. Initial Maintenance Service for Plant Material. Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptable healthy and well-established but not for less than maintenance period below:
   1. Maintenance Period for Trees and Shrubs: Twelve (12) months.
   2. Ground Covers, Perennials, Ornamental Grasses, and Other Plants: Twelve (12) months.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
   1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots are

unacceptable and will be rejected and shall be removed from the project site immediately.

2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
3. Acquire plants from nurseries within 100-mile radius of Project Site. Plant sources greater than this distance will not be accepted without written approval from Landscape Architect.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Landscape Architect, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

D. Labeling: Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.

1. Plants without labels will be rejected by Landscape Architect and shall be removed immediately from the Project Site.

2.2 TREES

A. Provided balled and burlapped trees, unless container-grown trees are specified on Plant Schedule.

B. Canopy Trees: Provide canopy trees with well-balanced crowns, straight trunks with intact main leaders, undamaged and uncut, and of height and caliper indicated on Plant Schedule, and conforming to ANSI Z60.1.

1. Tree sizes and conditions shall meet or exceed requirements as specified on Plant Schedule. Contractor may elect to provide trees with larger caliper than specified at no additional cost to Owner.

C. Understory Trees: Provide understory trees that are upright and spreading, branched naturally according to species and type, and of height and container size indicated on Plant Schedule, and conforming to ANSI Z60.1.

1. Understory trees shall have two to three main stems. Understory trees with four or more main stems may be rejected upon inspection by Landscape Architect.

2.3 FERTILIZERS

A. Feeder Packs: Organic, biodegradeable packs containing a measured dose of fertilizer (4-2-2), mycorrhizae, biochar, azomite, and micronized oyster shell (5% calcium and 1% Sulphur).

1. *Fuhgeddaboudit!* Root Zone Feeder Packs, manufactured by Organic Mechanics Soil Company, LLC
   P.O. Box 272, Modena, PA 19358
   Phone: 610-380-4598
   www.organicmechanicsoil.com

2.4 PLANTING SOIL

A. See Section 323913 “Soil Preparation.”

2.5 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of the following:
   1. Type: Triple-Shredded hardwood bark.
   2. Size Range: 3-inch maximum, 1/2-inch minimum.
   3. Color: Natural and undyed.

B. Leaf Litter: Chopped or shredded leaves, free of weeds, seeds, loam, sand, clay, and other foreign substances. Acquire leaf litter locally from a source approved by Landscape Architect.

2.6 TREE-WATERING BAGS

A. Slow-Release Watering Bags: Standard product manufactured for drip irrigation of plants and emptying its water contents over an extended time period; manufactured from UV-light-stabilized nylon-reinforced polyethylene sheet, PVC, or HDPE plastic. Obtain from source below or approved equal.
   1. Treegator Original, manufactured by Spectrum Products, Inc.
      153 Mosswood Boulevard, Youngsville, NC 27596
      Phone: 1-866-873-3428
      www.treegator.com

2.7 MISCELLANEOUS PRODUCTS

A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

B. Burlap: Non-synthetic, biodegradable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.
   1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
   2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
   3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
   4. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Landscape Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

3.3 PLANTING AREA ESTABLISHMENT

A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation ."

B. Placing Planting Soil: Place and mix planting soil in-place over exposed subgrade.

C. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

D. Around Existing Trees:
   1. Loosen existing soil surface by hand to a depth required to plant shrubs and / or herbaceous plants.
   2. Do not place more than 10” of planting soil under dripline of existing trees.
   3. Spread two-inch deep layer of compost over soil. Mix thoroughly into top six inches of soil. Excavate and remove existing soil as required to maintain existing grades of landscape beds.

E. Newly Graded Subgrades:
   1. Loosen compacted subgrade with a subsoil ripping tool to a depth of 18-inches and with vertical trenches 24-inches apart. Run subsoil-ripping tool in two directions at right angles to each other.
   2. Spread 2-inch-deep layer of topsoil or planting mix over loosened subgrade. Mix thoroughly into top 4-inches of subgrade.
   3. Spread topsoil or planting mix to depths indicated, but not less than required, to meet finish grades after addition of amendments, light rolling, and natural settlement. Do no spread if topsoil or subgrade is frozen, muddy, or excessively wet. Apply soil amendments and fertilizer on surface and mix thoroughly into topsoil.
   4. Spread 2-inch-deep layer of compost over topsoil. Mix thoroughly into top 6-inches of soil.
   5. After light rolling and settlement, compact in 6-inch lifts and compact to 85% of maximum dry weight according to ASTM D698, to depth required to meet grades and elevations as indicated on Drawings.

F. Finish Grade: Grade planting beds to a smooth, even surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
   1. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

G. Stage installation of topsoil or planting mix to avoid travel by equipment over placed topsoil or planting mix.

H. Restore planting beds if eroded or otherwise disturbed

3.4 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits.
   1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Scarify subgrade 2-inches, and trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Scarify sides of planting pit smeared or smoothed during excavation.
   2. Excavate approximately three times as wide as ball diameter for balled and burlapped and container-grown stock.

3. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
4. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
5. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
7. Maintain supervision of excavations during working hours.
8. Keep excavations covered or otherwise protected after working hours or when unattended by Installer's personnel.

B. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

C. Drainage: Notify Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

3.5 TREE AND SHRUB PLANTING

A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with top of root ball at same elevation relative to ground level as in the nursery.
1. If soil is dry, moisten prepared planting areas before planting. Do not create muddy soil conditions.
2. Backfill: Approved planting soil.
3. Do not remove burlap from balls. After placing some backfill around root ball to stabilize plant, carefully cut and remove rope and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
4. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
5. Place fertilizer feeder packs equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball per manufacturer’s instructions.

a. Quantity: Three (3) per canopy and understory tree.

6. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with top of root ball level with adjacent finish grades of planting soil.
   1. Backfill: Approved planting soil.
   2. Carefully remove root ball from container without damaging root ball or plant.
   3. Cut pot bound foots to prevent future root girdling.
   4. Place stock on setting layer of compacted planting soil.
   5. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
   6. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball per manufacturer's instructions.
      a. Quantity: One (1) per shrub.
   7. Continue backfilling process. Water again after placing and tamping final layer of soil.

E. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 TREE AND SHRUB PRUNING

A. Remove only dead, dying, or broken branches. Do not prune otherwise unless directed by Landscape Architect

B. Do not cut tree leaders unless directed by Landscape Architect.

C. Do not apply pruning paint to wounds.

3.7 PLANTING AREA MULCHING

A. Mulch backfilled surfaces of planting areas and other areas indicated.
   1. Trees in Turf Areas: Apply organic mulch ring of 1-1/2" thick layer of leaf litter, followed by 1-1/2" thick layer of triple-shredded hardwood mulch on top of leaf litter layer, with 18-inch radius around trunks or stems. Do not place mulch within 3 inches of trunks or stems.
   2. Planting Areas: Apply 1-1/2" thick layer of leaf litter, followed by 1-1/2" thick layer of triple-shredded hardwood mulch on top of leaf litter layer, over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.

3.8 INSTALLATION OF TREE WATERING BAGS

A. Provide one device for each tree.

B. Place device on top of the mulch at base of tree stem and fill with water according to manufacturer's written instructions.

3.9 PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.

B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

D. Plant maintenance shall include watering of plants. Loss of plants due to inadequate watering will be considered negligence of maintenance services and will require plant replacement at no cost to Owner. A one-year watering plan shall be submitted as part of Plant Submittals.
   1. Install and maintain temporary drip irrigation piping and hoses to convey water from sources to planting areas and to keep plantings uniformly moist.

E. Fertilize trees approximately one year after installation between October and December, or between February and April. Unless otherwise indicated by soil test results, apply at a rate of 2 pounds of actual nitrogen per 1,000 square feet. Make insertion points approximately 2’-6” apart, at a depth of 6 inches. Apply fertilized in the ball and backfill area, and to approximately 1 foot outside of the planting hole.

3.10 REPAIR AND REPLACEMENT

A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Landscape Architect.
   1. Submit details of proposed pruning and repairs.
   2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
   3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Landscape Architect.

B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition or are damaged during construction operations that Landscape Architect determines are incapable of restoring to normal growth pattern.
   1. Provide new trees of same size and species as those being replaced for each tree unless otherwise directed by Landscape Architect.

3.11 CLEANING AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

E. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

3.12 FINAL INSPECTION

A. Inspection to determine completion and acceptance of planted areas will be made by the Landscape Architect, upon Contractor’s request. Provide notification at least ten (10) business days before requested inspection date. Inspection comments will be submitted to the Contractor in writing.

B. Planted areas will be accepted provided all requirements, including the maintenance period have been complied with and plant materials are alive and in a healthy, vigorous condition.

C. Upon acceptance of Work, the Owner will assume plant maintenance and the plant material Warranty period will begin.

D. An additional inspection will be made near the end of the Warranty period to determine if plant materials need to be replaced. Plants shall be in a health, vigorous growing state and free of disease and insects.

END OF SECTION 329300

SECTION 334100

STORM UTILITY AND STRUCTURES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. The construction of junction boxes, trench drains, catch basins, stormwater piping, weirs, and other structures as shown on plan.
2. Any incidental or related operations.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 312000 – EARTH MOVING

1.3 SUBMITTALS

A. Product Data:
1. Submit copy of catalogue cuts of all fabricated materials including pipes, inlet boxes, grates, etc. for approval by the Owner prior to ordering.
2. Submit copy of sieve analysis for all sub-base materials

B. Shop Drawings: Submit shop drawings as specified to Owner for approval prior to ordering.

C. Calculations: Submit calculations for pre-cast manholes and inlets signed and sealed by a PA licensed Engineer.

1.4 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section, including all applicable Philadelphia Water Department codes and regulations.

B. Codes and Standards: Perform work in compliance with applicable requirements of governing authorities having jurisdiction.

C. Materials and workmanship shall conform to applicable requirements of Pennsylvania Department of Transportation Specifications.

D. All work shall be in compliance with applicable requirements of codes and regulations.

1.5 REFERENCES

A. Annual Book of ASTM Standards, latest edition; American Society for Testing and Materials, Philadelphia PA.

B. Pennsylvania Department of Transportation Specifications, latest edition, Publication 408.

C. Standards of the American Association of State Highway and Transportation Officials (AASHTO), latest edition.

D. Philadelphia Water Department codes and regulations.

E. City of Philadelphia Plumbing Code, 2018 or latest edition.

1.6 PROEJECT CONDITIONS

A. Conform to all conditions and restrictions included in other sections, including erosion and sediment control, protection of vegetation, existing improvements and utilities.

1. All work shall be in accordance with the laws of the Commonwealth of Pennsylvania and Philadelphia Water Department codes and regulations.
2. The Contractor shall apply and pay for all necessary permits and fees required in the course of his work as required by the governing codes.
3. The Contractor shall be responsible for coordinating his work with the work of other trades. Do no work that will damage, displace, or make unnecessarily difficult the installation of the work of other trades.
4. Notify and cooperate with local authorities and other organizations having jurisdiction (such as PennDOT and/or Philadelphia Water Department) when construction work will interfere with existing roads and traffic. The Contractor is responsible for obtaining all required permits for construction activity.
5. Provide temporary barriers, signs, warning lights, flagmen, and other protections as required to assure the safety of persons and vehicles around the construction area and to organize the smooth flow of traffic in compliance with local regulations and permit requirements.
6. The Contractor shall not cover any work until it has been inspected by the Engineer. Any work covered prior to inspection shall be opened to view by the Contractor at his expense.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pipe

1. All pipe, including bends, wye branches, and other fittings shall conform to Philadelphia Water Department codes and regulations.
2. High Density Polyethylene Pipe (HDPE) shall conform to Philadelphia Plumbing Code requirements, latest edition.
3. Reinforced concrete pipe shall conform to ASTM C-76, Class III, Wall B or AASHTO T33. Reinforced concrete pipe shall meet the requirements of Philadelphia Water Department codes and regulations for materials and fabrication. Quadrant reinforcing of pipe is not permitted.
4. All reinforced concrete pipe shall have rubber gasket joints conforming to ASTM C 443 Standard Specifications for Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets.
5. Factory manufactured wye branches shall be used to connect drains to stormwater conduit. Field fabricated wye branches and connections are not permitted.
6. Ductile iron pipe used in the construction of sewers, including bends, wye branches and other fittings, shall be manufactured and tested in accordance with the American National Standard for Ductile Iron Pipe, AWWA C151.
7. Unless otherwise noted, the pipe shall be Class 56 for pipe 12 inches diameter and smaller and Class 54 for pipe larger than 12 inches in diameter.
8. All ductile iron pipes and fittings used in the construction of sewers including bends and wye branches shall have gasket joints conforming with AWWA C111. Pipe and fittings shall have push on joints.
9. PVC Pipe: Poly (Vinyl Chloride) Pipe, SDR -35, shall be ANSI/ASTM D 3033, Type PSP or ASTM D 3034, Type PSM.
10. Vitrified clay pipe: for the construction of sewers, connections and other fittings, including bends, cut curves and wye branches, shall be extra strength clay pipe, shall conform to ASTM C 700 Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated, and shall be tested in accordance with ASTM C 301 Standard Methods of Testing Vitrified Clay Pipe. All vitrified clay pipes used in the construction of sewers and connections shall have gasket joints. The joints and joint materials shall conform to ASTM C 425 Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings. The use of polyvinyl chloride (PVC) for the outside sheath (bell) of the compression joints will not be permitted. All vitrified clay pipes shall be installed in accordance with ASTM C 12 Standard Recommended Practice for Installing Vitrified Clay Pipe Lines.
11. Fittings shall match material used for mains.

B. Structures

1. Storm Drain Inlets, Manholes, Trench Drains and Structures:
   a. Concrete Construction: Concrete construction shall be in accordance with Section 1001, PennDOT Specifications, latest edition.

b. Concrete Trench drains, Inlets and Manholes: Precast concrete inlets/manholes may be substituted for cast-in-place structures and shall be constructed as specified for cast-in-place. Precast structures may be used in only those areas where there is no conflict with existing underground structures which may necessitate revision of inverts. Concrete structures shall be placed on a 6 or 8 inch bed of compacted coarse aggregate Size No. 2A or as indicated on Plans and Details. Reinforcement steel, if required for handling, shall have a minimum of 2 inch cover. Handling devices, if used, shall be removable and the holes filled with concrete. Precast inlet structures will be modified to provide 12"-18" sediment storage and bottom leaching basins, open to gravel sumps in sub-grade, where specified on construction documents. Inlets in roadways must be at least H-20 rated.

c. PWD Concrete Outlet Structure: Precast concrete outlet structure may be substituted for cast-in-place structures and shall be constructed as specified for cast-in-place. Outlet structure shall have minimum interior dimensions of 48" x 60" with 8" typical wall thickness. See plans for internal weir configuration, if appliable. Two circular manhole access points shall be provided, gray iron per PWD standards and details. Aluminum ladder bars to be provided per PWD standards and details. Concrete box, top slab, and frame/manhole covers to be H-20 rated. Reinforcement shall meet requirements of PennDOT Publication 408, Section 709. Provide trap Neenah Foundry R-3707-12 or approved equal when making connection to combined sewer.

d. Standard ADA inlet grates/covers and frames shall be ductile iron, heavy-duty traffic rated, and sized as shown on the plans. Inlet grates shall be sized as per contract documents.

e. All PVC Catch Basins and Cleanouts shall be as manufactured by Nyloplast and as noted on site detail drawings or approved equals.

f. PVC Catch Basins and Cleanouts shall be sized as shown on the plans or as required for necessary pipe connections. Lids for all PVC structures shall be secured. All PVC structures shall be manufactured with black colored PVC or painted black.

g. All Control Structure boxes shall be precast concrete with traffic rated heavy duty solid frame and cover. Manhole frame and cover shall be heavy-duty model, undipped, solid plated, with neoprene gasket installed as manufactured by East Jordan Iron Works or approved equal and as noted on detail drawings.

h. Heavy Duty Trench drain grates /covers and frames shall be cast iron, heavy-duty traffic rated and sized as shown on the plans. Trench drain grates and covers shall be bolted to the frame.

i. Trench Drains shall be Urban Accessories Jamison Grate (ADA compliant cover) and shall be installed per manufacturer's specifications and recommendations. Urban Accessories 465 E. Fifteenth Street Tacoma, WA 98421.

j. Manhole frame and cover shall be heavy-duty model V-1326 as manufactured by East Jordan Iron Works or approved equal.

k. Stormwater structures connected directly to a combined sewer must have a hood/trap installed to prevent sewer gases from escaping.

C. Aggregate Subsurface Storage Beds

1. All aggregates within infiltration beds shall be clean and thoroughly washed and shall meet the following:
   a. Maximum Wash Loss of 0.5% (ASTM C117)
   b. Minimum Durability Index of 35 (ASTM D3744)
   c. L.A. abrasion loss, 30% maximum. (ASTM C131 and C535)
   d. Aggregate shall be 100% crushed material.
   e. Fractured Faces, 1 side 98% minimum, 2 sides 90% minimum (ASTM D5821).
2. Unless otherwise approved by the Engineer, coarse aggregate for the infiltration beds shall be uniformly graded with the following gradation (AASHTO size no. 3):

U.S. Standard Sieve Size	Percent Passing
2 ½" (63mm)	100
2" (50mm)	90-100
1 ½" (37.5mm)	35-70
1" (25mm)	0-15
½" (12.5mm)	0-5

3. Choker base course aggregate for infiltration beds shall have the following gradation (AASHTO size number 57):

U.S. Standard Sieve Size	Percent Passing
1 ½" (37.5mm)	100
1" (25mm)	95-100
½" (12.5mm)	25-60
4 (4.75mm)	0-10
8 (2.36mm)	0-5

4. Non-woven geotextile (drainage filter fabric) shall conform to the following:
   a. Minimum flow rate of 110 gal/min/ft2 ASTM D-4491
   b. Grab tensile strength min 150 lb ASTM D-4632
   c. Mullen Burst strength min 300 psi ASTM D-3786
   d. Puncture strength min 90 lb ASTM D-6241
   e. Apparent opening size 60-70 US Sieve ASTM D-4751
   f. Non-woven geotextile shall be Mirafi 160N, or approved equal.
5. Waterproof Liner for Waterstop shall be Solmax 230 (30 mil), or approved equal.

D. Weir Plates

1. Stainless Steel Weir Plates
   a. Weirs shall be as specified herein and have the characteristics and dimensions shown on the Contract Drawings.

b. Stainless steel weir plates shall be fabricated of stainless steel having a minimum thickness of ¼-inch and shall have adequate strength to prevent distortion during normal handling, during installation and while in service.

2. Anchor bolts
   a. Anchor bolts shall be used for mounting the weir plates.
   b. Anchor bolts shall have a minimum diameter of ¼-inch.

E. Water Quality Inlets

1. Water Quality Inserts for concrete catch basins shall be Grate Inlet Skimmer Box by Suntree Technologies, Inc and sized as shown on contract documents or approved equal. Install Grate Inlet Skimmer Box according to manufacturer's recommendations. www.suntreetech.com (321-637-7552)

F. Anti-Seep Collars

1. Anti-Seep Collars shall be quarter-inch (¼") HDPE or Polyethylene sheets cut to the dimensions indicated and installed as indicated on the Drawings. All metal fittings or attachments used shall be nylon or stainless steel (Grade 304 or better). Plastic sealant for weld shall be as suggested by manufacturer.

G. Underdrain System (Smart Drain™)

1. Where indicated, The underdrain system drainage belts shall be Smart Drain™ advanced micro siphon drain belt or approved equal. www.smartdrain.com (1-800-638-8582).
2. Unless otherwise approved by the Engineer, fine aggregate for the Smart Drain underdrain system shall be clean coarse (0.5-2 mm) drainage sand with 100% passing the No. 10 sieve and no more than 10% passing the No. 40 sieve.

H. Flexible impervious liner, where indicated, shall be Solmax HDPE Series, meeting the following criteria:
1. Minimum 30 mils thickness
2. Liner shall be resistant to mildew, rot, ultraviolet radiation, insects, and rodents.
3. Smooth HDPE conforming to physical requirements stipulated in the Geosynthetic Research Institute (GRI) GM13 Standard Specifications.

I. Unions and Flanges
1. All unions and flanges on each side of all pieces of equipment and other similar items shall be designed in such a manner that they can be readily disconnected.
2. All unions and flanges must be placed in a location which will be readily accessible after completion of the project.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions under which work is to be performed and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.2 EXCAVATION AND BACKFILL

A. Grade utility trench bottom to a smooth, firm, stable and rock-free foundation. Remove unstable, soft, and unsuitable materials, as determined by the Engineer, and backfill with clean granular material to indicated level, per PennDOT Specification 408.

3.3 DEMOLITION OF EXISTING UTILITIES

A. In the event that plumbing or piping systems must be demolished, no lines shall be left open ended. All lines to be demolished shall be terminated with either a valve and a cap or plug, or with just a cap or plug.

B. All caps or plugs shall be installed to withstand the flow and pressure of the line that it is terminating in the event that the line is reenergized.

3.4 INSTALLATION OF PIPE

A. The Contractor shall stake out all proposed lines prior to the start of work. The location of said lines shall conform to the locations shown on the drawings. Any problems with alignments shown on the drawings shall be brought to the attention of the Engineer. Any changes in alignments shown on the drawings must be approved by the Engineer. Staked alignments shall be approved in the field before the start of work.

1. All piping shall be cut accurately for fabrication to measurements established at the construction site. Remove all foreign matter or dirt from the inside of the pipe before it is lowered into position.
2. Align piping in the trench in accordance with the instructions of the pipe and pipe joint manufacturers. Follow manufacturer's instructions in joining pipes. All piping shall be worked into place without springing and/or forcing.
3. During and following installation, protect inlets and all piping from sediment and other foreign matter by covering, capping, installation of silt sacks or haybales, and whatever other measures are required.
4. Repair any damaged sections of pavement that may result from construction activities, according to PennDOT specifications.
5. All restoration by permitee is to be in accordance with the Philadelphia Streets Department Standard Construction Item publication.
6. Storm water drainage system shall be provided for all roof and area drains and be connected into the site storm system.

3.5 INSTALLATION OF AGGREGATE INFILTRATION BEDS

A. Owner and Engineer shall be notified at least 24 hours prior to all infiltration bed work.

B. Owner and Engineer shall be contacted upon final bed bottom grading prior to installation of geotextile and aggregate. Notify the Engineer 72 hours prior to sub-grade completion. Geotextile shall not be placed until Engineer has observed sub-grade conditions.

C. Subgrade preparation

1. Existing subgrade under bed areas shall NOT be compacted or subject to construction equipment traffic prior to geotextile and stone bed placement. Excavators/backhoes should be used to excavate the bed area such that equipment is never running on exposed bed bottoms.
2. Where erosion of subgrade has caused accumulation of fine materials and/or surface ponding, this material shall be removed with light equipment and the underlying soils loosened/scarified to a minimum depth of 6 inches. Overly dense or compacted soils should also be loosened/scarified to a minimum depth of 6 inches.
3. Bring subgrade of stone infiltration bed to line, grade, and elevations indicated.

D. Aggregate Storage Bed Installation

1. Upon completion of subgrade work, the Engineer shall be notified and shall inspect at her discretion before proceeding with infiltration bed installation.
2. Geotextile and infiltration bed aggregate shall be placed immediately after approval of subgrade preparation. Any accumulation of debris or sediment which has taken place after approval of subgrade shall be removed prior to installation of geotextile at no extra cost to the Owner.
3. Place geotextile in accordance with manufacturer's standards and recommendations. Adjacent strips of geotextile shall overlap a minimum of sixteen inches (16"). Secure geotextile at least four feet (4') outside of bed and take any steps necessary to prevent any runoff or sediment from entering the storage bed.
4. Install coarse aggregate in 8-inch maximum lifts. Lightly compact each layer with equipment, keeping equipment movement over storage bed subgrades to a minimum. Install aggregate to grades indicated on the drawings.
5. Following placement of bed aggregate, the geotextile shall be folded over the top of the entire bed and secured in place trimmed to bed extents.
6. The infiltration bed area shall be backfilled with clean, coarse aggregate as indicated on the contract documents.

END OF SECTION 334100