Washington Metropolitan Area Transit Authority

REHABILITATION OF WMATA PARKING FACILITIES NEW CARROLLTON; LARGO TOWN CENTER NORTH & SOUTH; VIENNA NORTH; WEST FALLS CHURCH AND WHITE FLINT

TECHNICAL SPECIFICATIONS

FINAL SUBMITTAL

CONTRACT No. FQ18064

A Gannett Fleming/Parsons
JOINT VENTURE

JANUARY 2018

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

REHABILITATION OF WMATA PARKING FACILITIES NEW CARROLLTON; LARGO TOWN CENTER NORTH & SOUTH; VIENNA NORTH; WEST FALLS CHURCH AND WHITE FLINT

TECHNICAL SPECIFICATIONS

TABLE OF CONTENTS

SECTION	TITLE	PAGE NO.
	Table of Contents	TOC-1 to 12
DIVISION 01		
01110	Summary of Work	01110-1 to 6
01111	Contractor Key Staff	01111-1 to 3
01114	Safety/Environmental Requirements	01114-1 to 11
01116	Identification and Security	01116-1 to 3
01141	Access to Site	01141-1 to 3
01180	Project Utility Interface	01180-1 to 2
01250	Contract Modification Procedures	01250-1 to 11
01312	Project Meetings	01312-1 to 4
01321	Construction Photographs	01321-1 to 5
01322	Contract Progress Reporting	01322-1 to 11
01330	Submittal Procedures	01330-1 to 8
01420	References	01420-1 to 6
01470	Quality Management System	01470-1 to 28
01510	Temporary Utilities	01510-1 to 3
01520	Temporary Construction Facilities	01520-1 to 6
01530	Temporary Decking	01530-1 to 5
01550	Maintenance of Traffic, Access, and Parking	01550-1 to 4
01560	Temporary Barriers and Enclosures	01560-1 to 4
01570	Temporary Controls	01570-1 to 8
01580	Project Signs	01580-1
01610	Basic Product Requirements	01610-1 to 4
01630	Product Substitution Procedures	01630-1 to 3
01711	Acceptance of Conditions	01711-1 to 3
01721	Layout of Work and Field Engineering	01721-1 to 19
01722	Mobilization	01722-1 to 2
01723	Protection of Adjacent Construction	01723-1
01731	Cutting and Patching	01731-1 to 5
01740	Cleaning	01740-1 to 2
01775	Closeout	01775-1 to 11
01820	Demonstration and Training	01820-1 to 7

TABLE OF CONTENTS (CONTINUED)

SECTION	TITLE	PAGE NO.
DIVISION 02 – EXISTING CONDITIONS		
02250	Shoring	02250-1 to 4
02410	Selective Demolition	02410-1 to 8
02420	Selective Electrical Demolition	02420-1 to 4
DIVISION 03 – CONCRETE		
03010	Maintenance of Concrete	03010-1 to 10
03100	Formwork	03100-1 to 5
03200	Reinforcement	03200-1 to 7
DIVISION 04 – MASONRY		
04050	Common Work Results for Masonry	04050-1 to 6
04220	Concrete Unit Masonry	04220-1 to 8
DIVISION 05 – METALS		
05010	Maintenance of Metals	05010-1 to 4
05100	Structural Metal Framing	05100-1 to 8
05500	Metal Fabrications	05500-1 to 4
DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES		
	Not Used	
DIVISION 07 – THERMAL AND MOISTURE PROTECTION		
07180	Traffic Coatings	07180-1 to 9
07190	Water Repellents	07190-1 to 8
07620	Sheet Metal Flashing and Trim	07620-1 to 6
07840	Firestopping	07840-1 to 4
07920	Joint Sealants	07920-1 to 6
DIVISION 08 – OPENINGS		
08110	Hollow Metal Doors and Frames	08110-1 to 6
08120	Aluminum Doors and Frames	08120-1 to 4
08710	Door Hardware	08710-1 to 6

TABLE OF CONTENTS (CONTINUED)

SECTION	TITLE	PAGE NO.
08880	Glazing	08880-1 to 4
DIVISION 09 – FINISHES		
09205	Furring and Lathing	09205-1 to 7
09320	Tile	09320-1 to 10
09511	Acoustical Panel Ceilings	09511-1 to 7
09650	Resilient Flooring	09650-1 to 8
09900	Painting and Coating	09900-1 to 11
09910	Traffic Striping and Painting	09910-1 to 6
09970	Special Coatings for Steel	09970-1 to 12
DIVISION 10 – SPECIALTIES		
10605	Wire Mesh Partitions	10605-1 to 5
DIVISION 11 – EQUIPMENT		
	Not Used	
DIVISION 12 – FURNISHINGS		
	Not Used	
DIVISION 13 – SPECIAL CONSTRUCTION		
13905	Fire Protection, Suppression and Alarm	13905-1 to 16
DIVISION 14 – CONVEYING SYSTEMS		
	Not Used	
DIVISION 15 – MECHANICAL		
15075	Identification of Mechanical Equipment and Piping	15075-1 to 4
15205	Piping Systems	15205-1 to 21
DIVISION 16 – ELECTRICAL		
16050	Common Work Results for Electrical	16050-1 to 4
16060	Grounding and Bonding for Electrical Systems	16060-1 to 6
16070	Hangers and Supports for Electrical Systems	16070- 1 to 8
16075	Identification for Electrical Systems	16075-1 to 4

TABLE OF CONTENTS (CONTINUED)

SECTION	TITLE	PAGE NO.
16080	Acceptance of Electrical Systems	16080-1 to 3
16120	Low Voltage Electrical Power Conductors and Cables	16120-1 to 8
16130	Conduits for Electrical Systems	16130-1 to 9
16131	Wireways for Electrical Systems	16131-1 to 3
16132	Boxes for Electrical Systems	16132-1 to 6
16145	Wiring Devices	16145-1 to 7
16525	Lighting Fixtures and Mounting Poles	16525-1 to 13
APPENDIX A		
	Not Used	
APPENDIX B		
	Not Used	
APPENDIX C		
	Drawing List	1 to 15
APPENDIX F		
	Measurement of Quantities	1 to 18

END OF TABLE OF CONTENTS

ENGINEER OF RECORD'S SEAL APPLYING TO THE FOLLOWING SPECIFICATION SECTIONS:

DIVISION 02 – EXISTING CONDITIONS

02250	Shoring
02410	Selective Demolition

DIVISION 03 – CONCRETE

03010	Maintenance of Concrete
03100	Formwork
03200	Reinforcement

DIVISION 04 – MASONRY

04220	Concrete Unit Masonry

DIVISION 05 – METALS

05100	Structural Metal Framing

"PROFESSIONAL CERTIFICATION – I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 42582, EXPIRATION DATE: 08-13-2018"

COMMONWEALTH OF VIRGINIA
IFTEKHAR AHMAD
Lic. No. 0402050670
01/25/2018
PROFESSIONAL ENGINEER

COMMONWEALTH OF VIRGINIA
DIPANKAR SENGUPTA
Lic. No. 0402043677
01-25-2018
PROFESSIONAL ENGINEER

STATE OF MARYLAND
DIPANKAR SENGUPTA
34339
01-25-2018
PROFESSIONAL ENGINEER

"PROFESSIONAL CERTIFICATION – I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 34339, EXPIRATION DATE: 06-17-2019"

ARCHITECT OF RECORD'S SEAL APPLYING TO THE FOLLOWING SPECIFICATION SECTIONS:

DIVISION 04 – MASONRY

04050 Common Work Results for Masonry

DIVISION 05 – METALS

05010 Maintenance of Metals
05500 Metal Fabrications

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

07180 Traffic Coatings
07190 Water Repellents
07620 Sheet Metal Flashing and Trim
07840 Firestopping
07920 Joint Sealants

DIVISION 08 – OPENINGS

08110 Hollow Metal Doors and Frames
08120 Aluminum Doors and Frames
08710 Door Hardware
08880 Glazing

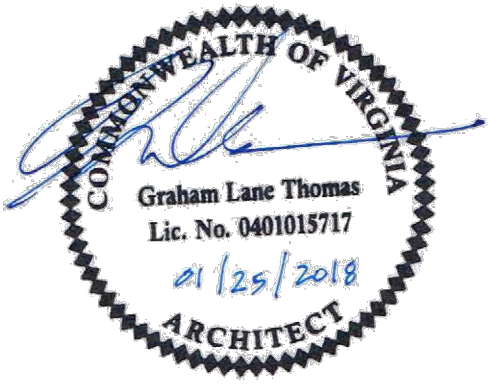
DIVISION 09 – FINISHES

09205 Furring and Lathing
09320 Tile
09511 Acoustical Panel Ceilings
09650 Resilient Flooring
09900 Painting and Coating
09910 Traffic Striping and Painting
09970 Special Coatings for Steel

DIVISION 10 – SPECIALTIES

10605 Wire Mesh Partitions

"PROFESSIONAL CERTIFICATION – I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ARCHITECT UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 8567, EXPIRATION DATE: 05-02-2019"



ENGINEER OF RECORD'S SEAL APPLYING TO THE FOLLOWING SPECIFICATION SECTIONS:

DIVISION 13 – SPECIAL CONSTRUCTION

13905	Fire Protection, Suppression and Alarm

DIVISION 15 – MECHANICAL

15075	Identification of Mechanical Equipment and Piping
15205	Piping Systems

"PROFESSIONAL CERTIFICATION – I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 30749, EXPIRATION DATE: 06-27-2018"

COMMONWEALTH OF VIRGINIA
01/25/2018
DEBDAS GHOSAL
NO.
016382
PROFESSIONAL ENGINEER

ENGINEER OF RECORD'S SEAL APPLYING TO THE FOLLOWING SPECIFICATION SECTIONS:

DIVISION 02 – EXISTING CONDITIONS

02420	Selective Electrical Demolition

DIVISION 16 – ELECTRICAL

16050	Common Work Results for Electrical
16060	Grounding and Bonding for Electrical Systems
16070	Hangers and Supports for Electrical Systems
16075	Identification for Electrical Systems
16080	Acceptance of Electrical Systems
16120	Low Voltage Electrical Power Conductors and Cables
16130	Conduits for Electrical Systems
16131	Wireways for Electrical Systems
16132	Boxes for Electrical Systems
16145	Wiring Devices
16525	Lighting Fixtures and Mounting Poles

"PROFESSIONAL CERTIFICATION – I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 25908, EXPIRATION DATE: 01-30-2019"

COMMONWEALTH OF VIRGINIA
MONTE A. RICHARDS
Lic. No. 0402035948
01/25/2018
PROFESSIONAL ENGINEER

SECTION 01110
SUMMARY OF WORK

PART 1 GENERAL

1.01 SUMMARY

A. The Work includes constructing the Project as indicated in the Contract Documents.

B. The completed Project will result in the complete construction, testing, and commissioning of the following Authority facilities:

1. Parking Structure: Rehabilitate six parking garages (two at Largo Town Center) to return them to a state of good repair. Repairs include the following:

   a. Replace all deteriorated expansion joint components.

   b. Replace damaged sealant at tooled joints.

   c. Replace damaged sealant and backer rod at double tee beam joints.

   d. Sawcut 1/2” minimum beyond deteriorated concrete and patch at double tee beam flange with sealant when the spall width is less than 2”.

   e. 1” deep sawcut and remove unsound concrete and patch at double tee beam flange with sealant when the spall width is between 2” and 9”.

   f. Replace all damaged vertical joint sealant components.

   g. Clean out and seal the crack from underside with epoxy injection at underside cracks.

   h. Apply epoxy injection at top side cracks.

   i. Repair crack with injection port and epoxy at vertical cracks.

   j. Remove unsound concrete and patch the vertical spall area with dowels.

   k. Sawcut and patch the top side spall area and clean/paint the existing reinforcement.

   l. Full depth sawcut and repair the deep spall areas at underside of concrete decks.

   m. Remove unsound concrete and patch the shallow spall areas with foaming as required at underside of concrete decks.

   n. Repair failed patch at precast panel lifting points.

   o. Remove unsound concrete and repair the deteriorated concrete washs.

   p. Repair double tee web spalls.

   q. Repair connection plates and unsound concrete.

   r. Replace double tee beam bearing pads.

s. Grind smooth concrete at double tee uneven joints.

t. Repair damaged concrete curbs.

u. Replace CMU cracked mortar at underside of double tees.

v. Repair traffic topping at parapet walls.

w. Install traffic bearing membrane on roof levels.

x. Replace damaged or missing bolts at bollard bases and missing traffic delineators.

y. Replace missing plastic cap at vertical lifting points.

z. Repair ponding area near drains.

aa. Clean and seal by power washing and epoxy sealant at efflorescence or rust staining areas.

bb. Retool and regrout deteriorated CMU mortar and grout joints.

cc. Clean and seal the corroded connection plates.

dd. Clean and coat with waterproofing the map cracking or honeycomb on wall and deck areas.

ee. Clean and repair the joint at water leaking on walls.

ff. Replace corroded or missing anchor bolts.

gg. Replace damaged parking garage stop curbs.

hh. Realign displaced angle and replace missing anchors at expansion joints.

ii. Clean and galvanize coat the corroded connection areas.

jj. Provide steel framing between double tee webs at crack parallel to expansion joint and longitudinal cracks in double tee flange.

kk. Repair spalls at inverted tee.

ll. Replace missing stair nosings.

mm. Install silane sealer coating on intermediate levels.

nn. Drain Body Corrosion. Replace Drain Body and associated corroded piping.

oo. Drainage pipe corrosion. Replace piping to the extent shown on the drawings. Replace piping and piping hangers with same type and material as existing.

pp. Replace drain grating with same type as existing.

qq. Replace corroded door frames.

rr. Scrape clean, prime, and repaint corroded pipe guards, and pipe guards with flaked paint.

ss. Scrape clean, prime and repaint corroded handrails.

tt. Scrape clean and treat chain link fence panels with anti-corrosive.

uu. Replace damaged storefront doors and door closers. Reinstall weather stripping.

vv. Remount misaligned signs and replace missing signs.

ww. Replace missing stair nosing's and reattach loose or detached stair nosing's.

xx. Scrape clean, prime, and repaint bollards.

yy. Repaint faded and missing pavement markings including stop bars, directional arrows, parking striping, no parking striping, crosswalks, and ADA symbols.

zz. Repaint curbs.

aaa. Replace missing acoustical ceiling tiles

bbb. Replace damaged and worn out signs.

ccc. Replace missing door hardware.

ddd. Power wash stained parapet walls.

eee. Remove plants encroaching into the parking structure.

fff. Corroded conduit and receptacles: Lockout breaker, tag, identify, and then remove the existing conductors from conduit, to the nearest junction box or point of termination. Cut and remove the portion of compromised conduit, rethread, and reassemble conduit. Reinstall existing conductors, and re-terminate. Lockout breaker identify, tag, and disconnect the existing conductors from defective device. Remove defective device and replace in kind.

ggg. Missing conduit body or enclosure: Close cover, and gasket, over the opening of the conduit body or enclosure. Replace cover and gasket in kind.

hhh. Corroded conduits and conduit mounting hardware: Remove and replace supporting straps and mounting supports with anodized-aluminum. Paint exterior of metal components with a corrosive-preventive coating, approved for use and application.

iii. Damaged receptacles: Lockout breaker, identify, tag, and disconnect the existing conductors from defective device. Remove defective device and replace in kind.

jjj. Non-operational blue lamp lighting fixture: Verify circuit is energized at the proper voltage. If electrical power is present, replace lamp in kind with approved led lamp.

2. In addition, provide all Site work including site clearing, site utilities, site roads and sidewalks, temporary parking for WMATA employees during construction, landscaping, graphics and signage, and traffic control devices for the complete project.

C. The Project shall function as an integral part of and be fully compatible with the existing WMATA system.

1.02 DAYS/HOURS OF WORK

A. The standard work week for the Contract will be 5 consecutive 8-hour days Monday-Friday, with the work scheduled between 6:00 am to 3:00 pm or as defined in Section 01141, ACCESS TO SITE.

B. Provide Contracting Officer Representative 7 Days advance notice prior to changing shift hours and 48 hours advance notice for planned work shifts outside the established work week and work day.

1.03 LOCATION

A. The Project is located at five WMATA Metro Station described below:

1. The two Largo Town Center parking facilities are located adjacent to north and south sides of the Largo Town Center Metro Station. The north parking garage can be accessed via Harry S. Truman Drive, and south parking garage can be accessed via Grand Boulevard. The north parking structure is a six-level garage with the lowest level at finish grade. The south parking structure is a five-level garage with the lowest level at finish grade. Both garages consist of upper levels made from consist of precast concrete double tee members, and façade made of precast panels with thin brick tiles and spandrel beams. The two parking facilities are connected via a roof level vehicular bridge over the metro platform, canopy and tracks.

2. The New Carrollton parking facility is located adjacent to the New Carrollton Metro Station along Garden City Drive. The parking structure is an eight-level garage with the lower level at finish grade. The elevated levels consist of precast concrete double tee members. The façade of the parking structure consists of precast concrete members.

3. The Vienna (North) parking facility is located just north of The Custis Memorial Parkway (Route 66) at the corner of Vaden Drive and County Creek Road. The parking structure is a four-level garage with the lowest level at finish grade. The upper levels consist of precast concrete double tee members. The façade of the parking structure consists of precast concrete members.

4. The West Falls Church parking facility is located between the westbound and eastbound lanes of the Custis Memorial Parkway, and south of the West Falls Church Metro Station. The parking structure is an eight-level garage with the lower level at finish grade. The elevated levels consist of precast concrete double tee members. The façade of the parking structure consists of precast concrete members.

5. The White Flint parking facility is located east of White Flint Metro Station and north of Marinelli Road. The parking structure is a six-level garage with the lower level at finish grade. The elevated levels consist of precast concrete double tee members. The façade of the parking structure consists of precast concrete members.

1.04 SITE LOGISTICS

A. Access to the construction Site shall be from garage entrance. Egress from the Site shall be from garage exit.

B. Construction equipment and materials will not be staged within Authority Right-of Way

1. Construction operations will be required to be staged as shown on the phasing drawings.

C. Parking

1. WMATA will not provide additional parking outside of what is shown on the phasing plans.

2. Contractor parking is prohibited on city streets.

D. Constraints on Construction

1. Work Sequence

a. Construction shall be completed in the following Phases

(1) See phasing plans.

2. Special Events

a. Minimize risks to the public during special community events that are located in close proximity to the Project Site.

b. Construction activities shall be coordinated with the Authority Rep. when working on site to reduce construction impacts during any special events.

c. Maintain a Special Community Event List in coordination with the Authority for the duration of the Contract. The list shall identify local special holidays, parades, festivals, and other similar events that are within the proximity of the Project construction area and operations. The list shall include the following information:

(1) Name and general description of the event

(2) Date, time of day, and duration

(3) Location(s)

E. Work performed by Others:

1. None.

F. Coordination of Work with Others: Coordinate Work through the Contracting Officer Representative with the following:

1. Utilities and jurisdictional authorities affected by or having jurisdiction over the Project.

2. Other Contracting Officer Representatives, Authority consultants, and contractors associated with adjacent projects.

G. Survey Work: Perform as needed to execute the Project as specified in Section 1721, LAYOUT OF WORK AND FIELD ENGINEERING.

H. Design Completion: Perform or furnish design professional services for specified elements of the Project. Perform the design services in accordance with the specifications and requirements of the Contract and in accordance with professional standards of skill, care,

and diligence adhered to by firms recognized for their expertise, experience, and knowledge in performing these services. The Contractor shall be responsible for the professional quality, technical accuracy, completeness, and coordination of the services. Design professional services shall be performed by a registered Professional Engineer licensed to practice engineering in all jurisdictions where the specified elements of the Project will be constructed.

I. Permits: The Authority has provided permits noted and attached in Section 00806, PERMITS AND RESPONSIBILITES. Contractor shall obtain all additional permits from Utilities and Jurisdictional Authorities as needed.

   1. The Contractor shall, without additional expense to the Authority, be responsible for obtaining necessary licenses, permits not provided by the Authority, and easements and for complying with applicable International, Federal, State, local, or municipal laws, codes, or regulations in connection with the prosecution of the Work.

J. Safety: Establish and manage Project safety in accordance with Section 01114, SAFETY/ ENVIRONMENTAL REQUIREMENTS.

K. Quality: Establish and manage a Quality System in accordance with Section 01470, QUALITY MANAGEMENT SYSTEM.

L. As-Built Documents: Maintain a hard copy drawing and specification record of as-built conditions during construction phase, and provide As-Built Drawings and As-Built Specifications at the completion of the Project in accordance with Section 01775, CLOSEOUT.

M. Demonstration and Training: Demonstrate equipment and systems and provide training to WMATA staff as indicated in Section 01820, DEMONSTRATION AND TRAINING.

N. Salvaging of Materials and Equipment

   1. Maintain property control records for materials or equipment to be salvaged. The Contractor shall be responsible for the storage and protection of salvaged materials and equipment and shall replace salvage materials and equipment, which are broken or damaged during salvage operations as the result of negligence or while in the Contractor’s care.

   2. Salvaged material not specified for reuse shall become the property of the Contractor and shall be removed from the Site.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION (not used)

END OF SECTION

SECTION 01111

CONTRACTOR KEY STAFF

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies key staff that forms the Contractor's team and identifies their basic functions.

1.02 REFERENCES

A. Registrar Accreditation Board of the American Society for Quality (RABASQ)

B. Occupational Safety and Health Association (OSHA)

1. Construction Safety Training

2. First Aid/CPR/Blood Borne Pathogens Training

1.03 SUBMITTALS

A. Submit the following within 10 Days of Award in accordance with Section 01330, SUBMITTAL PROCEDURES:

1. Evidence of qualifications and experience of Key Staff.

1.04 CONTRACTOR

A. The Contractor shall responsible for constructing the Project and for furnishing and managing the services of Subcontractors and vendors, to perform all manufacture, fabrication, installation, and construction to complete the Project in accordance with the Contract Documents, all applicable jurisdictional codes and regulations, the approved Quality Management System, the approved Safety Plan, and environmental and other applicable requirements to achieve Acceptance in accordance with the approved Project Schedule.

B. All personnel involved in the performance of construction work shall be experienced and qualified to perform their trade, and all construction work shall be performed in a skilled and workmanlike manner.

C. Individuals holding these key staff positions shall not be changed without written Authority approval for substitutions of key staff.

D. Key Staff

1. Construction Project Manager

a. Shall have an undergraduate degree in engineering with a minimum of 15 years experience in managing complex multi-discipline heavy construction

projects and a minimum of 10 years managing the construction of projects of a similar type and financial magnitude in the rapid transit industry.

b. Responsible for managing construction of all facets of the Project and has overall responsibility for its successful and timely completion.

c. Supervises the Key Staff, shall be the sole point of contact with the Contracting Officer Representative, shall be responsible for coordinating with outside agencies as required, shall be responsible for managing cost and maintaining schedule of the Project, shall be responsible for ensuring that QA/QC and Safety guidelines are followed, and shall be responsible for testing, commissioning, and close-out of the Project. Responsibilities include but are not limited to acquiring construction permits not furnished by the Authority; managing Subcontractors, independent testing companies, fabricators and Suppliers; development, management, and implementation of Project Schedule; preparation, submittal, and management of construction submittals; maintaining as-built documentation; and coordinating with outside agencies and Utility companies on construction related matters. The Construction Manager is responsible to ensure that construction is based on the Contract Documents and that all applicable codes and standards are complied with.

2. Construction General Superintendent

a. Shall have a minimum of 15 years experience in complex multi-discipline heavy construction, a minimum of 10 years in rapid transit industry, and a minimum of 5 years in a supervisory capacity supervising projects of a similar type and financial magnitude.

b. Responsible for oversight of day-to-day construction at the Site.

c. Responsibilities include but are not limited to supervising construction activity, overseeing coordination between Subcontractors, coordinating with Quality Manager and Safety Manager in the implementation of project Quality and Safety plans, and ensuring that construction is based on current Shop Drawings and Working Drawings. The Construction General Superintendent is also responsible for maintaining as-built documentation.

3. Quality Manager

a. A degreed engineer and trained as a Lead Auditor in a Registrar Accreditation Board of the American Society for Quality (RABASQ) approved course on the requirements of ISO 9001 and with a minimum of 10 years of related experience including a minimum of 5 years of management positions in a production, manufacturing, or construction environment performing QA/QC auditing. Transit industry experience is preferred.

b. Reports to one or more levels of management above the Contractor’s Project Manager.

c. Responsible for the Quality Assurance (QA) and Quality Control (QC) for the Project and shall be fully familiar with the Federal Transit Agency's (FTA) Quality requirements.

d. Shall be a full time staff member of the Contractor and shall establish, implement, and maintain the Quality Management System, shall report directly to and be supervised by an Officer of the Contractor at a level above that of the Project Manager responsible for the Project, shall serve as a liaison officer with the Authority and the Jurisdictional Authorities on matters relating to the Contractor's quality system, shall be responsible for ensuring that the Quality Management System is effective in ensuring that the Contract requirements are satisfied, and shall be responsible for the oversight of onsite and offsite testing by the Contractor.

4. Safety Superintendent

a. Shall have a degree in engineering with a minimum of 10 years experience in heavy industry construction safety practices and with a minimum of 5 years in rapid transit construction in operating conditions, and shall have completed OSHA Construction Safety Training and First Aid/CPR/Blood Borne Pathogens Training. Shall be a Certified Safety Professional (CSP).

b. Responsible for development of a construction safety plan.

c. Shall be a full time member of the Contractor and devotes full time to worksite safety in implementing, enforcing, and maintaining the safety program for the Contractor and Subcontractor forces. The Safety Superintendent shall have no duty other than safety supervision of persons, equipment, and property affected by Contract work.

d. Shall have specialized training and experience in construction safety supervision and have a thorough knowledge of all OSHA regulations. The Safety Superintendent shall have the ability to develop and conduct safety-training courses. The Safety Superintendent shall be familiar with industrial hygiene equipment and testing as required for the protection of all personnel and the public

PART 2 PRODUCTS (not used)

PART 3 EXECUTION (not used)

END OF SECTION

SECTION 01114

SAFETY/ENVIRONMENTAL REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes construction safety and security and environmental safety requirements for the Project including WMATA's Safety Awareness Program.

1.02 REFERENCES

A. WMATA Construction Safety and Environmental Manual (CSEM)

B. ANSI/ISEA 107 - American National Standard for High-Visibility Safety Apparel

C. Occupational Safety and Health Association (OSHA)

1. 29 CFR §1910
2. 29 CFR §1926
3. 49 CFR §172
4. 49 CFR §390-397

D. U.S. Army Corps of Engineers - Safety Manual EM-385-1-1

E. National Commission for the Certification of Crane Operators

F. Resource Conservation and Recovery Act (RCRA) of 1976 and amendments

G. Metrorail Safety Rules and Procedures Handbook (MSRPH) - SOP No. 19

H. WMATA, Office of Rail Transportation Maintenance Operations Control, Administrative Procedure OAP 200-33, Site Specific Work Plan (SSWP)

1.03 QUALITY ASSURANCE

A. Safety Superintendent: As specified in Section 01111, CONTRACTOR KEY STAFF

B. First Aid Attendant

1. Shall have current First Aid and CPR certification. A resume, certifications, and evidence of training shall be submitted documenting education and experience.
2. Shall be trained in Blood-borne Pathogens in accordance with CFR §1910.1030.

1.04 SUBMITTALS

A. Submit to the Contracting Officer Representative for approval in accordance with Section 01330, SUBMITTAL PROCEDURES, 60 Days prior to commencing construction, unless noted otherwise:

1. Documentation and Certifications of Safety Superintendent's and First Aid Attendant's, as applicable, experience in construction safety

2. Contractor's Organizational Health and Safety Program Plan that includes OSHA required plans listed below that are applicable to the Work

   a. Site-specific Emergency Response Plan

   b. Site-specific Temporary Fire Protection System Plan

   c. Site-specific Waste Water Discharge Plan if wastewater is generated

   d. Site-specific Pollution Control Program

   e. Site-specific Dust and Debris Control Plan

   f. Site-Specific Work Plans for all work that will be performed in the right-of-way and operational ancillary rooms within the station

   g. Site-specific Fall Protection Plan

   h. Bloodborne Pathogens Exposure Control Plan

   i. Hearing Conservation Program if employees are exposed to continuous noise in excess of the OSHA Action Level

   j. Respiratory Protection Program if employees are exposed to dust (including crystalline silica) or other toxic atmospheres in excess of the OSHA permissible exposure limits. If a respiratory program is required, provide documentation of training, medical clearance for respirator use, and respirator fit testing.

   k. Hot Work Program

   l. Lockout Tagout Program

   m. Confined Space Program

3. Job Hazard Analysis submitted prior to each element of construction.

4. Documentation to show that all Confined Space entrants and attendants are trained in Confined Space Entry, including hands-on-training or Confined Space Awareness, as applicable, and possess applicable licenses and certifications.

5. Site-specific Confined Space Permits at least 48 hours before entry.

6. Identity of all materials or chemicals to be used on Authority property (including welding rods), material safety data sheets (MSDSs) for these products, and a brief explanation of how they will be used and if wastes will be generated. Submit MSDS Review Request Forms prior to the use these materials or chemicals.

7. CCO certificates before crane operators work on the Site.

B. Submit to the Contracting Officer Representative for information in accordance with Section 01330, SUBMITTAL PROCEDURES, 60 Days prior to commencing construction, unless noted otherwise:

1. Certificates of Insurance for pollution liability coverage, if applicable, in accordance with Section 00877, INDEMNIFICATION AND INSURANCE REQUIREMENTS, for Contractor or Subcontractors performing work involving hazardous materials, hazardous substances, hazardous wastes, or contaminated soil or water.

2. Results of noise monitoring, air monitoring, and soil, water or waste sampling submitted weekly during work activities.

3. Documentation of medical surveillance submitted monthly.

4. Identity of equipment that may generate toxic atmospheres such as gasoline or diesel-powered generators, welding, and cutting equipment

5. Documentation of licenses and certificates required for lead or asbestos abatement, UST removal, or installation, OSHA's Hazardous Waste Operations and Emergency Response Standard (HAZWOPER), or other work requiring licensing or certification such as welding.

6. Documentation of licenses, certificates, and U.S. EPA identification numbers required for transportation of hazardous materials, hazardous substances, or hazardous wastes.

7. Documentation of licenses, permits, and certificates required for disposal of hazardous wastes including the name and address of the waste disposal facility where hazardous waste materials are to be disposed.

8. Certification of Crane Operators Certificate before the crane operator works on the Site.

9. Identification of air monitoring devices that will be used to monitor air quality at the Work Site. Provide copies of most recent manufacturer calibration and all Design-Builder field calibration checks.

1.05 SAFETY REQUIREMENTS

A. The Contractor shall be responsible for all Subcontractors, Suppliers, and other persons working under its direction to comply with all requirements as noted herein, and shall disseminate these requirements to those personnel.

B. Cooperate with representatives of the Authority and federal, state, and local regulatory agencies during Site inspections or investigations. Inspection and investigation activities do not involve directing of Contractor's work, but may involve interviews with Contractor personnel. The Contracting Officer Representative will notify the Contractor if any operation that is not in compliance with federal, state, or local health and safety or environmental regulations or Authority policy and procedures, and that may require the Contractor to stop work on a specific task or operation.

C. Immediately report all accidents and incidents (including near misses) that occur during the performance of the Work to the Contracting Officer Representative.

D. The storage of hazardous and flammable materials (including such items as rags, mops, paper towels, or other combustible materials contaminated with hazardous or flammable products) on Authority property, is restricted. Contractors seeking to store hazardous or flammable materials on Authority property must obtain approval from the Authority by submitting material safety data sheet (MSDS) for each specific chemical and the quantity of each chemical to be stored on the Site. It may not always be possible to grant permission to store hazardous or flammable materials on Authority property. If permission is granted, store the materials in compliance with the jurisdictional codes and regulations. Acquire permits for use of hazardous materials as required by the jurisdictional Fire Marshal.

E. The use of explosives for the performance of Contract work will not be permitted without written Approval from the Contracting Officer Representative. Obtain all permits and approvals from the Jurisdictional Authorities.

F. Prior to performing any work on or above or under the right-of-way, arrangements shall be made through the Contracting Officer Representative for access rights and power outage in accordance with SOP No. 19 contained in the Metrorail Safety Rules and Procedures Handbook and OAP 200-33 (SSWP). All special requests for access, single tracking, power outages, escorts, and other Authority support shall be submitted in writing. Site Specific Work Plans shall be submitted for all Work conducted in Authority Right-of Way and any operational facility. Ensure that personnel complete safety training by Authority on the rules and procedures for working on the Right-of-Way before starting such work.

G. Employ and assign to the construction work a Safety Superintendent as specified in Section 01111, CONTRACTOR KEY STAFF, and a separate certified First Aid Attendant for on-site work activities. A first aid station shall be established and fully equipped to meet the needs of the anticipated work force. The certified First Aid Attendant shall be on duty in the first aid station at all times when construction work is in progress except when on emergency calls. In no event shall work at the Site be performed until the approved Safety Superintendent and First Aid Attendant are available to the Project.

H. If, at any time, the Work Site is without the services of an approved Safety Superintendent and First Aid Attendant for a period of 15 Days or more, the Work may be closed down at the discretion of the Contracting Officer Representative. The Safety Superintendent and First Aid Attendant shall be acceptable to the Contracting Officer Representative, and their performance will be reviewed and documented by the Contracting Officer Representative on a continuing basis. If the Safety Superintendent's

and First Aid Attendant's effectiveness is below standard, the Contractor shall provide immediate replacement at the Contracting Officer Representative's direction. Once employed, the Safety Superintendent and First Aid Attendant shall not be changed without permission of the Contracting Officer Representative.

I. For all work within Confined Spaces, comply with all OSHA, state, and local Jurisdictional Authority rules and regulations for confined spaces defined by 29 CFR §1910.146. Confined spaces shall be classified as either non-permit confined space or permit-required confined space in accordance with OSHA regulations.

J. Prior to the initial entry into a confined space, coordinate entry with the Contracting Officer Representative and take air quality readings to establish base readings and conditions. At a minimum, oxygen, lower explosive limit, carbon monoxide, and hydrogen sulfide, shall be measured. Measurement of additional parameters may be required depending on the location of the space and potential for atmospheric hazards related to contamination or work activities.

K. Air quality and any additional parameter reading results shall be provided to the Contracting Officer Representative for recording purposes and shall determine if atmospheric hazards exist, which would classify the space as a permit-required confined space. Continuous and follow-up monitoring of air quality shall meet OSHA requirements, and all subsequent results shall be provided to the Contracting Officer Representative.

L. Prior to the start of any work involving non-permit confined spaces, submit the following:

1. Written Job Hazard Analysis for all work to be performed in the confined space, including MSDSs for chemicals to be used in the space. Submit MSDSs for all chemicals to be used on Authority property along with a brief description of how and where they will be used and if wastes will be generated. The MSDSs will be reviewed by Authority and if approved, the materials can be used in the system. If they are rejected, submit a substitute for Authority approval. The MSDSs must be recent (less than 3 years old) and comply with the OSHA Hazard Communication Standard 29 CFR §1910.1200. The Contractor is responsible for complying with the requirements of the MSDSs.

2. Written Emergency Response Plan, which identifies emergency responders for rescue operations.

3. Written plan for a temporary Fire Protection System as specified in Section 00740, PROTECTION OF PERSONS AND PROPERTY, for use during the term of the Contract, for Authority approval. Ensure that work activities do not adversely impact existing fire protection system(s) i.e., sprinklers, stand pipes, and portable extinguisher.

4. Identification of air monitoring devices that will be used to monitor air quality at the work Site. Provide copies of most recent manufacturer calibration and all Contractor field calibration checks. As a minimum, Authority requires field calibration checks on air monitoring instruments, each day (or shift) before use. The field calibration check information shall include the date, time, calibration check data, and the printed name and signature of the person performing the calibration check.

5. Documentation to show that all personnel working in or near non-permit confined spaces are trained in Confined Space Awareness.

M. Prior to the start of any work involving permit-required confined spaces, submit the following in addition to those items required for non-permit confined spaces:

1. Written Site-specific Confined Space Program.

2. Confined space permit for applicable space. Each permit is valid for a maximum of 24 hours.

3. Written Respiratory Protection Program.

4. Documentation to show that all personnel required to wear respiratory protection have received respiratory protection training, have been fit tested for the respirators they are required to wear (applies to tight fitting respirators) and have been medically evaluated to verify that they have no health problem that would interfere with their safe use of a respirator.

5. A warning sign to identify the work Site as a permit-required confined space requiring authorization to enter.

6. The Contractor is required to notify the State at least 24 hours prior to entering permit-required confined spaces or to employ State certified Safety personnel who will manage permit-required confined space access and who will perform the required record keeping.

N. Provide a Job Hazard Analysis prior to the start of each phase of work.

O. Work clothing consists of long pants, shirts with long or short sleeves, sturdy work boots, and appropriate personal protective equipment. Jewelry that hangs, loose clothing, or clothing with non-detachable hoods, drawstrings, or anything that can become entangled in machinery, shall not be worn on the work Site if machinery is in use on the work Site. Personal protective equipment such as hard hats and footwear shall meet the requirements of 29 CFR §1910.135 and §1910.136. Athletic-type footwear shall not be worn on the Site.

P. Smoking is prohibited in the Metrorail system, Metrobus system, other Authority facilities, and in Authority vehicles. The Contracting Officer Representative will select a designated smoking area outside the system or facilities and Contractor will be informed of its location. Contractor personnel found smoking in un-designated areas will be subject to removal from Authority property. The Contractor’s Safety Superintendent shall be responsible for ensuring compliance.

Q. The OSHA Standard for Sanitation, 29 CFR §1910.141, shall be followed. Prior to starting work, furnish for the Contractor’s staff, necessary toilet convenience secluded from public view. They should be kept in a clean and sanitary condition and shall comply with the requirements and regulations of the area in which the work is being performed. Potable drinking water shall be provided with individual cups and sanitary conditions for the water dispenser shall be maintained. A common drinking cup and other common utensils are prohibited.

R. For all work at heights above 6 feet, submit a detailed, site-specific Fall Protection Plan. Comply with the most stringent OSHA requirements for Walking-Working Surfaces (29 CFR Part 1910 Subpart D), Scaffolds (29 CFR Part 1926, Subpart L), and Fall Protection 29 CFR Part 1926, Subpart M.

S. Comply with 29 CFR §1910.95, Occupational Noise Exposure for all work on Authority property, including construction. This standard requires that employees exposed to continuous noise in excess of the OSHA Action Level, participate in a Hearing Conservation Program. Instruments used for noise measurements must be appropriate for the type of noise being measured (impact/impulse or continuous).

T. If the Work involves removal of paints or coatings, test the paint or coatings to determine if they contain heavy metals such as lead that require special handling and disposal considerations. As a minimum, testing shall be conducted for the eight metals (arsenic, barium, cadmium, chromium, lead, mercury, silver, and selenium) required by the Resource Conservation and Recovery Act (RCRA) of 1976 and amendments. If any of these are present, the components will require special handling and disposal to prevent exposure to workers, patrons, the community, and the environment. The Contractor's personnel performing lead-based paint abatement, removal, or control, shall have all licenses and accreditation required by the jurisdiction in which the work is performed. Jurisdictions that do not have their own state lead plans fall under the auspices of the Environmental Protection Agency (EPA). The Contractor shall provide medical monitoring to meet the requirements of 29 CFR §1910.1025 and §1926.62. As a minimum, medical monitoring shall consist of biological monitoring for lead and zinc protoporphyrin and shall include a physician's medical determination. As a minimum, biological monitoring shall be conducted immediately prior to working on Authority property where the employee may be exposed to lead, and immediately upon completion of this work. The Contractor shall provide training for lead workers and supervisors as required by the jurisdictional regulations. Documentation shall be submitted to the Contracting Officer Representative prior to commencement of work. All documentation shall be authentic and verifiable. All materials shall be handled and disposed of in compliance with the jurisdictional regulations. MSDSs for replacement paints/coatings must be approved by Authority prior to use on Authority property.

U. If the Work involves removal of insulation, flooring, cove base, mastic, ceiling tile, roofing materials, or any other material that is suspected of containing asbestos, the Contractor must have the materials sampled and analyzed to determine if they contain asbestos. If the Contractor will be handling or removing asbestos-containing materials, the Contractor shall have all licenses and accreditations required by the jurisdiction in which the work is performed. The Contractor s required to provide medical monitoring to meet the requirements of 29 CFR §1910.1001 and §1926.1101. The Contractor shall provide training for asbestos workers and supervisors as required by the jurisdictional regulations. Documentation shall be provided to the Contracting Officer Representative prior to commencement of work. All documentation shall be authentic and verifiable. All materials shall be handled and disposed of in compliance with the jurisdictional regulations. All replacement materials shall be free of asbestos.

V. Contractor's personnel shall not be exposed to asphalt fumes in excess of the National Institute for Occupational Safety and Health (NIOSH) recommended ceiling limit of 5

milligrams of asphalt fumes per cubic meter of air (5 mg/m^3), in any 15-minute period. NIOSH provides recommendations for control of asphalt fumes.

W. Work that generates visible dust requires submission of a Dust and Debris Control Plan to prevent exposure of employees, patrons, and the community to dust including crystalline silica dust. Be prepared to submit air-monitoring data to demonstrate effectiveness of dust control measures. If dust cannot be controlled, submit Respiratory Protection Program in compliance with 29 CFR §1926.103 or 29 CFR §1910.134, and submit evidence of air monitoring, training documentation, medical clearance for respirator use, and respirator fit tests for tight-fitting respirators.

X. Ensure that the level of exhaust emissions from equipment such as air compressors and generators, are within acceptable limits to comply with clean air regulations and that workers are not exposed to exhaust fumes or gases (carbon monoxide, sulfur dioxide, nitrogen oxides, hydrogen sulfide, aldehydes) in excess of the most stringent of occupational exposure limits.

Y. For all work generating waste water, submit a Waste Water Discharge Plan that describes how the Contractor will treat and release wastewater generated by activities at the work Site, for all work that generates wastewater. Apply for Temporary Discharge Permit from local sewer authority, as required by specific site activities. Comply with Consolidated Plan prepared by Authority for Bus Divisions and Rail Yards.

Z. For Abrasive Blasting activities, all MSDSs for abrasives shall be submitted for Approval prior to abrasive blasting activities. Only abrasives containing less than 1 percent crystalline silica shall be used for abrasive blasting.

AA. For Hot Work activities, provide documentation on certification for personnel who perform welding on Authority property. Ventilation in accordance with OSHA regulations shall be provided for hot work such as welding, cutting, or brazing.

BB. At the Site of the work, a First Aid Kit shall be provided and fully equipped to meet the needs of the anticipated work force. Employees expected to render First Aid or CPR shall have the proper current certifications and be trained in Bloodborne Pathogens in accordance with 29 CFR §1910.1030.

CC. Work shall not be performed in any area in use by the public, unless specifically required by the Contract or directed in writing by the Contracting Officer Representative. Give at least 48 hours notice to the Contracting Officer Representative before beginning such work.

DD. In cases where the movement of Contractor's motorized equipment is necessary, flag persons shall be provided to warn and direct personnel and patrons away from the area of travel. Flag persons shall be certified as trained in proper flagging techniques and Contractor employees involved in traffic control and devices shall be certified as trained in traffic management as required by the State or local jurisdiction. Certification shall be documented.

EE. When it is necessary to maintain use of work areas involving stations, sidewalks, elevators, platforms, bus shelters, vehicular roadways, building entrances, and corridors,

protect the area with guardrails, substantial barricades, temporary fences, overhead protection, and temporary partitions as deemed necessary by the Contracting Officer Representative. Under no circumstances will yellow or orange tape strung between barricades, or the like, be acceptable as a substantial barricade. Open manholes, access openings, or other breaks in the normal walking surface shall be isolated from personnel and the public using barricades.

FF. Sidewalks, entrances, platforms, mezzanines, or any other location where personnel or the public traverses, shall always be kept clear of obstruction, tools, ladders, work debris, and excavation materials. When necessary, temporary sidewalks or pathways shall be provided for pedestrian traffic. Temporary sidewalks or pathways shall be free of tripping hazards and protected by proper guardrails and barricades. Temporary means of egress and access shall be marked for easy recognition. If work is required above sidewalks, overhead protection shall be provided. Protected walkways shall be Approved by the Authority.

GG. Appropriate warning signs and instructional safety signs shall be conspicuously posted in all areas involving construction activities. Work involving electrical systems or equipment in or near the area to which personnel or the public have access shall be isolated using barricades and partitions. Exposed, live circuits shall not be left accessible to personnel or the public or left dangling overhead. Before completion of the Work:

1. Ensure that all wiring is insulated and properly positioned.

2. Verify grounding, bonding, or both, of all metallic conduit, wiring or electrical equipment that is in the areas of contractual effort, and to which the public can make contact.

3. Notify the Contracting Officer Representative immediately in those instances where verification cannot be made.

4. Contractor’s personnel working near the platform edge or in the right-of-way shall wear reflective safety vests with the tear-away feature, to identify them to passing trains, as directed by the Authority at the right-of-way safety training required in this Section. The safety vests shall comply with the ANSI/ISEA 107 guideline entitled American National Standard for High-Visibility Safety Apparel. All of the Contractor’s personnel are required to attend safety training provided by the Authority before starting work near the platform edge or in the right-of-way.

HH. Use of Cranes and Derricks:

1. General Safety Requirements. Comply with the following:

   a. 29 CFR §1910.180 through §1910.189.

   b. 29 CFR §1926.550 through §1926.556

   c. U.S. Army Corps of Engineers, Safety Manual EM-385-1-1.

2. No part of any crane or derrick boom shall swing over Authority patrons, tracks, or stations without an Authority Approved shield or procedure.

3. Placement of crane or derrick shall be coordinated with the Contracting Officer Representative.

4. A supervisory or a red tag power outage is required. Exceptions may be granted on an individual basis after a review and approval by the Authority.

5. Hardhat requirements are enforced.

6. “Swing Stop” requirements may be instituted based on the hazards involved.

7. Use of cranes and derricks over common corridor railroads and highways is under the rules of the affected common corridor railroad or highway owner.

8. All cranes used for erecting components of precast concrete on the Project shall be equipped with Load Moment Indicating (LMI) devices or Rated Capacity Indicators (RCI), an anti-two-block device. All crane operators shall be certified to operate the type of crane used by the National Commission for the Certification of Crane Operators (CCO) and their CCO certificates shall be submitted to the Contracting Officer Representative. To increase the factor of safety when picking structural elements of the building, all cranes shall have load capacity charts reduced (de-rated) by a factor of 30 percent. Submit a lift plan showing all pertinent information demonstrating that the total load does not exceed 70 percent of the maximum before crane delivery to the Project Site.

II. All jobsite visits for visitors and tours shall be coordinated through Contracting Officer Representative in accordance with the WMATA Construction Safety and Environmental Manual, and Contractor insurance requirements.

1.06 ENVIRONMENTAL SAFETY REQUIREMENTS

A. Comply with the most stringent of federal, state, or local environmental regulations for air, water, land, and waste in order to maintain the safety and health of employees, Authority patrons, and the community.

B. If task requires specialized licenses or certifications, for example “lead or asbestos abatement contractor’s license or certified tank installer/remover”, show evidence of such registration prior to commencement of work. If the Work requires specialized training, for example lead or asbestos training, show evidence that employees have received such training prior to commencement of work.

C. If the Work requires transportation of hazardous materials or hazardous substances, provide evidence of Department of Transportation General Awareness Driver’s Training in compliance with 49 CFR §172 and Commercial Driver’s License in compliance with 49 CFR §390-397, prior to commencement of work.

D. All hazardous materials and hazardous substances shall be stored in “Performance Oriented Packaging” in compliance with 49 CFR §178, Subpart L.

E. If the Work requires disposal of hazardous wastes, disposal shall be to a Treatment/Storage/Disposal facility with a Part B Permit and the waste hauler shall have a state or local license and U.S. EPA identification number. Apply and pay for temporary

EPA Generator ID number required to dispose of hazardous waste. Submit evidence of all applicable licenses and permits along with the name and address of the waste disposal facility where hazardous waste materials are to be disposed, prior to commencement of work.

F. If the Work involves response to spills of hazardous materials, hazardous substances or hazardous wastes, all personnel shall have appropriate training that complies with 29 CFR §1910.120.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION (not used)

END OF SECTION

SECTION 01116

IDENTIFICATION AND SECURITY

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes identification and security requirements for work on Authority Property.

1.02 DEFINITIONS

A. Authority Property: Includes the Authority's Rail and Bus Operating System and Authority administrative facilities, whether under construction or being rehabilitated.

1.03 SUBMITTALS

A. Forms necessary to initiate background check process, including color copy of the front and back of Contractor personnel's Driver License or other accepted form of identification.

1.04 CRIMINAL BACKGROUND CHECK REQUIREMENT

A. As a prerequisite to eligibility for a WMATA-issued identification and access badge ("One Badge"), access to WMATA's customers, property, or confidential information, and in consideration for this Contract, the Contractor shall have the sole responsibility for, and shall assure, adequate criminal background screenings on a routine basis of all of its personnel who are or will be working on WMATA's premises (whether they receive a One Badge or not) or otherwise have access to WMATA's customers, property, or confidential information.

B. Contractor shall implement, not later than notice to proceed, a criminal background check screening of the Contractor's personnel that shall take into consideration (1) the nature of the services or work being performed under the contract with particular regard for the individual's access to, and interaction with, WMATA's customers, property, and confidential information; (2) the nature or gravity of the offense or conduct resulting in a criminal conviction; and (3) the time that has lapsed since the conviction and/or completion of the sentence.

C. The Contractor shall contract with, or otherwise engage, a reputable third-party vendor to conduct the required criminal background screenings, and shall provide the vendor with a copy of its criminal background check screening policies and procedures.

D. The Contractor shall not place any person on or engage any person under this Contract, unless that person passes the Contractor's criminal background screening. At the end of each calendar quarter, the Contractor shall certify to the Contracting Officer's Technical Representative on a form provided, its compliance with this criminal background screening requirement and confirm that all persons

required to be screened passed the contractor's criminal background screening before working on this Contract. For the sole purpose of monitoring the Contractor's compliance, WMATA reserves the right to request additional documents or perform its own criminal background screening of Contractor's personnel. The Contracting Officer will inform the Contractor, in writing, of any proposed action within a reasonable time before such action is taken.

E. The Contractor shall indemnify and hold WMATA harmless from any and all claims, demands, damages, costs and expenses, including attorneys' fees and other costs and expenses associated with any claims, demands, requests for relief, and/or other liabilities arising out of or resulting from the contractor's criminal background screening obligations and processes.

F. The Contractor will include this requirement in all subcontracts under this Contract, and receive certifications from their subcontractors to ensure that its subcontractors' personnel who are or will be working on WMATA's premises (whether they receive a One Badge or not) or otherwise have access to WMATA's customers, property, or confidential information undergo the required criminal background checks.

1.05 IDENTIFICATION AND SECURITY CHECKS

A. All employees of the Contractor and its Subcontractors working on WMATA projects shall prominently display an identification badge issued by the Authority.

B. Contractor Photo ID Badges: Individuals requiring the Contractor photo ID badges are subject to the following identification and security checks

1. Provide valid and current photo identification, such as a State-issued Driver's License, State-issued Identification Card, U.S. Passport, or identification from the Immigration and Naturalization Service, such as a Permit to Work or a Permanent Residence Card (Green Card).

2. The individual's identification may be matched against the FBI Watch List and security clearance.

3. The photo identification will be matched against the Contractor's list of employees authorized to work on a particular job.

1.06 NON-CONFORMANCE

A. In the event any employee of the Contractor or its Subcontractors fails to adhere to the requirements of this Section, the employee or Subcontractor will be removed from the job until non-conformance is corrected. Such removal will not be grounds for any time extension or additional compensation.

1.07 ADMINISTRATION

A. Contractor Photo ID Badge:

1. A Contractor Photo ID badge will be required if the individual will be present on Authority Property. Issuance of the Contractor Photo ID badge will require the

individual to schedule and report to the Authority's Jackson Graham Building at 600 Fifth Street, NW, Washington DC for processing.

2. Contractor Photo ID badge takes approximately 14 Days to obtain unless personnel have lived outside of the United States within the last year, in which case the background checking process will require additional time to complete.

3. It will be the Contractor's responsibility to immediately notify the Contracting Officer Representative if a worker loses his or her Contractor Photo ID badge. A fee will be charged for each lost badge.

4. All Contractor Photo ID badges shall be returned to the Contracting Officer Representative when they are no longer needed.

5. Contractor Photo ID badges shall be renewed on an annual basis.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION (not used)

END OF SECTION

SECTION 01141

ACCESS TO SITE

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies requirements for gaining access to Site and describes work hours the Contractor will be allowed in WMATA Trackway and Operating Facilities.

1.02 DEFINITIONS:

A. Non-Revenue Hours of Work – When the Authority is not operating revenue service trains and the track is made available to the Contractor.

B. Revenue Service Adjustment (RSA) Hours of Work – There are two service conditions:

1. Single tracking when a single track is made available to the Contractor to work while the Authority operates trains in both directions on the opposite track.

2. Shutdowns when both tracks of a section of line are made available to the Contractor to work.

1.03 IDENTIFICATION CARDS

A. All Contractor personnel needing access to trackway or WMATA operating facilities must have WMATA Safety Certification badges. Additionally, Contractor shall provide its personnel, visiting or working at the Site, with Contractor Photo ID Badges. Both badges shall be displayed in a prominent manner on each person while engaged in the Work. Access to the Site will be granted only to properly accredited representatives of the Contractor and its Subcontractors when they have completed the required WMATA safety certification and training and received Photo ID Badges.

1.04 HOURS OF WORK

A. Work such hours per shift, with or without overtime, as many shifts per day and as many days per week as necessary to complete the various parts of the Work and the entire Work within the dates specified and within the restrictions listed below.

B. Work within WMATA trackway, on station platforms and within WMATA operating facilities affecting revenue service shall be carried out during non-revenue hours and/or Revenue Service Adjustment (RSA) hours and under the oversight of WMATA escorts.

C. Coordinate and schedule all work with the Contracting Officer Representative to ensure that the Contractor’s activities do not interfere with the operation of or access to the Authority’s facilities.

D. Typical working hours for work not requiring access to track or other Authority facilities that require escorts for access are 0700 to 1600.

E. Project Schedule, as required in Section 01322, CONTRACT PROGRESS REPORTING, shall include a detailed construction-phasing plan based on the Hours of Work commitments by the Authority. If the phasing plan requires RSA hours, these shall be identified by the Contractor in the Project Schedule by calendar quarter within which they will occur.

F. There are Federal Holidays that occur on Monday's throughout the year creating a 3-day weekend. In addition to the Hours of Work indicated in Article 1.04G herein, on holiday weekends listed below, single track RSAs will be permitted between 2200 Friday and 0400 Tuesday and complete shutdown RSAs will be permitted between 0300 Saturday and 0400 Tuesday.

   1. Martin Luther King Day
   2. President's Day
   3. Memorial Day
   4. Columbus Day
   5. Labor Day

G. The Hours of Work associated with non-revenue and RSAs and the frequency that these Hours of Work will be available to the Contractor are noted below. Also included are specific dates for the first year of construction, which shall be incorporated into the Project Schedule by the Contractor as required work dates.

   1. Non-revenue – Mon – Thu 12:30 am – 4:30 am
   2. Fri / Sat 2:00 am – 6:00 am
   3. Sun 2:00 am – 7:00 am
   4. Shutdown Sat morning 1:00 am to Mon morning 4:00 am

H. RSAs will not be permitted during the following periods in any calendar year:

   1. March 12 through April 21
   2. The first Saturday of June (Race for the Cure)
   3. The week containing July 4 including the preceding and succeeding weekends.
   4. The 4th Sunday of October (Marine Corps Marathon)
   5. Thanksgiving eve through the following Monday
   6. Christmas eve and Christmas day

7. New Year's eve and New Year's day

I. Many times during a calendar year there are large events scheduled in the Washington DC area that require special attention by WMATA. These events are typically scheduled no sooner than 90 Days in advance of their occurrence. Plan no more than three such events in any calendar year. WMATA will notify the Contractor of the scheduling of these events as soon as they become known. If the event conflicts with a scheduled RSA, then the Contractor RSAs will need to be advanced or delayed 1 week unless there is conflict with the black-out periods listed above.

J. There shall be no RSAs starting prior to 0100 on nights of regularly scheduled sporting events such as baseball, basketball, hockey, or soccer.

K. Emergencies, excluding Acts of God, arise during the course of Metrorail operations that could cause the cancellation of a scheduled RSA. Anticipate no more than four cancellations within a calendar year. If an emergency occurs, then the Contractor RSAs will need to be delayed 1 week unless that conflicts with the black-out periods listed above.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION (not used)

END OF SECTION

SECTION 01180

PROJECT UTILITY INTERFACE

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies the Contractor's responsibilities regarding interface with Utility companies and agencies.

1.02 SUBMITTALS

A. Submit sets of drawings and specifications to those Utilities and agencies affected by construction as required. Provide the Contracting Officer Representative with an electronic copy of all transmittal letters and other communications and replies thereto as each is sent to or received from a Utility or agency.

B. Complete list of affected Utilities and agencies to the Contracting Officer Representative:

C. Shop Drawings for utility connections and special facilities developed during construction.

1.03 UTILITIES AND AGENCIES

A. Comply with the requirements of each Utility and agency.

B. The Utilities and agencies listed hereinafter may not be all inclusive. Recommend additional agencies/utility companies as appropriate. Determine all affected Utilities including but not limited to the following agencies or their successor agencies and submit complete list to the Contracting Officer Representative:

1. Verizon
2. Washington Gas
3. PEPCO
4. WSSC
5. Comcast
6. Cox Cable
7. Plantation Pipeline Company
8. Other identified utility owner (cable, fuel lines, etc.) whose facility will be affected by the construction

PART 2 PRODUCTS

2.01 APPROVED PRODUCTS

A. All products to be utilized on any utility shall be as approved by that Utility.

PART 3 EXECUTION

3.01 DESIGN, CONSTRUCTION, AND MAINTENANCE OF UTILITY FACILITIES

A. All work performed by the Contractor on any utility, if any, shall be performed in accordance with the requirements of that Utility and the full knowledge of the Contracting Officer Representative.

B. Contract Drawings indicate where Utilities will self-perform design, construction, and maintenance of their facilities in relation to this Contract. Coordinate the schedule and the interface for the Work of the Contract with the work done by Utility.

C. Provide the Utilities with detailed Shop Drawings for utility connections and special facilities during construction.

END OF SECTION

SECTION 01250

CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies procedures for making Contract Modifications.

1.02 GENERAL

A. Out-of-Scope Items. Specific approval must be received from the Contracting Officer Representative prior to doing work, which may be considered to be outside the Scope of Work and for which additional reimbursement may be requested in accordance with the General Conditions.

B. Requests for additional work may be initiated by the Authority. Claims for an increase in Contract Price shall be thoroughly documented as specified in the General Conditions and directed to the Contracting Officer Representative who, upon Approval, will issue a Modification stating the amount of the increase in fee.

C. Should the Contractor be excused from the provision of certain services identified in this Scope of Work, the Contractor will be requested to give a credit to the Authority. The offer for the credit shall be documented and directed to the Contracting Officer Representative who, upon Approval at the appropriate level, will issue a Modification.

1.03 TIME AND MATERIALS WORK FOR THE CONSTRUCTION EFFORT

A. In the event equitable adjustment cannot be agreed to in a timely manner, the Authority reserves the right to order work on a time and materials basis as specified in the General Conditions. When work is ordered under this Section, notwithstanding the provisions of other Sections, compensation for the Work shall be determined as hereinafter provided and shall constitute the total compensation to be paid for the changes to the Work. The methods, labor, materials, and equipment used in the performance of such work shall be subject to the Approval of the Authority.

B. Work performed by or for the Contractor: labor, materials, services, and equipment shall be furnished by the Contractor or by a Subcontractor or by others on behalf of the Contractor. The Contractor will be paid therefor as hereinafter provided, except where agreement has been reached to pay in accordance with Article 1.03C. below.

1. Labor: The cost of labor used in performing the work, whether the employer is the Contractor, Subcontractor, or other forces, will be the sum of the following:

   a. The gross actual wages paid including income tax withholding but not including any employer payments to or on behalf of workmen for health and welfare, pension, vacation, insurance, and similar purposes.

   b. To the actual gross wages, as defined in Article 1.03B.1.a above, will be applied a percentage based upon current applicable labor rates concerning

payments made to or on behalf of workmen other than actual wages, which percentage shall constitute full compensation for all payments other than actual gross wages as defined in Article 1.03B.1.a above and subsistence and travel allowance as specified in Article 1.03B.1.c below. The Contractor shall compute a separate percentage for each craft or a composite percentage for all crafts, if so approved by the Authority. All computed percentages shall be submitted to the Contracting Officer Representative for Approval within 30 Days after start of construction work or as directed by the Contracting Officer Representative prior to time and materials work being performed.

c. Subsistence and travel allowance paid to such workmen if required by collective bargaining agreements. The charges for labor shall include all classifications through foremen when engaged in the actual and direct performance of the Work. They shall not include charges for such overhead personnel as assistant superintendents, superintendents, office personnel, timekeepers, and maintenance mechanics.

2. Materials: The cost of materials required for the accomplishment of the Work will be delivered cost to the purchaser, whether Contractor, Subcontractor, or other forces, from the Supplier thereof, except as the following are applicable:

   a. If a cash or trade discount by the actual supplier is offered or available to the purchaser, it shall be credited to the Authority notwithstanding the fact that such discount may not have been taken.

   b. If materials are procured by the purchaser by any method, which is not a direct purchase from and a direct billing by the actual supplier to such purchaser, the cost of such materials, including handling, shall be deemed to be the price to the actual Supplier as determined by the Contracting Officer Representative.

   c. If the materials are obtained from a supply or source owned wholly or in part by the purchaser, payment therefor will not exceed the price paid by the purchaser for similar materials furnished from said source on Contract items or the current wholesale price for such materials delivered to the job Site, whichever price is lower.

   d. The cost of such materials shall not exceed the lowest current wholesale price at which such materials are available in the quantities concerned, delivered to the job Site, less any discount as provided in Article 1.03B.2.a above.

   e. If the Contractor does not furnish satisfactory evidence of the cost of such materials from the actual supplier thereof, the cost shall then be determined in accordance with Article 1.03B.2.d above.

   f. The Contractor will not be compensated for indirect costs and profit on Authority-furnished materials.

3. Equipment: The Contractor will be paid for the use of equipment in accordance with the Contract. The Contractor shall furnish all data, which might assist the Authority in the establishment of such rates.

    a. Operators of equipment will be paid under Article 1.03B.1 above.

    b. Small tools (defined as equipment less than $2,000 in acquisition costs) are computed at a maximum of 5 percent of direct base labor wages.

4. Subcontracts: The cost for Subcontract work at any tier will be the actual cost to the Contractor/Subcontractor for work performed by a Subcontractor as computed in accordance with Articles 1.03B.1 through 1.03B.3 above. For the purposes of this Article, Subcontractor is defined as an individual, partnership, corporation, association, joint venture, or any combination thereof, who contracts with the Contractor to perform work or labor or render service on or about the work. The term Subcontractor shall not include those who supply materials only. When work paid for on a time and materials basis is performed by forces other than the Contractor's organization, the Contractor shall reach agreement with such other forces as to the distribution of the payment made by the Authority for such work, and no additional payment therefore will be made by the Authority by reason of performance of the Work by a Subcontractor or by others.

5. To the totals, completed as indicated in Articles 1.03B.1 through 1.03B.4, shall be added field office overhead as follows:

    a. If the costs determined above do not exceed $100,000 and the adjustment in time for Contract performance is 10 Days or less, the markup shall be computed in accordance with Article 1.04 below.

    b. In all other cases, the most recent audited daily field office overhead rate will be used.

6. Home Office General and Administrative (G&A) costs will be determined using the most recent audited rate at the time the work was accomplished. A fixed rate of 3 percent will be used in the absence of an audited rate.

7. Profit will be negotiated as provided in Article 1.07 below.

8. A percentage for Contractor's bond, not to exceed 1 percent, may be added.

C. Special items of work: If the Contracting Officer Representative and the Contractor, by agreement, determine that either: an item of time and materials work does not represent a significant portion of the total Contract Price, or such item of work cannot be performed by the forces of the Contractor or the forces of any of its Subcontractors, or it is not in accordance with the established practice of the industry involved to keep the records, which the procedure outlined in Article 1.03B above would require, charges for such special time and materials work item may be made on the basis of invoices for such work without complete itemization of labor, materials, and equipment rental costs. To such invoiced price, less a credit to the Authority for any cash or trade discount offered or available, whether or not such

discount may have been taken, will be added a negotiated amount not to exceed 5 percent of the discounted price, in lieu of the negotiated lump sum not to exceed the percentages provided for in Article 1.03B above.

D. Records: The Contractor shall maintain its separate records in such a manner as to provide a clear distinction between the direct costs of work paid for on a time and materials basis and the cost of other operations.

1. The Contractor shall prepare, and furnish to the Contracting Officer Representative one electronic copy of report sheets of each day's work paid for on a time and materials basis the day after such work was performed. The daily report sheet shall itemize the materials used, and shall cover the direct cost of labor and the charges for equipment rental, whether furnished by the Contractor, Subcontractor, or other forces, except for charges described in Article 1.03C above. The daily report sheet shall provide names or identifications and classifications of workmen, the hours worked, and the size, type, and identification number of equipment, and hours operated.

2. Material charges shall be substantiated by valid copies of vendor's invoices. Such invoices shall be submitted with the daily report sheets, or if not available, they shall be submitted with subsequent daily report sheets. Should said vendor's invoices not be submitted within 60 Days after the date of delivery of the material or 15 Days after acceptance of the Work, whichever comes first, the Authority reserves the right to establish the cost of such materials at the lowest current wholesale prices at which such materials are available in the quantities concerned delivered to the location of the Work less any discounts provided in Article 1.03B.2.a above.

3. Said daily report sheets shall be signed by the Contractor or its authorized agent.

4. The Contracting Officer Representative will compare the Authority's records with the Contractor's daily report sheets, make any necessary adjustment, and compile the costs of work paid for on a time and materials basis on daily time and materials work report forms furnished by the Authority. When these daily reports are agreed upon and signed by both parties, they shall become the basis of payment for the work performed, but shall not preclude subsequent adjustment based on a later audit. The use of any specific Authority form, such as the Daily Report – Labor, Materials, & Equipment Form C-113, to segregate change order costs does not, in and of itself, invoke the provisions of this Article 1.03 or other provision of this Contract.

E. Payment: Payment as provided in Articles 1.03B and 1.03C above shall constitute full compensation to the Contractor for performance of work paid for on a time and materials basis and no additional compensation will be allowed therefore.

1.04 EQUITABLE ADJUSTMENT FOR MINOR CONTRACT MODIFICATIONS FOR THE CONSTRUCTION EFFORT

A. When the Authority and Contractor agree to an additive or deductive amount for a Modification to this Contract made pursuant to this Contract when the fair and

reasonable price in aggregate amount does not exceed $100,000, and further agree to an adjustment in the time for Period of Performance resulting from said Modification, which increases or decreases the completion date 10 or less Days, the equitable adjustment in Contract amount shall consist of the sum of the following:

1. Direct labor, material, and equipment costs as agreed to by the Authority and Contractor (small tools, defined as equipment less than $2,000 in acquisition costs, are included in equipment costs and computed at a maximum of 5 percent of direct base labor wages.)

2. Job Office Overhead costs, the sum of which shall be limited to a maximum of 10 percent of direct labor costs, including fringe benefits, but excluding FICA, FUTA, and State Unemployment Insurance (SUI); a maximum of 10 percent of direct material costs; a maximum of 5 percent of direct equipment costs (including small tools); and a maximum of 5 percent of Subcontract costs.

3. Home Office General and Administrative (G&A) costs are computed using the most recent audited rate or a fixed rate of 3 percent in the absence of an audited rate.

4. Profit will be determined in accordance with the guidelines specified in Article 1.06 below.

B. In using the above rates, the following shall apply:

1. Payroll Tax (FICA, FUTA, and SUI) amounts are added immediately after direct and indirect costs are totaled.

2. Subcontractors' indirect costs and profit shall be computed in the same manner as above.

3. Indirect costs shall not be duplicated in direct costs.

4. When the Period of Performance is increased, the change in Contract amount for direct and indirect costs computed by application of the above rates includes costs of impact and extended performance due to the time extension and no further consideration of costs arising from the specific Modification and cited pending change orders (PCOs) will be given. The Contractor will <u>not</u> receive both a percentage and a daily rate markup for job office overhead costs when a time extension to the Period of Performance is recognized.

5. Bond costs will be allowed at actual cost without markup.

C. Equipment rates shall be determined from prior Authority audits. In the absence of audited rates for equipment owned or controlled by the Contractor, hourly rates shall be computed in the same fashion as described in Article 1.07D.

1.05 COST OR PRICING DATA

A. The Contractor shall submit to the Contracting Officer Representative, either actually or by specific identification in writing an electronic copy of cost or pricing data under

the conditions described in this Paragraph and certify that, to the best of the Contractor's knowledge and belief, the cost or pricing data submitted is accurate, complete, and current as of the date of execution, which date shall be as close as possible to the date of agreement on the negotiated price of the Contract Modification. The cost or pricing data shall be submitted at the time the Contractor submits its proposal for the pricing of any Modification to this Contract, whether or not cost or pricing data was required in connection with the initial pricing of the Contract, when the Modification involves aggregate increases or decreases in costs plus applicable profits expected to exceed $100,000, or less at the discretion of the Authority Representative.

B. The submittal of certified cost or pricing data will not be required if the price is based on adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the general public, or prices set by law or regulation. The Contractor agrees that the terms "adequate price competition" and "established catalog or market prices of commercial items sold in substantial quantities to the general public" will be determined by the Authority in accordance with the guidelines as set forth in Subpart 15.8 of the Federal Acquisition Regulations (48 CFR 15.8).

C. Cost or pricing data consists of all facts existing up to the time of agreement on price, which prudent buyers and sellers would reasonably expect to have a significant effect on the price negotiations for the Modification. The definition of cost or pricing data embraces more than historical accounting data; it also includes, where applicable, such factors as Subcontractor, Supplier, and vendor quotations, nonrecurring costs, changes in construction methods, unit cost trends such as those associated with labor efficiency and any management decisions which could reasonably be expected to have a significant bearing on costs under the proposed Modification and the Contract Work. Cost or pricing data consists of all facts, which can reasonably be expected to contribute to sound estimates of future costs as well as to the validity of costs already incurred. Cost or pricing data, being factual, is that type of information, which can be verified. Because the certificate pertains to cost or pricing data, it does not make representations as to the accuracy of the Contractor's judgment on the estimated portion of future costs or projections. The certificate does, however, apply to the data upon which the Contractor's judgment is based.

1.06 CONTRACT MODIFICATIONS, REQUIREMENTS FOR PROPOSALS, PRICE BREAKDOWN, NEGOTIATION OF PROFIT

A. The Contractor, in connection with any proposal it makes for a Contract Modification as specified in Section 00750, ACCOUNTING AND RECORD KEEPING, shall furnish a price breakdown, itemized as required by the Contracting Officer Representative. Unless otherwise directed, the breakdown shall be in sufficient detail to permit an analysis of all material, labor, equipment, Subcontract, and overhead costs, as well as profit, and shall cover all work involved in the Modification, whether such work was deleted, added, or changed. Any amount claimed for Subcontracts shall be supported by a similar price breakdown. In addition, if the proposal includes a time extension, a justification therefore shall also be furnished. The original and one electronic copy of the proposal, together with the price breakdown and time

extension justification, shall be furnished by the date specified by the Contracting Officer Representative.

B. Where profit is negotiated as an element of price, with either the Contractor or Subcontractor, a reasonable profit will be negotiated for each Modification by using the following procedure as a guide:

1. Breakdown:

Factor	Rate	Weight	Value
Degree of risk	20		
Relative difficulty of work	15		
Size of job	15		
Period of performance	15		
Contractor's investment	5		
Assistance by Authority	5		
Subcontracting	25		
TOTAL	100%		

2. Based on the circumstances of each Modification, each of the above factors shall be weighted from 0.03 to 0.12 as indicated below. The value shall be obtained by multiplying the rate by the weight. From the value column when totaled the fair and reasonable profit can be determined under the circumstances of the particular Modification.

a. Degree of risk: Where the modified work involves no risk or the degree of risk is very small, the weighting should be 0.03. As the degree of risk increases, the weighting should be increased up to a maximum of 0.12. Lump sum items will have generally a higher weighted value than unit price items for which quantities are provided. Other things to consider: The portion of the Work to be done by Subcontractors, nature of work, where work is to be performed, reasonableness of negotiated costs, amount of labor included in costs, and whether the negotiation is before or after performance of work.

b. Relative difficulty of work: If the modified work is most difficult and complex, the weighting should be 0.12 and should be proportionately reduced to 0.03 on the simplest of jobs. This factor is tied in to some extent with the degree of risk. Things to consider: The nature of the Work, by whom it is to be done, the location, and the time schedule.

c. Size of job: All modified work not in excess of $100,000 shall be weighted at 0.12. Work estimated between $100,000 and $5,000,000 shall be

proportionately weighted from 0.12 to 0.05. Work from $5,000,000 to $10,000,000 shall be weighted at 0.04, and work in excess of $10,000,000 at 0.03.

d. Period of performance: Modifications providing for an extension of time in excess of 30 Days shall be weighted at 0.12. Jobs of lesser duration shall be proportionately weighted to a minimum of 0.03 for jobs not to exceed 1 Day. No weight will be granted for this factor where there is no extension of the Period of Performance or interim dates due to work under this Modification.

e. Contractor's investment: Should be weighted from 0.03 to 0.12 on the basis of below average, average, and above average. Things to consider: Amount of Subcontracting, mobilization payment item, Authority-furnished property, and method of making progress payments.

f. Assistance by Authority: Should be weighted from 0.12 to 0.03 on the basis of average to above average. Things to consider: Use of Authority-owned property, equipment and facilities, and expediting assistance.

g. Subcontracting: Should be weighted inversely proportional to the amount of Subcontracting. Where 80 percent or more of the Work is to be Subcontracted, the weighting should to be 0.03, and such weighting proportionately increased to 0.12 where all the work is performed by the Contractor's own forces.

3. When considered necessary because of very unusual circumstances or local conditions, the range of weight may be increased to an upper limit of 0.15 if supported by adequate justification and Approved by the Authority.

4. When negotiations between the Contracting Officer or the Contracting Officer Representative and the Contractor are joined to determine an equitable adjustment for a Modification of this Contract, the Contractor shall encourage involved Subcontractor(s) to be present and to present their cost data and to participate in the resolution of a fair and equitable adjustment. In any event, if after reasonable effort, a negotiated settlement cannot be reached between the Contracting Officer or the Contracting Officer Representative and the Contractor and the Subcontractor(s) involved, then at the request of the Subcontractor(s) concerned, the Contracting Officer or the Contracting Officer Representative may process Part 1 of a two-part Modification to cover the direct costs only, as agreed upon or, if not agreed upon, as determined unilaterally by the Contracting Officer or the Contracting Officer Representative. Subcontractors(s) requests for a Part 1 Modification shall be submitted to the Contractor, and the Contractor shall forward such requests promptly to the Contracting Officer Representative. Any payments received by the Contractor under this procedure shall be passed along within 10 Days thereafter to the Subcontractor concerned.

C. Change orders: When the Contracting Officer directs a change in accordance with the provisions of this Contract, the Contractor shall identify in its proposal for equitable adjustment the network activities that precede and follow the change order work activities. If the change order work activities are performed concurrently with

existing network activities, those concurrent network activities shall be identified. If the change order work activities restrain network activities, those restraints shall be identified.

1.07 PAYMENT FOR USE OF EQUIPMENT

A. The following methods of determination of equipment costs shall apply to all adjustments to Contract Prices arising under the provisions of the Contract except for Section 00728, TERMINATION FOR CONVENIENCE OF THE AUTHORITY, provisions thereunder.

B. Allowable ownership and operating expense for construction plant and equipment in sound workable condition, owned by the Contractor, Joint Venture, Partnership, organizations under common control, and any equipment under lease purchase or sale-lease back agreements, will be paid for at hourly rates applicable to the Period of Performance, published in the Rental Rate Blue Book for Construction Equipment (Blue Book) by PRIMEDIA Information, Inc., by applying the following formula: the Regular Hourly Rate shall be 75 percent of the sum of the monthly rate (area adjustment map not used) divided by 176 and the estimated operating cost per hour. Regular Hourly Rate shall be full compensation for equipment ownership and operating expenses and shall include the cost of fuel, oil, lubricants, supplies, spare parts, repairs and maintenance, major overhauls, mechanics and servicing labor, depreciation, storage, insurance, interest, taxes, record keeping, and all incidentals. The cost of equipment operators is not included. For forward pricing, the Blue Book rates in effect at the time of negotiations shall apply. For retrospective pricing, the Blue Book rates in effect at the time the work was performed shall apply. Manufacturers ratings and manufacturer-approved modifications shall be used to classify equipment for the determination of the Regular Hourly Rate. The hourly rates are calculated as shown in the following example:

	Regular Hourly Rate	**Multi-shift Hourly Rate**	**Standby Hourly Rate**
Monthly Rental Cost	$6,070.00	$6,070.00	$6,070.00
Divided by Hours	176	176	176
Hourly Rental Cost	$34.49	$34.49	$34.49
Hourly Operating Cost	18.20	18.20	18.20
Subtotal	52.69	52.69	52.69

Adjustment	75%	75%	75%
Regular Hourly Rate	39.52	39.52	39.52
Status	100%	60%	40%
Payment Rate	$39.52	$23.71	$15.81

1. For Contractor owned equipment as identified in Article 1.07B, the first 8 hours, or fraction thereof, usage in any one day shall be paid for at the Regular Hourly Rate, and any additional time in excess of 8 hours, shall be considered to be an additional shift, or fraction thereof, and shall be paid for at 60 percent of the Regular Hourly Rate. Standby time, if authorized by the Contracting Officer Representative, will be paid for at 40 percent of the Regular Hourly Rate. Standby time shall be limited to the regular 8-hour shift and shall not exceed 40 hours in a week. Any usage time less than 30 minutes shall be considered to be 1/2 hour.

2. For third-party rented equipment, the Authority will accept rental rates actually paid and substantiated by certified reproduced copies of invoices or bills. Such invoices or bills shall indicate the amount of operating expenses and operator wages and fringes, if any, included in the rental rate. In no case shall the bare rental rate per hour (operating expense, and operator wages and fringes not included) exceed the appropriate Regular Hourly Rate. Where required, the operating costs per hour will be agreed upon between the Contractor and the Authority using operating costs per hour from the Blue Book for the same or similar equipment

3. When approved by the Contracting Officer Representative, use of equipment not listed in the Blue Book will be permitted. An equitable hourly rate for such equipment will be established by the Contracting Officer Representative based on Contractor furnished cost data and basic information concerning the equipment. Information required to determine rates includes, but is not limited to, manufacturer, year, size, model, serial number, capacity, and weight. This information shall be furnished to the Contracting Officer Representative prior to the use of the equipment. Authority shall be granted audit access to verify information related to or pursuant to this Section.

4. The Regular Hourly Rate does not include “move-in” and “move-out” costs.

5. These equipment rates shall apply to equipment in sound workable condition. The equipment shall be of approved size and capacity to provide normal output or production required for the work to be done. Equipment not meeting these requirements may be used only with the Contracting Officer Representative’s approval and at agreed, reduced rates. Usage time or standby time will not be allowed while equipment is inoperative due to breakdown, and such equipment

shall be removed from the jobsite at the direction of the Contracting Officer Representative.

C. Items of equipment with an acquisition cost of $2,000 or less shall be considered as small tools.

D. Equipment costs that are paid under the equipment use rate shall not be duplicated in the Contractor's other direct or indirect costs.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION (not used)

END OF SECTION

SECTION 01312

PROJECT MEETINGS

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies administrative and procedural requirements for Project meetings.

B. During the term of this Contract, attend meetings and conferences with officials of the Authority, governmental agencies, and others interested in the Work as may be directed by the Contracting Officer Representative. Meeting minutes, prepared by either the Contractor or the Contracting Officer Representative as specified herein, shall state the place and time of the meeting, the names and identification of those present, a brief description of the matters discussed, and the agreements reached.

C. Meetings shall be held in the Project office or at other locations in the Washington Metropolitan Area, as needed. Contractor and other concerned parties attending these meetings shall each be represented by persons thoroughly familiar with and authorized to conclude matters relating to the Work described in the Contract Documents.

1.02 PRE-CONSTRUCTION MEETINGS

A. Conduct pre-construction meetings at the Site prior to the start of construction activities that require special coordination for those activities that are deemed to require a separate meeting because of the technical nature of the installation.

B. The Contractor's Key Staff, Subcontractors, representatives of manufacturers and fabricators involved in or affected by the installation, coordination, or integration with their materials and installations that have preceded or will follow and the Authority, the Contracting Officer Representative, and other representatives of the Authority shall attend the meeting.

C. Notify the Authority in advance of the date, time, location, and topics for review and discussion at each pre-construction meeting. Ensure that other attendees are properly notified. Topics that may require pre-construction meetings include, but are not limited to the following:

1. Installation of equipment or systems

2. Items that require connection to existing Authority equipment or systems as applicable

3. Other pre-installation meetings as may be called by the Contractor or the Contracting Officer Representative

D. Agenda discussion items for the meeting may include, but are not limited to, the following:

1. Safety
2. QA/QC
3. ADAAG compliance
4. Temporary facilities
5. Space and access limitations
6. Shop Drawings, Working Drawings, Product Data, Quality Control Samples, Certifications, and Documentation
7. Purchases and deliveries
8. Manufacturers' recommendations
9. Inspection and testing requirements
10. Required performance results
11. Recording requirements
12. Possible conflicts and compatibility problems
13. Weather limitations

E. Work shall not proceed if the meeting cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of work and schedule a follow-up meeting with the Authority at the earliest date.

F. Record meeting minutes and distribute copies to everyone in attendance and to others affected by decisions or actions resulting therefrom.

1.03 PROGRESS MEETINGS

A. Conduct progress meetings [weekly] at regularly scheduled times convenient for all parties involved. Progress meetings are in addition to specific meetings held for other purposes, such as coordination and pre-construction meetings. A Three-Week Work Plan will be developed by the Contractor prior to the start of the meeting as specified in Section 01322, PROGRESS REPORTING, and will be discussed during the planning portion of the agenda. Additionally, discussions will address administrative and technical issues of concern, determining resolutions, and development of deadlines for resolution within allowable time frames.

B. Determine, together with the Contracting Officer Representative, who should attend the meeting in addition to the Contracting Officer Representative, other representatives of the Authority, the Contractor's Key Staff, and those Subcontractors, Suppliers, or other entities critical to the current progress or involved in planning, coordination, or performance of future activities that are part of the Work.

C. Contracting Officer Representative will publish an agenda prior to each meeting and will distribute copies to Contractor. Agenda items may include:

1. Review of minutes of the previous progress meeting
2. Contractor's construction schedule and construction sequence
3. Safety, including discussions of hazards and risks
4. QA/QC, including discussion of Non-Compliance Notices
5. ADAAG compliance
6. Temporary facilities and services
7. Site utilization, Site access needs and Hours of Work issues
8. Updated submittals list and submittal priorities
9. Requests for Information
10. Documentation of information for payment requests
11. Pending Change Orders and Modifications
12. Resource allocation
13. Off-Site fabrication problems
14. Purchases and deliveries
15. Housekeeping

D. The Contracting Officer Representative will record meeting minutes and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting. Meeting minutes will document issues of significance including submittals, schedules, quality assurance/quality control, safety, problems encountered, and the assignment of responsibilities for future action.

1.04 PROGRESS AND QUALITY STATUS REPORT REVIEWS

A. A preliminary progress and quality status report meeting will be held on a monthly basis prior to the submittal of the Contractor's final Monthly Progress Report and associated documents. The purposes of the meeting are to review and determine the status of each activity in relation to the Contractor's draft Monthly Progress Report and any deficiencies based on the Quality System as specified in Section 01470, QUALITY MANAGEMENT SYSTEM, in order to develop an informal agreement on the monthly progress payment request.

B. The meetings shall be attended by the Contractor's Key Personnel, the Contracting Officer Representative, and other representatives of the Authority.

C. The Monthly Progress Report and associated documents, as specified in Section 01322, CONTRACT PROGRESS REPORTING, shall be updated on a monthly basis. Job progress shall specifically include actual start and completion dates for all activities completed during the reporting period, actual start dates and percent complete for activities started but not completed during the reporting period, estimated start dates for activities scheduled to start during the next period, approved changes in durations of activities, and separate tabulation of monthly earnings including a cumulative tabulation of monthly earnings to date. In computing the monthly earnings, no value will be allowed for partially completed activities.

D. Update the Monthly Progress Report and associated documents to incorporate all changes agreed to during the preliminary progress and quality status report meeting. A formal progress and quality status report meeting will be held prior to the submittal of the Contractor's progress payment request. The purpose of the meeting is to review and develop a formal joint agreement on the Monthly Progress Report, job progress, pay items, and quality certification. This meeting shall be held 5 working days after the preliminary progress and quality status report meeting.

E. Submit the approved Monthly Progress Report and the progress payment request in accordance with Section 00744, METHOD OF PAYMENT.

1.05 CHANGE MEETINGS

A. Separate meetings will be held in the Washington Metropolitan Area by either the Authority or the Contractor, on an ad hoc basis, to discuss and resolve change order issues as they arise during the course of construction.

B. This meeting shall be attended by the Contractor's Key Staff, Contracting Officer Representative, and those Subcontractors, Suppliers, or other entities critical to the resolution of any open issues. The parties shall each be represented by persons thoroughly familiar with and authorized to conclude matters relating to the Work described in the Contract Documents.

C. The Contracting Officer Representative will record meeting minutes and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION (not used)

END OF SECTION

SECTION 01321

CONSTRUCTION PHOTOGRAPHS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes procedural requirements for photographic documentation, including digital images and video recordings.

1.02 SUBMITTALS

A. Make submittals in accordance with Section 01330, SUBMITTAL PROCEDURES, and as described in Section 01322, CONTRACT PROGRESS REPORTING.

B. Key Plan: Submit key plan 30 Days prior to start of construction. If vantage points are altered, submit key plan updates with corresponding photographic documentation submittal.

C. Digital Still Photographs: Submit with record of photographs indicating name of photographer, identification of vantage point, date of photograph and electronic file name. Submit the following types of still photographs:

1. Pre-Construction Photographs: Submit 30 Days prior to start of construction.

2. Monthly Construction Photographs: Submit every 30 Days.

3. Subject-specific construction photographs such as, but not limited to still photos showing potential change, non-conformance, quality, and property damage, and required photo documentation.

4. Completion of Construction Photographs: Submit within 30 Days of Notice of Substantial Completion.

D. Digital Video Recordings: Submit with a record of the contents of each segment of the video recording identifying name of photographer, location, time of day, viewing direction, traveling direction, and starting and ending points. Submit the following types of video recordings:

E. Pre-Construction Video Recording: Submit 30 Days prior to start of construction.

1. Monthly Video Recordings: Submit every 30 Days.

F. Photographer and Videographer Information: Submit a complete list of photographer names and contact information within 30 Days of Notice to Proceed.

G. Usage Rights Documentation: Obtain and transfer copyright usage rights from photographers to the Authority for unlimited reproduction of photographic documentation within 30 Days of Notice to Proceed.

1.03 QUALITY ASSURANCE

A. Qualifications:

1. Photographer Qualifications: Professional photographer experienced in construction photography for a minimum of 3 years.

2. Videographer Qualification: A professional firm experienced in audio-video documentation for construction or similar documentary projects for a minimum of 3 years.

PART 2 PRODUCTS

2.01 KEY PLAN

A. Indicate project site with notation of vantage points marked for location and direction of each still photograph and video recording.

B. Include location and type and model of still and video camera(s).

C. Include description of vantage point indicating location, direction (by compass point), and elevation.

2.02 STILL PHOTOGRAPHS

A. Camera Specifications: Provide digital camera with sensor resolution of a minimum of 8 megapixels for producing color digital photographs.

B. Format:

1. Set camera to produce a digital stamp of the current date and time on each image.

2. Provide required images in .JPG format.

3. Digital photographic files shall be capable of producing standard commercial quality photographs, 8 inches by 10 inches in size.

4. Identification:

5. Electronically label each still photograph with the following information on the bottom left corner:

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

Project: _____ Contract No.: _____

Contractor_____

Photograph No. _____ Date: _____

Description:_____

2.03 DIGITAL VIDEO RECORDINGS

1. Camera Specifications: Provide digital video camera for producing color digital video images and meeting the following requirements: Capable of producing NTSC 1080 lines/60 fields

2. Resolution in the Y channel shall contain a minimum of 500 TV lines at center, utilizing no less than three charge-coupled-device (CCD) chips, each containing no less than 5 megapixels for optimum picture clarity

3. Format: Set camera to produce a digital stamp of the current date and time on each video sequence containing the month, day, year, hours, minutes, and seconds.

4. Provide high-resolution NTSC or agreed upon format.

B. Identification: Electronically label video recordings with the following information: location, project name, and municipality. With each submittal, provide the following information:

1. Name of Project

2. Contract Number

3. Name of Contractor

4. Video recording ID number

5. Date video recording was recorded

6. Description

PART 3 EXECUTION

3.01 GENERAL

A. All photographic and video documentation shall be captured digitally. Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

3.02 STILL PHOTOGRAPH REQUIREMENTS

A. Preconstruction Photographs:

1. Provide pre-construction still photographs at each site.

2. Take sufficient overlapping still photographs to show existing conditions of adjacent properties before starting the Work.

3. No construction shall begin prior to Contracting Officer Representative review and approval of the pre-construction photographs of the construction area.

4. Take still photos at locations to be disturbed or likely to be affected by construction and at locations designated by the Contracting Officer Representative.

B. Monthly Construction Photographs: Take still photos of construction during the progress of the Work.

1. Take a minimum of twenty still construction photos at each site every 30 Days starting after the pre-construction digital survey and continuing until Substantial Completion is achieved.

C. Subject-specific Construction Photographs:

1. If there are any evident changes in conditions, non-conformance in the Work, or signs of potential damage to property or constructed project, take sufficient photographs to document the conditions and no less than ten still photographs.

2. The photographer shall provide scale to the area/condition, such as a tape measure to substantiate cracking.

3. Provide construction photos as required.

D. Final Completion Construction Photographs:

1. Take a minimum of twenty still photos at each site at Substantial Completion.

3.03 VIDEO RECORDING REQUIREMENTS

A. General:

1. Audio:

a. Begin each recording with the name of videographer, Project name, Contract number, date and start time, location, and direction of travel.

b. End recording with date and time.

c. Narration: Describe scenes on video recording by audio narration. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.

2. Video:

a. Set to continuously record: transparent digital information shall include the date and time of recording.

B. Preconstruction Video Recordings:

1. Document the entire Project Site.

a. Include all surface features located within at least 300 feet of the construction site and accompany with appropriate audio description. Include all existing curbs, sidewalks, driveways, ditches, paved areas, landscaping, trees, culverts, headwalls, retaining walls and buildings.

2. Duration: approximately 120 minutes.

C. Monthly Construction Video Recordings: Select vantage points to show status of construction and progress since last video recordings were recorded. Minimum recording time shall be 30 minutes.

END OF SECTION

SECTION 01322

CONTRACT PROGRESS REPORTING

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies the requirements for reporting progress and the development and maintenance of schedules and work plans for both the design and construction of the Project.

B. The Contractor shall carefully monitor the progress of the Work during design and construction and provide the Authority with Monthly Progress Reports detailing the progress of that work.

C. The approved schedules shall be used by the Contractor to ensure adequate planning, scheduling, managing, and executing of the Work, and to enable the Authority to evaluate work progress and progress payments. These approved schedules shall not be revised without the prior approval or direction of the Contracting Officer Representative. Schedules shall include the following Initial 90-Day Schedule; Project Schedule; monthly updates of the Project Schedule; 90-Day Schedule; and Three-Week Work Plan.

1.02 REFERENCES

A. Associated General Contractors Manual - Construction Planning and Scheduling.

1.03 SUBMITTALS

A. Make the following submittals in accordance with Section 01330, SUBMITTAL PROCEDURES:

B. Monthly Progress Status Report shall be submitted in electronic format in MS Word and Adobe (.PDF) and formatted to 8-1/2 by 11 inches or 11 by 17 inches in size.

C. Schedule submittals including Initial 90-Day Schedule, Project Schedule and monthly updates, 90-Day Schedule, and Three Week Work Plan, shall be generated in Primavera Project Planner (P6) for Windows and formatted to 11 by 17 inches or 22 inches by 34 inches. Submit monthly in Primavera (.XER) and Adobe (.PDF) format and on paper media for the 90-Day Schedule or the Project Schedule, whichever is in use.

1. CPM terminology, definitions, and conventions as required herein shall be consistent with the technical portions of the Associated General Contractors Manual titled Construction Planning and Scheduling.

2. All schedules and reports shall be prepared and submitted in electronic format and labeled with the Contract Number, Project name, Contractor's

name, data date, run date, and with any access codes or file designators listed.

D. The Project Schedule submittal, all subsequent schedule updates, and time extension requests shall also include the following computer-generated reports:

1. Successor Report: This report shall contain all activities shown on the graphic network diagram listed in ascending order of activity ID based on successor relationships.

2. Predecessor Report: This report shall contain all activities shown on the graphic network diagram listed in descending order of activity ID based on their predecessor relationships.

3. Float Report: This report shall contain all activities shown on the graphic network diagram listed in order of ascending total float values and, where float values are equal, in chronological order of the early start date.

4. Late Finish Report: This report shall contain all activities as shown on the graphic network diagram listed in chronological order of the late finish date.

E. Contracting Officer Representative will review and return the Contractor's schedule submittal with comments according to the following schedule from the date of receipt:

Initial 90-Day Schedule	7 Days
90-Day Schedule	7 Days
Project Schedule	21 Days
Three-Week Work Plan	1 Day

1. The Contractor shall make all corrections to the schedule requested by the Contracting Officer Representative and resubmit the schedule for approval. If the Contractor does not agree with the Contracting Officer Representative's comments, the Contractor shall provide written notice of disagreement within 5 Days from the receipt of the Contracting Officer Representative's comments for the Project Schedule. Contracting Officer Representative's comments to the Initial 90-Day Schedule, Project Schedule, 90-Day Schedule, and Three-Week Work Plans with which the Contractor disagrees shall be resolved in a meeting held for that purpose.

F. Resubmittals shall conform to the same requirements as original submittals.

1.04 MONTHLY PROGRESS REPORTS

A. The Monthly Progress Reports shall include a narrative report, schedules, a Quality Compliance Certification and construction photographs as follows:

1. A narrative description of work accomplished, work activities planned for the upcoming reporting period, problem areas and actions intended by the

Contractor to mitigate the problem areas, work that is being performed out of sequence with accepted schedules, status of change orders, notices of potential Claims, status of submittals, and status of Contractor procurement items. Proposed minor logic changes shall be listed and described in the narrative. Include narrative of design progress each month until design is complete and Approved.

2. Schedules including the Initial 90-Day Schedule, or the Project Schedule, or the Monthly Update of the Project Schedule as appropriate; 90-Day Schedule; and a Three-Week Work Plan. Schedules shall clearly identify the critical path(s).

3. Cash flow curves indicating graphically the total percentage of work activity/event dollar value scheduled to be in place on early finish, late finish, and actual finish on a monthly and cumulative basis.

4. Quality Compliance Certification as specified in Section 01470, QUALITY MANAGEMENT SYSTEM.

5. A summary of meetings or conferences held or attended during the report period.

B. A listing of actions or decisions required of the Authority with an indication of the date by which such action or decision is required to avoid any adverse impact on the schedule.

1. Utility/Jurisdictional Authority coordination and approvals report. Include telephone conversations and dates of contact made with each Utility/Jurisdictional Authority.

2. Construction photographs, as described in Section 01321, CONSTRUCTION PHOTOGRAPHS.

1.05 INITIAL 90-DAY SCHEDULE

A. A cost loaded schedule covering the first 90 Days of the Contract shall be submitted within 20 working days following the date of the Notice of Award. The Initial 90-Day Schedule is the Contractor's plan for planning, managing, executing, and for recording completed work during the first 90-Day Days of the Project. All approved activities in the Initial 90-Day Schedule shall be incorporated into the Project Schedule.

B. The schedule shall be time-scaled and may be submitted in either bar chart or Critical Path Method (CPM) format. The Initial 90-Day Schedule shall include the same requirements as the Project Schedule with the exception of information that is not reasonably available in the first 90- Days.

C. Work items defined in the schedule shall not exceed 20 working days duration.

D. The initial submittal shall be accompanied by a written narrative that describes the schedule and the approach to the Work that the Design-Builder intends to employ during the initial 90-Day period of the Contract.

E. The Initial 90-Day Schedule will be used to process progress payments for the 90-Day period following NTP until the Project Schedule is Approved.

1.06 PROJECT SCHEDULE

A. A cost loaded, calendar time-scaled CPM network diagram schedule covering the complete Period of Performance of the Project shall be submitted within 60 Days following the date of the Notice to Proceed. A Project Schedule, acceptable to the Contracting Officer Representative, shall be in place prior to the third progress payment request being submitted. The original logic of the Initial 90-Day Schedule shall be incorporated into the Project Schedule unless identified changes are submitted and approved by the Contracting Officer Representative.

B. The schedule must meet all of the dates listed under Special Conditions Section 00824, PERIOD OF PERFORMANCE AND PROJECT SCHEDULE.

C. The Project Schedule shall be prepared utilizing the Precedence Diagram Method (PDM) of CPM scheduling technique.

D. The Project Schedule shall show clearly the sequence and interdependence of activities and shall list specifically:

1. Interim milestone completion dates as specified and staging of the Work shall be prominently identified.

2. Acquisition of permits, and Jurisdictional Authority and Utility approvals

3. Submittals and Authority review of submittals

4. Procurement, fabrication, delivery, installation, and testing of major materials and equipment

5. Delivery of Authority-furnished equipment, if any

6. Interfacing, coordination, and dependencies with preceding, concurrent, and follow-on contractors

7. Work to be performed by other agencies, which affect the schedule

8. Manpower, material, and equipment restrictions, if any

9. Inspection of the Work including Punch List and Acceptance

10. The progressive delivery of Record Documents as major sections of the work are completed; for example completion of foundation piling or completion of underground utility work

11. Resources necessary to accomplish the Work for that activity including, but not limited to, specific equipment, manpower, and material requirements.

12. The costs of the work for each activity

13. The graphic network diagram shall be composed of two parts, a Table of Activity Data and a time-scaled graphic network diagram, and shall include the following:

    a. A Table of Activity Data in columnar format with the pertinent data for each activity in the row corresponding to that activity's placement of schedule. The minimum required data are:

        (1) Activity ID,

        (2) Activity Description,

        (3) Early Start date,

        (4) Early Finish date,

        (5) Late Start date,

        (6) Late Finish date,

        (7) Total Float,

        (8) Planned Duration,

        (9) Monetary value in whole dollars for that activity, labor-days applicable to each activity, and all lag/lead time

    b. The Contracting Officer Representative may require additional data such as total shifts or other resource data.

    c. An activity numbering system shall be utilized, which assigns a unique activity identification number to each activity. No two activities shall bear the same activity number or description.

    d. Activity descriptions shall be brief but shall convey the scope of the work described. Unusual abbreviations shall be explained in a legend. If an activity includes work to be done by a Disadvantaged Business Enterprise (DBE), that fact shall be identified in the activity description by inclusion of an appropriate parenthetical entry (e.g., Install West Footing Reinforcing Steel (DBE1)) with DBE properly identified in the legend.

    e. Percentages shall generally not be used in activity descriptions e.g., Pour West Footing (0 to 50 percent) is not acceptable.

    f. A time-scaled graphic network diagram showing logical relationships and constraints formatted in accordance with the following requirements:

        (1) A bar (node) representing the duration of each work activity scaled to the planned duration with arrows (relationship lines) defining predecessor and successor relationships. Each bar shall contain the following information positioned above, below, or adjacent to it in a consistent and legible manner:

(a) activity description;

(b) abbreviated start and finish dates (the day of the month in which the event occurs),

(c) and the activity duration.

(2) Lag time in whole Project units (e.g. working days) shall be displayed on each relationship line where it occurs. The use of lag must be minimized and restricted to only those situations where it is not possible to properly define the start or finish of an activity by the use of a normal Finish-to-Start, Start-to-Finish, Start-to-Start, or Finish-to-Finish relationship. Negative lag shall not be used.

14. Monetary value of each activity indicated in the Schedule shall be identified in the Table of Activity Data following the description. The allocation of monetary values assigned to activities shall be subject to approval and shall contain, as close as can reasonably be determined, all labor, equipment, material, and Subcontractor cost plus its proportional share of all indirect costs. The total of all values allocated to the individual work activities shall equal the total Contract value. Should the Contractor intend to deliver materials and receive payment under the delivered Materials on Site (MOS) provision of the Contract, with the approval of the Contracting Officer Representative, the following shall be incorporated into the schedule:

a. A MOS delivery activity shall be incorporated into the schedule in logical sequence with the associated installation activity. The cost allocated to the installation activity shall be reduced by the approved MOS activity amount. The activity description shall contain the MOS designation and an MOS activity code shall be assigned.

b. The monetary value assigned to that MOS activity shall be arrived at by considering only those materials the monetary values of which are to be excluded from the monetary values of the installation activities to which they relate. The monetary value of the delivery activity shall equal the projected invoiced values of materials, as restricted above and in other relevant provisions of the Contract, to be delivered to the Site. The Contractor shall submit a separate, detailed breakdown of the projected total of all MOS activities.

E. Individual schedule activities shall not exceed 20 working days duration, except certain procurement, delivery, or MOS activities, which may exceed 20 working days with the approval of the Contracting Officer Representative. Activities exceeding 20 working days duration shall be subdivided.

F. Schedule activities shall be sufficiently described to include what is to be accomplished and of the activity sequence (i.e. group activities by category of work, work area, and responsibility). Activity durations shall be expressed in whole days. Work that is to be performed by Subcontract shall be clearly defined.

G. The schedule diagram shall indicate a clearly defined critical path, which shall be prominently distinguished.

H. A written narrative shall accompany the schedule submittal describing the Contractor's approach and methods for completion of the Work. The narrative shall be adequate for the Contracting Officer Representative to understand the schedule and specifically identify the use of lag time.

1. The supporting narrative shall include the following:

a. A realistic approach to meeting the Contract completion date required by the Contract.

b. A discussion of the critical path and the most critical activities in meeting the required completion dates.

c. A listing of holidays and special non-working days planned during the Contract duration.

d. A separate tabulation of estimated monthly and cumulative planned earnings. The monetary values shall be generally consistent with the proposal item breakdown.

I. Submit the calendar(s) used to calculate the Project Schedule, including: (i) the proposed number of working days per week; (ii) the planned number of shifts per day; (iii) the number of hours per shift; and (iv) all non-working days.

J. In addition to the Project Schedule, the Contractor shall submit for approval a summarized Project Schedule depicting the entire Project Schedule in graphical, time-scaled format that clearly identifies the Contractor's work areas, activities, and planned logic for completion of the Work. The summarized Project Schedule shall consist of hammocked activities or otherwise summary bars of logically-grouped activities, of approximately 300 to 500 activities total.

K. A schedule showing the work completed in less than the Period of Performance, which is found practical and Approved by the Authority, shall be considered to have float. The float shall be the time between the scheduled completion of the Work and the Contract completion date. Float shall not be for the exclusive benefit of either the Authority or the Contractor. Float shall be a resource available to both parties.

L. A schedule found to be impractical by the Contracting Officer Representative for any reason shall be revised by the Contractor and resubmitted.

M. Upon Approval by the Authority, the Project Schedule shall be the baseline schedule used to monitor progress.

1.07 MONTHLY UPDATES OF THE PROJECT SCHEDULE

A. At least once each month, the Contractor shall submit an updated Project Schedule showing the progress of the Work to date and anticipated activities to be worked on.

B. The Project Schedule shall not be revised to include additional activities, deleted activities, revised activity durations, revised network logic, or any other changes to the schedule, without approval of the Contracting Officer Representative. Only actual progress, completion dates, and anticipated future progress shall be incorporated in a schedule update.

C. If according to the current updated Project Schedule, the Contractor is 60 or more working days behind the Contract completion date of any milestone, or the schedule contains 60 or more working days of negative float, considering all granted time extensions, the Design-Builder shall submit a Recovery Schedule, showing a practical plan to complete the work within the Contract time. The Contractor shall execute some or all of the following remedial actions: (i) increase construction labor in such quantities and crafts as necessary to eliminate the backlog of work; (ii) increase the number of working hours per shift, shifts per working day, working days per week, the amount of construction equipment or any combination to eliminate the backlog of work. The Authority may withhold progress payments until a revised schedule, acceptable to the Contracting Officer Representative, is submitted by the Contractor.

D. Any revisions to the planned sequence, activity durations, interdependency of activities and any other change to the schedule shall be submitted separately for review. Written notification and explanation for the proposed changes and separately revised Project Schedule and narrative reports shall accompany the submittal. Changes shall not be incorporated into the current schedule until the submittal has been accepted by the Contracting Officer Representative. The baseline Project Schedule, i.e., the current schedule excluding schedule changes, shall be submitted along with the proposed schedule changes for the Contracting Officer Representative's review and approval.

E. Maintain the As-Built Project Schedule data according to the field records and submit to the Contracting Officer Representative on a monthly basis. In addition, retain all monthly schedule updates until the Work has been Accepted.

F. After all Contract work items are complete, and as a condition of Final Payment, the Contractor shall submit three copies of an As-Built Project Schedule showing actual start and finish dates for all work activities and milestones, based on the accepted monthly updates. The schedule submittals shall be in tabular and in time-scaled PDM plot formats. See Section 00744, METHOD OF PAYMENT, for additional retainage to be withheld until the As-Built Project Schedule is delivered to the Contracting Officer Representative, is reviewed, and is determined to be complete and accurate.

1.08 90-DAY SCHEDULE

A. A schedule depicting activities occurring in the upcoming 90-Day period in greater detail than specified in the Initial 90-Day and Project Schedules. The logic shall follow the logic of the approved Project Schedule.

B. The schedule shall be time scaled and may be submitted in either bar chart or Critical Path Method (CPM) format.

C. Activities shall be 10 Days or less duration with particular focus on design, procurement, and associated activities to be performed in this time frame.

D. The 90-Day Schedule shall be updated and submitted monthly for review and approval by the Contracting-Officer Representative.

1.09 THREE-WEEK WORK PLAN

A. A schedule in a calendar time-scaled bar chart format depicting the Contractor's intended work activities for the upcoming 3-week period shall be submitted on a weekly basis due on the first working day of each week. Each activity having 1-day duration shall be prominently noted.

B. Deviations, including but not limited to sequences of work, timing, and durations of activities from the Initial 90-Day or Project Schedules shall be noted and explained in writing.

C. The form of submittal may be formatted smaller than specified in Article 1.03 herein; however, the format shall not be less than 8-1/2 by 11 inches in size.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION

3.01 GENERAL

A. Schedules shall represent a practical plan to complete the Work within the Period of Performance, and shall convey the Contractor's intent in the manner of prosecution and progress of the Work.

B. The scheduling and executing of the Project Work in accordance with the schedule are the responsibility of the Contractor.

C. The submittal of schedules shall be understood to be the Contractor's representation that the schedule meets the requirements of the Contract Documents and that the Work will be executed in the sequence and duration Indicated in the schedule.

D. All schedule submittals are subject to review and acceptance by the Contracting Officer Representative. The Authority retains the right to withhold progress payments until the Contractor submits a schedule, payment schedule, and updates acceptable to the Contracting Officer Representative.

E. The approved Project Schedule will be used as the basis for progress payments to the Contractor. Payments will be made by the Contracting Officer Representative only for activities that are 100 percent complete.

3.02 PAYMENT

A. Submittal Monthly Progress Report at least 5 working days prior to the submittal of a progress payment request. No progress payment request will be processed if there is not an agreed update in place.

3.03 PROJECT SCHEDULER

A. To prepare the Project schedules, the Contractor shall engage the services of a full time scheduler who is skilled in the time and cost application of scheduling using PDM network techniques for heavy construction projects.

B. The Contractor's scheduler may or may not be an independent consultant; however, the scheduler shall be available to the Contractor and Contracting Officer Representative to address schedule questions and shall attend all Periodic Progress Review and Schedule meetings convened by the Contracting Officer Representative.

C. In the event that the Project scheduler is not found to be competent or to have sufficient relevant experience, WMATA will request that the Project scheduler be removed from the Project pursuant to Section 00709, PROJECT MANAGEMENT AND SUPERINTENDENCE AND KEY STAFF. In that event, the Contractor shall submit a new candidate for consideration within 10 Days.

3.04 REQUESTS FOR TIME EXTENSIONS

A. The Contractor is responsible for submitting a written request for any extensions of Period of Performance within the time specified by the Contract. Requests not submitted in writing, without the required documentation, and not submitted within 30 Days will not be considered.

B. The request shall include documentation with written justification for the extension of time, supporting evidence, and specific references to the Contract for which the basis of the request is being made.

C. The request shall also include a calendar time-scaled CPM network schedule analysis and reports specified in Article 1.06 herein, depicting the time impact basis of the request with the affected areas prominently highlighted. The Project Schedule to be used in determining the time extension request shall be the current and accepted schedule at the time of the event.

D. If the Contracting Officer Representative finds that the Contractor is entitled to an extension of time of any completion date under the provisions of the Contract, the Contracting Officer Representative's determination of the total number of Days extension will be based upon the current analysis of the currently approved Project Schedule and upon data relevant to the extension. Extensions of time for performance under any and all of the provisions of the Contract will be granted only to the extent that equitable time adjustments for the activity or activities affected

exceed the total float along the paths involved of the most critical path to Project completion.

E. The Contractor shall submit a CPM fragnet with enough detail to depict the causes, duration, and logic relationship and impact of the current schedule activities. The quantum of delay impact on Contract completion or interim milestone(s} must be determined for time extension.

F. Critical delays, i.e., delay, which may affect the activities on the current critical path, will be contemporaneously discussed and mutually agreed by all the parties involved. In case the quantum of delays or impact cannot be resolved, the background, issues, work performed, as well as start and finish dates of delays shall be well-documented in chronological order. The Contracting Officer Representative's determination of merit for time extension(s) will be awarded after the Contracting Officer Representative finds entitlement to the Contractor's request and only after the alleged delays are demonstrated to impact the most critical path(s). Data furnished by the Contractor will be used as a basis in the findings of the Contracting Officer Representative.

G. A complete As-Built Schedule, which has enough detail to depict delay and demonstrate cause-effect delay impact, shall be submitted at the end of the Project.

END OF SECTION

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies the general requirements and procedures for preparing and submitting design and construction documents to the Authority and Jurisdictional Authorities for approval or for information. The submittals shall consist of, but not be limited to design drawings, computations, and specifications; Shop Drawings; Working Drawings; product data; samples; documents, letters, certifications and reports; permit applications and Jurisdictional Authority approval documents; and other submittals.

1.02 DEFINITIONS

A. Schedule of Required Submittals: A compendium of all required design and construction related submittals identified throughout the Contract Documents.

B. Contract Document Submittal Log: A document indicating the status of all Required Submittals listed in the Schedule of Required Submittals.

1.03 SUBMITTAL SCHEDULE

A. Provide a preliminary Schedule of Required Submittals, as described in Section 00720, SUBMITTALS, within 14 Days after the effective date of Notice to Proceed (NTP) for the Authority's review. The preliminary Schedule of Required Submittals shall be updated through discussions with the Authority during weekly progress meetings or through special meetings subsequent to initial Authority approval.

B. Submit a Contract Document Submittal Log, as described in Section 00720, SUBMITTALS, within 30 Days after the effective date of NTP. The Contract Document Submittal Log, created in MS Excel or MS Access, shall consist of all submittals required by the Contract Documents. Populate the Contract Document Submittal Log with submittal data as the design and construction progresses. The Contract Document Submittal Log shall list all versions of a submittal, however only one version of a submittal may be in effect at any one time.

C. Submit a final Schedule of Required Submittals within 60 Days after the effective date of NTP.

D. Submittals made shall be arranged and maintained in a tabular format by specification Section as well as in chronological order by the dates required for construction. The log shall include:

1. Scheduled date for initial Submittal, review, and "need" date for acceptance in order to fabricate and install, corresponding to the Project Schedule activity.

2. Contract number, specification Section number and title

3. Name of Subcontractor

4. Type of Submittal (Shop Drawings, product data, samples, or other), description of the item, name of manufacturer, trade name, and model number

5. Highlight submittals that are on the critical path and require expedited review to meet the schedule. Indicate lead time to the date of fabrication and installation.

6. State if submitted for approval or information.

7. If a Submittal is a safety critical item based on the approved Certifiable Items List (CIL), include the “Item” number and “Section” (paragraph) number, as shown on the Certifiable Items List.

8. Re-submittals: Reason for change

9. Tested/Inspected By: Identify the entity performing the test

E. The Contract Document Submittal Log shall be updated and submitted on a monthly basis.

1.04 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Submit one electronic copy in the format specified, unless noted otherwise, through the Authority’s Project Management Software System (PMSS). The Contracting Officer’s Representative will return one electronic copy through the PMSS.

B. Allow [21] Days for review of submissions and resubmissions.

C. The Contracting Officer’s Representative will discard submittals received from sources other than the Contractor.

D. Prepare separate submittals for each item in a specification Section. Group them in the order listed, paragraph by paragraph, and package them together.

E. Transmit submittals of related parts of the Work concurrently such that processing will not be delayed for coordination. Incomplete submittals will be returned to the Contractor with no action taken by the Authority.

F. Place a permanent label or title block on each submittal item for identification.

1. Indicate Project name and Contract number, the date of submission, reference to the specification Section article, and drawing number and detail to which the submittal applies.

2. Indicate name of firm or entity that prepared each submittal.

3. Provide a blank space approximately 5 by 5 inches, in the lower right corner of each drawing just above the title block, to record the Contractor’s review and approval markings and action taken by the Contracting Officer Representative.

G. All submittals shall be accompanied with a transmittal form containing the following minimum information.

1. Project name and Contract number, the date of submission, Subcontractor, Supplier, manufacturer name, and submittal number

2. Submittal purpose and description

3. Reference to the specification Section, drawing number, and title

4. Reference applicable standards, such as ASTM or Federal Specification numbers

5. Location(s) where product is to be installed, as appropriate

6. Identification of deviations from the Contract Documents

7. Notation that Submittal is a safety critical item, if identified on the “Certifiable Items List”

1.05 MEETING MINUTES

A. Prepare meeting minutes that are the responsibility of the Contractor immediately after each meeting. Submit draft copy to Contracting Officer Representative for review within 5 Days in MS Word format.

B. Submit final meeting minutes in Adobe (.PDF) format 3 Days after receipt of Authority review.

1.06 SHOP DRAWINGS

A. General:

1. Submit Shop Drawings in AutoCAD and Adobe (.PDF) formats.

2. Shop Drawings shall indicate all pertinent features of the products and the method of fabrication, connection, erection, or assembly with respect to the Work.

3. The first drawings submitted by Contractor, Subcontractor, or vendor will be reviewed for conformance with this Section. Once accepted, use the drawing format as a standard for subsequent drawings.

B. Dimensioning: Follow applicable dimensioning and tolerance practices as specified in ANSI/ASME Y14.5.

1. Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

2. Provide sufficient dimensions on drawings so that size, shape, and location may be determined without calculation.

3. Show each dimension clearly so that only one interpretation is possible. Show each dimension for a feature once.

4. Text must be legible on 11 by 17-inch prints.

5. Include on the Shop Drawings details necessary for the installation, maintenance, and repair of all equipment provided.

1.07 WORKING DRAWINGS

A. Submit Working Drawings in AutoCAD and Adobe (.PDF) formats.

B. Working Drawings indicate the Contractor's plan for temporary structures that will not become part of the completed Project such as decking, temporary bulkheads, support of excavation, support of utilities, groundwater control systems, and forming and falsework for underpinning; and for such other work as may be required for construction.

C. Working Drawings and calculations shall be signed and sealed by a professional engineer registered in the jurisdiction where the work will be performed and shall convey, or be accompanied by information sufficient to completely explain the structure, machine, or system described and its intended manner of use.

1.08 PRODUCT DATA

A. Submit product data in Adobe (.PDF) format.

B. If information must be specially prepared for a submittal because standard published data is not suitable for use, submit as Shop Drawings, not as product data.

C. Modify manufacturers' standard drawings, catalog cuts, brochures, diagrams, schedules, performance charts, illustrations, calculations, printed installation, erection, application, and placing instructions, and other descriptive data to delete information that is not applicable to the Contract. Indicate dimensions, clearances, performance characteristics, capacities, wiring and piping diagrams, and controls. Supplement standard information with additional information applicable to this Contract.

D. Submit product data concurrent with samples.

1.09 SAMPLES

A. 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 submittals and actual components as delivered and installed.

B. Maintain sets of accepted samples at the Site, available for quality control comparisons throughout the course of construction activity. Sample sets may be used to determine conformance of construction associated with each set.

1. Samples that may be incorporated into the Work are indicated in individual specification Sections. Samples not incorporated into the Work, or otherwise designated as the Authority's property, are the property of Contractor.

C. Samples for Verification: Submit full-size units or samples of a size indicated, physically identical with material or the product proposed for use and that shows a 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.

D. Number of Samples: Submit [five] sets of Samples. The Contracting Officer Representative will retain [three] Sample sets; the 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.

E. If variations in color, pattern, texture, or other characteristics are inherent in the material or product represented by a sample, submit at least [three] sets of paired units that show approximate limits of variations.

1.10 CERTIFICATES AND CERTIFICATIONS

A. Submit original certificates and certifications in MS Word and Adobe (.PDF) formats.

B. Provide certificates and certifications that demonstrate proof of compliance with Contract specification requirements for products, materials, equipment, and systems.

C. Authority Approval of a certification shall not be construed as relieving the Contractor from furnishing products that meet the specified design intent.

1.11 REPORTS

A. Submit original reports, signed and sealed by a professional engineer in the jurisdiction that the Work is to be constructed, and any related drawings in MS Word, AutoCAD and Adobe (.PDF) formats.

B. Provide reports that demonstrate proof of compliance with Contract specification requirements. The reports include manufactured products, materials, research, equipment, systems, and test reporting in the field or laboratory.

C. Authority Approval of submitted reports shall not be construed as relieving the Contractor from furnishing products that meet the specified design intent.

1.12 DATA

A. Submit data and any related drawings in MS Word, AutoCAD and PDF formats.

B. Provide written and graphic information including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations that demonstrate proof of compliance with Contract specification requirements. Provide the name and version of software used for calculations.

C. Authority Approval of submitted data shall not be construed as relieving the Contractor from furnishing products that meet the specified design intent.

1.13 CONSTRUCTION PHOTOGRAPHS AND VIDEO

A. All still photographic documentation of the Work shall be provided by the Contractor in digital format.

B. Video documentation recordings of the Work, accompanied with audio recording, shall be provided by the Contractor in digital format.

C. For detailed submittal procedures see Section 01321, CONSTRUCTION PHOTOGRAPHS.

1.14 AS-BUILT DOCUMENTS

A. Maintain a record set of drawings and specifications that reflect as-built conditions and that are annotated to show all changes incorporated as Work progresses.

B. Submit As-Built Drawings in AutoCAD and bookmarked-by-discipline Adobe (.PDF) formats that can be plotted either as full-size or half-size drawings that are scalable.

C. Submit approved As-Built Documents for the completed Work as specified in Section 01775, CLOSEOUT, as elements of the Work are completed and before the scheduled date of Substantial Completion.

1.15 CONTRACTOR'S REVIEW

A. Review each submittal, including all those provided by Subcontractors and Suppliers of any tier, check for coordination with other Work and for compliance with the Contract Documents. Note inconsistencies with Contract Documents. Submittals shall bear the Contractor's approval stamp and initials of the reviewer before submitting to the Authority.

B. Each submittal transmittal form shall be signed by the Contractor with a statement, "Having checked this submission, we certify that it conforms to the requirements of the Contract in all respects, except as otherwise indicated".

C. Do not start work where submittals are required until submittal review is completed by the Authority and Approval, if required, has been received.

D. Identify approval methods of the various jurisdictional authorities and obtain their approvals as required.

1.16 AUTHORITY'S REVIEW

A. The Contracting Officer Representative shall receive construction submittals from the Contractor and will distribute them within the Authority for review.

   1. Shop Drawings, samples, and other submission reviews by the Authority will not include checking of dimensions for potential conflicts.

   2. Approval by the Authority of a specific item will not indicate Approval of an assembly of which the item is a component.

   3. Incomplete submittals will be returned for resubmission without review.

B. Submittals that are reviewed by the Authority will be returned to the Contractor with one of the following approval codes:

   1. Code 1: Approved Without Condition or Comment.

   2. Code 2: Approved As Noted, Resubmittal Not Required. The Contractor shall comply with changes, conditions, or comments on the submittal.

   3. Code 3: Disapproved. The entire submittal is disapproved and shall be resubmitted.

1.17 RESUBMISSIONS, DISTRIBUTION, AND USE

A. Make resubmissions in same form and number of copies as initial submittal. Note the date and content of previous submittal. Clearly indicate extent of revision.

B. Furnish copies of final submittals to manufacturers, Subcontractors, Suppliers, fabricators, installers, Jurisdictional Authorities, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

C. Retain complete copies of submittals on Site.

1.18 RFI ADMINISTRATIVE REQUIREMENTS

A. Submit one electronic copy on the RFI form provided by the Authority, through the Authority's Project Management Software System (PMSS). The Contracting Officer's Representative will return one electronic copy through the PMSS.

B. Allow [7] Days for the review of each RFI.

C. The Contracting Officer's Representative will discard RFIs received from sources other than the Contractor.

D. All submittals shall be accompanied with a transmittal form containing the following minimum information.

   1. Project name and Contract number, the date of submission, and RFI number

   2. Clear statement of the question to be addressed by the Authority

3. Reference to the specification Section, drawing number, and title that is the subject of the RFI

PART 2 PRODUCTS (not used)

PART 3 EXECUTION (not used)

END OF SECTION

SECTION 01420
REFERENCES

PART 1 GENERAL

1.01 SUMMARY

A. This Section lists the reference standards cited in the Contract Documents, the organizations or Jurisdictional Authorities whose standards are cited, and common acronyms used in the Contract Documents.

B. When reference is made to codes, regulations, reference standards, and specifications, the Work shall conform to the current edition as of the date of Award, unless it is superseded by Jurisdictional Authorities.

1.02 ABBREVIATIONS AND ACRONYMS

AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
ABS	Acrylonitrile-Butadiene-Styrene
ac	Alternating Current
ACGIH	American Conference of Governmental Industrial Hygienists
ACI	American Concrete Institute
A/D	Analog to Digital
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
AHA	American Hardboard Association
AHDGA	American Hot Dip Galvanized Association, Inc
AI	Asphalt Institute
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Moving and Conditioning Association
AMTRAK	National Railroad Passenger Corporation
ANSI	American National Standards Institute (synonymous with USASI-ASA)
API	American Petroleum Institute
AREMA	American Railway Engineering and Maintenance of Way Association
ARI	Air Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers

ASME	American Society of Mechanical Engineers
ASNT	American Society of Nondestructive Testing
ASTM	ASTM International
ATBCB	Architectural and Transportation Barriers Compliance Board
AT&T	American Telephone and Telegraph Company
AWG	American Wire Gauge (synonymous with Brown and Sharpe)
AWI	Architectural Woodwork Institute
AWWA	American Water Works Association
AWS	American Welding Society
AWPA	American Wood Preservers' Association
BG&E	Baltimore Gas and Electric Company
BIA	Brick Institute of America
BLS	Bureau of Labor Statistics
B&O	Baltimore & Ohio Railroad (Division of the CSX Transportation)
BOCA	Building Officials and Code Administrators International
BTU	British Thermal Unit
BTUH	British Thermal Units Per Hour
C	Celsius (Centigrade)
CAGI	Compressed Air and Gas Institute
CE	US Army, Corps of Engineers
cfm	Cubic Feet Per Minute
CISPI	Cast Iron Soil Pipe Institute
CMU	Concrete Masonry Unit
C&O	Chesapeake and Ohio Railroad (Division of the CSX Transportation)
CONRAIL	Consolidated Rail Corporation (formerly Penn Central)
CQCS	Contractor's Quality Control System
CRSI	Concrete Reinforcing Steel Institute
CSX	CSX Transportation (formerly Chessie System, B&O, C&O, and Chesapeake & Ohio)
CTI	Cooling Tower Institute
dB	Decibel(s)
dc	Direct Current
DFT	Dry Film Thickness

DILM	Ductile Iron Pipe, Cement-Lined and Coated, Mechanical Joint
DILP	Ductile Iron Pipe, Cement-Lined and Coated, Push-On-Joint
DPST	Double Pole, Single Throw
DTS	Data Transmission System
EPA	Environmental Protection Agency
EPR	Ethylene-Propylene-Rubber
F	Fahrenheit
FAA	Federal Aviation Administration
FCCCR	Foundation for Cross-Connection Control Research of the University of Southern California Engineering Center
FHWA	Federal Highway Administration
FM	Factory Mutual Associates
FS	Federal Specifications
FED STD	Federal Standard
FTA	Federal Transit Administration (formerly UMTA)
GPH	Gallons Per Hour
GSA	General Services Administration
HOA	HAND/OFF/AUTOMATIC
HP	Horsepower
HVAC	Heating, Ventilating and Air Conditioning
IBC;	International Building Code
ICEA	Insulated Cable Engineers Association
ICI	Industrial Coatings International
ID	Inside Diameter
IEEE	Institute of Electrical and Electronic Engineers
IPS	Iron Pipe Size
ISO	International Organization for Standardization
JGB	Jackson Graham Building 600 Fifth Street, N.W. Washington, D.C. 20001
kHz	Kilo Hertz
kV	Kilovolts
kVA	Kilovolts-amperes
kW	Kilowatts

LED	Light Emitting Diode
mV	1,000 volts
mVA	1,000 volts-amperes
MCM	1,000 Circular Mils
MCP	Motor Circuit Protector
MDNR	Maryland Department of Natural Resources
METRO	Logo for the Washington Metropolitan Area Transit Authority
MNCPPC	Maryland-National Capitol Park and Planning Commission
MS	Military Specification
MSG	Manufacturers' Standard Gauge
MIL STD	Military Standard
MSHA	Maryland State Highway Administration
MSS	Manufacturer's Standardization Society of the Valve and Fitting Industry
MTPD	Metro Transit Police Department
MUTCD	Manual of Uniform Traffic Control Devices
MWAA	Metropolitan Washington Airports Authority
MWRA	Maryland Water Resources Administration (Part of MDNR)
NAAMM	National Association of Architectural Metal Manufacturers
NACE	National Association of Corrosion Engineers
NAVFAC	USN, Naval Facilities Engineering Command
NBGQA	National Building Granite Quarries Association
NBS	National Bureau of Standards
NC	Normally Closed
NCMA	National Concrete Masonry Association
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NO	Normally Open
NPS	National Park Service
NTP	Notice to Proceed
NTIS	National Technical Information Service

OCCB	Operations Control Center Building 600 Fifth Street, N.W. Washington, D.C. 20001 (see JGB)
OD	Outside Diameter
OS&Y	Outside Stem and Yoke
OSHA	US Department of Labor, Occupational Safety and Health Administration
PCI	Prestressed Concrete Institute
PDI	Plumbing and Drainage Institute
PE	Polyethylene
PEI	Porcelain Enamel Institute
PEI	Petroleum Equipment Institute
PEPCO	Potomac Electric Power Company
PGFD	Prince Georges County, Fire Department
PGDPW&T	Prince Georges County, Department of Public Works and Transportation
PGSCD	Prince Georges County, Soil Conservation District
PPHM	Parts Per Hundred Million
PPM	Parts Per Million
psf	Pounds Per Square Foot
psi	Pounds Per Square Inch
psig	Pounds Per Square Inch Gauge
PVC	Polyvinyl Chloride
RCRA	Resource Conservation and Recovery Act
rms	Root Mean Square
rpm	Revolutions Per Minute
ROD	Revenue Operation Date
RQD	Rock Quality Designation
SDI	Steel Deck Institute or Steel Door Institute, depending upon context in which it occurs
SMACNA	Sheet Metal and Air-Conditioning Contractors National Association
S1S	Smooth One Side
S2S	Smooth Both Sides
SJI	Steel Joist Institute
SPDT	Single Pole, Double Throw
SPST	Single Pole, Single Throw

SSPC	Steel Structures Painting Council
TBM	Tunnel Boring Machine
TCA	Tile Council of America
TGA	Thermogravimetric Analysis
UFAS	Uniform Federal Accessibility Standards
UL	Underwriters Laboratories, Incorporated
UMTA	Urban Mass Transit Administration
UPS	Unit Price Schedule or Uninterruptible Power System, depending upon context in which it occurs
USBR	US Bureau of Reclamation
USCG	US Coast Guard
USCS	US Commercial Standard
USDA/SCS	US Department of Agriculture - Soil Conservation Service
USDOT	US Department of Transportation
USGBC	US Green Building Council
USN/CD	US Navy, Chesapeake Division
USPS	US Product Standard
USSG	United States Standard Gauge
WAD	Washington Aqueduct Division (Element of U.S. Army C.E., Baltimore District)
WSSC	Washington Suburban Sanitary Commission
XLPE	Cross-Linked Polyethylene

PART 2 PRODUCTS (not used)

PART 3 EXECUTION (not used)

END OF SECTION

SECTION 01470

QUALITY MANAGEMENT SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for quality control.

B. The Contractor shall employ an independent Quality Control Engineering Firm to perform the quality control testing and inspection activities described herein. The independent Quality Control Engineering Firm shall report directly to the AR and be represented at the job site at all times during construction activities associated with this Contract.

C. 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 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 quality control procedures that facilitate compliance with the Contract Document requirements.
   3. Requirements for Contractor to provide quality control services required by the Contract Documents or authorities having jurisdiction are not limited by provisions of this Section.

1.02 DEFINITIONS

A. Quality Control: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction comply with Contract requirements. Services do not include contract enforcement activities performed by the AR.

B. Quality-Assurance: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

C. Mockups or Sample Panels: Physical example assemblies to illustrate finishes and materials. Mockups and Sample Panels 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. Mockups and Sample Panels establish the standard by which the Work will be judged.

D. Quality Control Engineering Firm: An entity licensed in the Commonwealth of Virginia and the state of Maryland retained by the Contractor to perform specific tests, inspections, or both as required by the Contract Documents, codes and/or jurisdictional agencies. The Quality Control Engineer shall work independently of the Contractor and shall report directly to the AR. Quality Control Engineer, testing laboratory or testing agency or similar language used in the Contract Documents shall mean the same as Quality Control Engineering Firm.

1.03 DELEGATED DESIGN

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. Design professional retained shall be licensed in the Commonwealth of Virginia and the state of Maryland.

1.04 REGULATORY REQUIREMENTS, CODES AND STANDARDS

A. Copies of Regulations, Codes and Standards: Obtain copies of the regulations, codes and standards referenced in the Contract Documents and retain at project site to be available for reference by parties who have a reasonable need to reference the information.

1.05 SUBMITTALS

A. Qualification Data the Quality Control Engineer specified in this Section to demonstrate their capabilities and experience. Include proof of qualifications in the form of a current certification of the inspection of the Quality Control Engineering Firm by one of the agencies listed. Submit individual resumes outlining experience, registration and certifications required for the Professional Engineer, full time field inspector, and additional field inspectors to be assigned to the project in accordance with the following requirements. The individuals submitted and approved shall not be replaced on the project without prior written approval of the Authority. The minimum requirements for the Quality Control Engineering Firm shall be as follows:
   1. The Quality Control Engineering firm shall have an in-house construction materials laboratory equipped, experienced and staffed to perform the testing outlined in the Contract Documents. The Quality Control Engineering firm shall have at least one Professional Engineer licensed in the Commonwealth of Virginia permanently stationed in the office of the Quality Control Engineering Firm providing services for the project. The Professional Engineer shall be in responsible charge of all work performed by the Quality Control Engineering firm on the project
   2. The Quality Control Engineering Firm's construction materials laboratory shall be certified by one of the following agencies. The certification shall be current and remain in force for the duration of the project.
      a. Washington Area Council of Engineering Laboratories (WACEL).

b. American Association of State Highway and Transportation Officials (AASHTO).
c. Department of the Army, Corps of Engineers.
d. Cement and Concrete Reference Laboratory (CCRL).

3. The Quality Control Engineering firm shall provide one field inspector to be stationed on site full time for the duration of the project. The minimum qualifications of the full time field inspector shall be certifications held by the assigned individual. At least one of the following certifications shall be held by the individual and remain in force for the duration of the project:
   a. WACEL Structural Inspector
   b. American Concrete Institute; Concrete Construction Inspector
   c. National Institute for Certification in Engineering Technologies (NICET); Construction Level 3.
4. The Quality Control Engineering Firm shall provide additional field inspectors to assist the full time field inspector as required by the work activities or the AR to ensure that the testing and inspection requirements are fulfilled. A minimum of two (2) field inspectors shall be on site during all concrete pours. The minimum qualifications of the additional field inspectors shall be certifications held by the assigned individual. At least one of the following certifications shall be held by each individual and remain in force for the duration of the project.
   a. WACEL: Concrete Level II.
   b. American Concrete Institute: Concrete Field Testing Technician – Grade I.
   c. NICET: Construction Level II.
5. The Quality Control Engineer Firm shall provide at least one field inspector to inspect structural steel fabrications and field welding performed as part of the work. This inspector may be assigned to the project of a part-time basis but shall be responsible for the monitoring and inspection of all work involving structural steel and welding. The minimum qualifications of the additional field inspectors shall be certifications held by the assigned individuals. At least one the following certifications shall be held by the individual and remain in force for the duration of the project:
   a. WACEL: Structural Steel.
   b. American Welding Society: AWS QC1.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to the Contractor to be designed or certified by a design professional, indicating that the products, materials and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services. The design professional shall be a Professional Engineer or Architect (based on the specific design discipline requirements) licensed in the Commonwealth of Virginia and state of Maryland. Submittals requiring seals shall be sealed and signed by the responsible design professional.

C. Schedule of Tests and Inspections: Schedule of tests and inspections shall be developed jointly between the Contractor and Quality Control Engineer based on the

requirements of the Contract Documents. The schedule shall be submitted within 30 days of the Notice to Proceed. The schedule shall be formatted 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.

D. Reports: The Quality Control Engineer shall prepare daily activity reports and test reports for the project Daily reports shall be delivered to the AR at the end of each day's work. Daily reports and test reports shall be forwarded to the office of the Quality Control Engineer, reviewed by the Professional Engineer, certified and written reports delivered within five (5) working days of the test or inspection activity. Daily reports and test reports that include the following:

1. Date of issue.
2. Project title, correspondence, number, and Contract number. Follow the format provided by the Authority.
3. Name, address, and telephone number of Quality Control Engineering firm.
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. Ambient 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 Documents requirements.
12. Punch list where required.
13. Recommendations on retesting and re-inspecting.
14. Name and signature of field or laboratory inspector.
15. Name and signature of the AR.
16. Signature and Seal of the Professional Engineer in responsible charge.
17. Two copies shall be delivered directly to the AR and one copy shall be delivered to the Contractor.

E. Permits, Licenses, and Certificates: For the Authority's records, submit copies of permits, inspection 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.

1.06 QUALITY ASSURANCE

A. 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.

B. Manufacturer's Representative Qualifications: An AR 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.

C. 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. Where required, submit copies of manufacturer's certifications held by Installer.

D. 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.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified and licensed to practice in the Commonwealth of Virginia and state of Maryland, and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for inspection and testing, installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Quality Assurance Compliance:
   1. The Contractor shall prepare a contract quality assurance program based on the requirement for work plans, submittals and other quality assurance and quality control articles contained in this Contract. The program shall consist of the plans, procedures and organization necessary to provide inspection, testing unless otherwise specified, and verification that materials, equipment, workmanship, fabrication, construction and operations comply with Contract requirements. The Quality Assurance Program and the name and qualifications of the person within the Contractor’s organization responsible for managing the approved Quality Assurance Program shall be submitted to the Authority Representative. Work will not be permitted for any portion nor will progress payments be made for any portion of work until the Contractor’s Quality Assurance Program is approved for that portion by the Authority Representative and the Quality Assurance Manager is approved by the Authority Representative. Notify the Quality Control Engineer and AR at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.
   2. To assure the Contractor’s compliance with and conformance to the approved Contractor’s Quality Assurance Program, the program will be subject to quality audits. Audits will be scheduled by the Authority Representative as required.

G. Quality Assurance (QA) Program:
   1. Before starting the other Work of this Contract, develop and implement an approved Contractor's Quality Assurance Plan (CQAP) for this Contract that incorporates the requirements of the Federal Transportation Administration's 15 quality elements as described in FTA IT-90-5001-02.1, referred to as the FTA Guidelines, and the additional requirements in this Contract's Specifications.
      a. The CQAP must include the specified requirements for all 15 quality elements listed in the FTA Guidelines.
         1) Not all of the required quality elements are identified and specified in this Section.
         2) Some of the 15 FTA Quality Elements required to be incorporated into the CQCP, including numbers 1, 2, 3, 4, 5, part of 8, 9, 13, 14, and 15, are identified and specified in this Section.
         3) Several of the required quality elements, including FTA Quality Elements 6, 7, part of 8, 10, 11, and 12, are identified and specified in Quality Control.
      b. Submit the Contractor's Quality Assurance Plan (CQAP) to the AR for approval.
   2. Contractor Quality Assurance Plan (CQAP):
      a. Management Responsibility [FTA Quality Element 1]:
         1) Define your organizations quality policy in the CQAP.
            a) Provide a statement that shows your organization's commitment to the quality policy extends to the highest level.
               (1) Your organization's management must declare and document its commitment to quality within a Quality Policy Statement to be included at the beginning of the CQAP.
         2) In the CQAP, show that your quality policy extends to all levels of your organization.
      b. Quality Assurance and Control Personnel:
         1) Contractor Quality Assurance Manager:
            a) Employ a Contractor Quality Assurance Manager empowered with full authority and responsibility to represent and act for the Contractor on all quality related matters for this Contract.
               (1) Give the Quality Assurance Manager the authority and responsibility for ensuring the quality policy is communicated, implemented, and maintained.
               (2) Have the Quality Assurance Manager, or his designated substitute, available and on the Work Site at all times that any work is in progress.
               (3) Give the Quality Assurance Manager responsibility for coordinating inspections and testing to be performed by the Testing and Inspecting Agencies as specified in Section Quality Control, and authority to stop further construction of non-conforming Work pending completion of required corrective action.
            b) Contractor's Quality Assurance Manager Qualifications:

(1) The Contractor's Quality Assurance Manager must have a minimum of five years of construction-related Quality Assurance experience with a minimum of two years in supervision or management of Quality Assurance Work.
(2) The Contractor Quality Assurance Manager must be acceptable to the AR.
(3) Submit the proposed Contractor's Quality Assurance Manager's resume showing his name, qualifications, and experience to the AR for approval.

2) Quality Control Inspectors and Test Personnel:
   a) Employ, at a minimum, one qualified full-time Quality Control inspector to be on-site during the installation and testing phase of the Contract.
   b) Assign or designate additional Contractor Quality Control personnel to perform inspections and test the Work as required.
   c) Submit the resumes showing the names, qualifications, and experience of all quality control personnel assigned to the Quality Control Manager to the AR for approval.
3) Place the Quality Assurance Manager and other assigned quality assurance personnel on the direct payroll of the Contractor, but do not assign them to any other positions under this Contract.
   a) Have the Quality Assurance Manager report directly to the highest level of management, such as corporate principal or corporate quality assurance manager, and not to any project level manager.
      (1) Set up the Contractor Quality Assurance Manager position to be independent of the Contract's construction staff.
4) Identify those persons responsible for the quality assurance and control functions in the CQAP; and define in writing the responsibility, authority, and interrelation of those persons.
   a) Include an Organization Chart detailing the quality assurance and control organization and reporting responsibilities.
   b) Identify a Contractor Quality Assurance Manager and show that his position is independent of the Contract‘s construction staff.
   c) Show the Contractor Quality Assurance Manager's staff and clear lines of authority and responsibility for quality management.
5) Do not remove any Contractor quality assurance personnel from their duties on this Contract without prior written notice to the AR.
   a) Notify the AR, in writing, if you plan to remove or replace the Quality Assurance Manager or other key quality control personnel identified on the organization chart.
   b) Submit the resumes of replacements for the Quality Assurance Manager and other key quality control personnel showing their qualifications to the AR for approval.

3. Documented Quality Management System [FTA Quality Element 2]:
   a. Establish and document a quality management system within the Contractor Quality Assurance Plan (CQAP) to ensure Contract quality objectives are

satisfied, and maintain the quality management system during the life of the Contract.

1) Develop, implement, and maintain a quality management system consistent with the requirements of this Section, General Provisions and FTA-IT-90-5001-02.1 to assure that the equipment and materials provided conform to the applicable requirements of every Section of the Contract Specifications.
2) Provide a quality management system to assure accuracy and consistency in production, installation, and construction processes by providing documented work instructions where needed to ensure quality.
3) Do not begin Work covered by the Contractor's Quality Assurance Plan (CQAP) until the AR reviews and approves the plan.
4) Extend the quality management system requirements to Suppliers and Subcontractors as appropriate.

b. Establish, implement, and maintain a Quality Procedure Development Plan (QPDP) to develop procedures and instructions for implementing the Contractor's Quality Assurance Plan (CQAP).

1) Develop written procedures and instructions for activities affecting quality in design, procurement, manufacturing, and construction, as applicable to the Work being performed.
   a) Procedures must contain a statement of their purpose, scope, applicability, and assigned responsibilities.
      (1) Assign specific responsibilities and clearly delineate individual job authorities and responsibilities.
   b) Describe sequential processes to be followed to accomplish quality objectives; and contain references to codes, standards, specifications, and related or interfacing procedures.
      (1) Prescribe inspection and testing techniques with written procedures, and keep them up-to-date.
      (2) If new inspection or testing techniques are being used for construction or manufacturing, allow adequate time to develop appropriate quality procedures for the new techniques.
      (3) Include formats for the quality records needed to ensure that the procedures and instructions are followed and documentation requirements are understood.
   c) In developing the quality procedures, give consideration to identifying and acquiring any inspection equipment, skills, or special quality processes needed to ensure quality performance.
2) Include an index of all procedures and instructions to provide a comprehensive account of the quality controls that are required to implement the Contractor Quality Assurance Plan (CQAP).

c. Daily Quality Management Reports:

1) Prepare Daily Quality Management Reports for each day any Work is performed and which at a minimum identify material deliveries, Work accomplished, tests conducted, results of inspection and tests,

nonconforming work and its disposition, causes of nonconforming work, and corrective actions taken to prevent recurrence.

2) Submit the Daily Quality Management Reports to the AR for review on a daily basis.

d. Certification of Payment Requests:

1) Submit Application for Payments in accordance with the requirements of General Provisions.

e. Certification of Completion of the Work:

1) When all obligations under the Contract have been fulfilled, submit written notice to the AR in accordance with the requirements of General Provisions.

4. Design Control [FTA Quality Element 3]:

a. Establish appropriate written procedures within the Contractor's Quality Assurance Plan (CQAP) for identifying, documenting, and reviewing and approving all changes and modifications to the original design.

1) Establish and maintain procedures to control and verify the design of systems in order to ensure that the design criteria, other specified requirements, and requirements of the relevant regulatory agencies are met.

2) Extend this responsibility to those responsible for developing "as-built" documents as part of the design documentation at the end of the Contract, and to construction or manufacturing to ensure compliance with the design requirements.

b. Design control includes planning the design interfaces and design verification activities to ensure that the design requirements are understood, and controlling design changes through Contract completion.

1) Prepare a Design Plan that identifies individuals responsible for different design parts and who has the responsibility to assure the quality of the design.

a) Identify, document, and review design input requirements; and have the requirements reviewed by the designer and those responsible for developing the requirements.

b) Assign competent individuals to verify the quality of the design.

2) Verify and document that design output meets the design input requirements.

a) Design output includes acceptance criteria, conformance to regulatory requirements whether or not these have been stated in the design output requirements, and identifying those aspects of the design that are crucial to the safe and proper functioning of the final product or system.

b) Identify the various organizational interfaces required between various groups producing and commenting on the design, and specify the information to be documented, transmitted, and regularly reviewed.

c) Include the following design verification activities, as appropriate:

(1) Alternative calculations.

(2) Independent checks of design calculations, specifications, drawings, and contract documents.
(3) Conducting and documenting design reviews.
(4) Undertaking qualification tests and demonstrations.
(5) Comparing the design with similar proven designs, if available.
(6) Design reviews for constructability, operability, and maintainability.

3) Specify within the Design Plan how the operating and maintenance departments of the Authority would interface with those producing the design.

5. Document Control [FTA Quality Element 4]:
   a. Establish and maintain written procedures for the control of Contract documents.
      1) Develop document control procedures that provide controls for the drawings, specifications, Contract data, special work instructions, operational procedures, and receipt and transmittal of submittals.
      2) Provide procedures for the distribution and storage of documents related to the Contract.
         a) Promptly eliminate obsolete documents from each work location.
         b) Retain superseded documents in Contract files, and clearly identify each as such.
      3) Examples of the types of Contract documents requiring control include, but are not limited to:
         a) Contract Drawings.
         b) Specifications.
         c) Special work instructions.
         d) Operational procedures.
         e) Quality assurance program procedures.
   b. Develop document control measures to assure that all relevant documents are current and available to all users who require them.
      1) Develop procedures to insure that documents are reviewed by the relevant authorized personnel.
         a) Provide procedures to insure that changes to documents are reviewed and approved by the same authorized individuals that reviewed and approved the original documents.
         b) Control changes to Contract documents, and promptly distribute those changes to all required locations together with a master list enumerating the current revisions of each document.
      2) Develop procedures to assure that all documents required are received and distributed in a timely manner, and contain the necessary technical information.
         a) Distribute and make available copies of documents to all locations needing them to assure that the quality management system functions effectively.
6. Purchasing [FTA Quality Element 5]:
   a. Establish and maintain procedures to assure that purchased services and products conform to specified requirements.

b. Provide written procedures within the Contractor's Quality Assurance Plan (CQAP) that address at a minimum the following:
   1) Evaluation and selection of Suppliers using specified evaluation criteria including supplier quality programs.
      a) Generate a list of qualified Suppliers with the descriptions of the scope of services that they have been qualified to provide to the Contract.
         (1) Prior to procurement of items and materials, submit a list of Suppliers and Subcontractors that includes a description of the items to be supplied, and/or other pertinent information as appropriate to the AR for approval.
      b) Select Suppliers based on their ability to meet Contract requirements.
   2) Transmission of applicable design, manufacturing, quality, and other associated technical requirements in purchase documents.
   3) Review and approval of purchasing documents by a designated authority to verify the adequacy of requirements specified prior to release.
   4) Periodic assessment of Supplier performance; e.g., inspection and testing at the source, and/or auditing of the Supplier by the Contractor.
   5) Evaluation of the adequacy of the products procured at the time of receipt and/or at the point of manufacture to verify compliance with purchasing documents.

c. Extend the quality requirements of this Section to Suppliers and Subcontractors as appropriate to the work being performed.
   1) Impose upon Suppliers and Subcontractors within procurement documents the same quality control requirements, including inspection and test procedures, as imposed on the Contractor by this Section, other Contract Specifications, and referenced standards.

7. Inspection and Testing [FTA Quality Element 8]:
   a. Testing and Inspection Agencies:
      1) Employ the services of one or more independent certified material testing laboratories, hereafter referred to as the Testing and Inspection Agency or Testing and Inspection Agencies, to perform materials testing, control testing, and inspections of the materials to be incorporated into the Work of this Contract; and having the following qualifications.
      2) Testing and Inspection Agency Qualifications:
         a) Each Testing and Inspection Agency must comply with the quality standards for testing laboratories of the nationally recognized associations and agencies that promulgate the test standards specified, and to the basic requirements of ASTM E 329 and the other standards specified in individual Specification Sections.
         b) Each Testing and Inspection Agency must be capable of performing the reviews, inspections, and testing required by this Contract; including but not limited to the following:

(1) Inspecting, sampling, and testing proposed materials and production as required by the AR for compliance with the Contract Documents.
(2) Capable of securing production samples of materials at plants or stockpiles during the course of the work, and testing the samples for compliance with the Contract Documents.

c) The Testing and Inspection Agency must be approved by the AR, and must also be accepted by the local jurisdictions responsible for building inspection.

d) Submit the qualifications and certifications of the proposed Testing and Inspection Agencies to the AR for approval.

3) Dismissal and replacement of any of these independent certified Testing and Inspection Agencies by the Contractor requires written notice to and the approval of the AR.

8. Inspection, Measuring, and Test Equipment [FTA Quality Element 9]:

a. Identify, control, calibrate, and maintain inspection, measuring, and test equipment (M&TE) required to perform inspections, tests, and measurements in order to demonstrate the conformance of Work to the specified requirements.

1) Establish and maintain a system to identify, control, calibrate, and maintain all inspection, measuring, and test equipment prior to its use to demonstrate that construction conforms to the requirements of the Specifications.

a) Identify each piece of inspection, measuring, and test equipment with unique identification label permanently and directly affixed to the equipment.

b) Also affix calibration labels to inspection, measuring, and test equipment showing the date the equipment was last calibrated and the date recalibration is due.

2) Use only inspection, measuring, and test equipment of the proper type and accuracy for the required measurement, and store and use equipment under suitable environmental conditions.

a) Inspection or tests performed using inspection, measuring, and test equipment that is subsequently found to be out-of-tolerance, or damaged during use, or lost are considered nonconforming until all characteristics previously inspected or tested using the equipment have been reassessed and re-verified as correct, re-inspected, or re-tested as necessary.

(1) A nonconformance report for out-of-tolerance or damaged inspection, measuring, and test equipment must be processed in accordance with the requirements of Nonconformance Reporting [FTA Quality Element 11] as specified in Section Quality Control.

b. Make provisions for the recalibration of inspection, measuring, and test equipment in a timely manner.

1) Contractor or Authority must perform and document calibration of inspection, measuring, and test equipment using calibration standards

traceable to the National Institute of Standards and Technology (NIST), and at intervals specified in calibration procedures to assure the accuracy of inspection, measuring, and test equipment.
a) NIST information is accessible at ts.nist.gov.
2) In the event that no national standards exist for calibration, document the basis for calibration.
3) Recall and recalibrate inspection, measuring, and test equipment at pre-prescribed intervals and maintain records of calibration.

9. Quality Records [FTA Quality Element 13]:
   a. Establish and maintain written procedures for quality records to identify which records are to be kept; responsibility for their production and collection; and responsibility for indexing, filing, storage, maintenance, and disposition of quality records.
      1) Identify every type of quality record to be generated as a result of implementing the CQAP, and specify the retention time for each.
      2) Quality records requiring control include, but are not limited to:
         a) Inspection Reports.
         b) Test Data.
         c) Certification Records.
         d) Personnel Qualifications.
         e) Submittals, Value Engineering Change Proposals (VECP), Change Orders, and Requests for Interpretation/Information (RFI).
         f) Calibration Records.
         g) Nonconformance Reports.
         h) Corrective Action Reports.
         i) Quality Audit Reports.
      3) Include Supplier, Contractor, and Subcontractor quality records.
      4) Ensure that a level of authority commensurate with the nature of the quality records verifies the adequacy of records on a systematic basis.
   b. Index, file, and maintain all quality records in a manner that provides for timely retrieval, traceability to, identification with, and acceptability of, material, equipment and systems.
      1) Quality records must be legible and specify the work involved.
      2) Only complete, legible, and properly authenticated documents can be considered quality records.
      3) Maintain quality records to provide objective evidence that all activities conform to CQAP requirements specified, to show that the quality management system is properly functioning, and to document the basis of decisions.
      4) Maintain quality records in a manner that minimizes deterioration and damage.
      5) Index of Quality Control Records:
         a) Prepare and submit an index of all quality control records that will be accumulated and maintained during the progress of the Work.
   c. Make quality records available to the AR upon request.
   d. Retention time for all quality records will be not less than 3 years after the date of Final Acceptance, except as modified below.

1) Sample retention:
   a) In addition to the Sample requirements of Special Conditions, retain all Samples of materials, products, or assemblies to be incorporated into the Work for a minimum period of 1 year after the date of the Certificate of Final Acceptance.
2) Provide 30 days notice to the AR of intent to discard or destroy quality records, including Samples as may be in the possession of the Contractor or his Subcontractors, subsequent to this retention time.

10. Quality Audits [FTA Quality Element 14]:
    a. Establish and implement written procedures for the performance of internal quality audits to assure that the elements of the quality management system are functioning as intended.
       1) Quality audits are not the same as financial audits.
    b. Quality Audit Schedule:
       1) Establish a Quality Audit Schedule denoting the locations, organizations to be audited, topics, and scheduled dates.
       2) Schedule audits based upon the status and importance of the activity being audited.
          a) At a minimum, perform audits at 90-day intervals or as necessary to verify that all elements of the Quality Management System are functioning as intended.
       3) Update the audit schedule at 90-day intervals beginning on the date of approval of the initial schedule by the AR.
    c. Quality Audit Plan:
       1) Prepare and submit quality audit plans to the AR for each audit.
          a) Address audit scope, location, and dates.
          b) Include audit checklists to be used.
    d. Quality Audit Procedure:
       1) Perform scheduled internal audits to verify that quality assurance procedures are being enforced and are functioning as intended to ensure total compliance with the Specifications, Contract Drawings, and all reference standards.
       2) Conduct Audit Entrance Meetings with the audited organization's responsible management personnel.
       3) Use procedures, standards, and audit checklists to assure substantive audit results.
       4) Identify records examined, activities witnessed, and personnel interviewed during the audit.
       5) Thoroughly investigate problems and clarify misunderstandings during the course of the audit.
       6) Document the quality problems in Audit Finding Reports.
       7) Conduct Audit Exit Meetings with responsible personnel and discuss audit results, problems noted, and required corrective action, and schedules for completion of corrective actions.
    e. Quality audit personnel:
       1) Use qualified personnel having no direct responsibilities in the area audited.

2) Document the basis of audit personnel qualification.

f. Quality Audit Report:
   1) Document audit results within a Quality Audit Report.
      a) Report areas/topics audited.
      b) Identify the audited organization and report any problems found.
      c) Address the root causes that led to any nonconforming conditions, and recommend actions to prevent recurrence of the nonconformance.
   2) Distribute Quality Audit Reports and Audit Finding Reports to personnel having responsibility for the areas audited within 10 working days following the completion of the audit.
   3) Submit all Quality Audit Reports to the AR for approval no later than 30 days after each audit.
   4) Maintain records of quality audits as quality records and make them available to the AR upon request.

g. Quality audit follow-up:
   1) Assure that responses to Audit Fining Reports are complete and accurate.
   2) Track and verify corrective action, and close problem reports resulting from audits in a timely fashion.
   3) Re-audit deficiency areas on an accelerated basis to verify effectiveness of corrective action and actions to preclude recurrence of problems.

h. Authority Audits:
   1) Quality audits of Contractor, Subcontractor, and Supplier activities may be performed by the Authority's representatives to verify compliance with the Specifications and referenced standards.
   2) Upon notice by the AR, provide timely access to facilities, locations, records, and personnel by the Authority's auditors to facilitate performing Authority audits.
   3) Assure cooperation with the Authority's auditors by all Contract personnel.
   4) Provide timely and thorough responses to Authority-identified quality problems.

11. Training [FTA Quality Element 15]:
    a. Establish and maintain documented procedures for identifying training needs and to provide for the training of all personnel performing activities affecting quality.
       1) Training must include, but not be limited to, procedures to identify potential quality problems in either the Work or materials; and must include appropriate direction for identifying, reporting, and resolving quality problems.
       2) Train the Contractor's quality assurance and quality control personnel so they are qualified for their assigned quality tasks based on having the appropriate education, training, or experience required.
       3) Train the workers, Subcontractors, Suppliers, and others who perform tasks affecting quality to comply with the various quality-related

procedures defined in the CQAP as they relate to the individual's responsibilities.

4) Develop and maintain a training matrix that lists the following:
   a) Project personnel by title.
      (1) Include consultant, Contractor, and Subcontractor personnel.
   b) Applicable procedures, standards, specifications, or other training materials.
   c) Type of training (classroom or required reading).

H. Field Samples and Mock-Ups:
1. When specified, provide Samples and mock-ups that illustrate functional and aesthetic characteristics similar in every way to the actual materials or equipment to be incorporated into the work.
   a. Provide office Samples of sizes and quantities that clearly illustrate the full color range and functional characteristics of products and materials, including attachment devices.
   b. Furnish required Samples and mock ups at no additional cost to the Authority.
2. Erect field Samples and mock-ups at the Work Site as specified in individual Specification Sections, and as may be necessitated by the Contractor submitting value engineering proposals, at locations acceptable to the AR.
   a. Do not incorporate the Sample or mock-up material or equipment into the Work until approval to do so is received from the AR.

I. Failure to Perform:
1. In the event the Contractor fails to adequately perform any or all of the provisions of this Section, the Authority, at its sole discretion, reserves the right to have the AR perform any or all of the provisions in this Section and back charge the Contractor for the actual cost to the Authority of such services.
   a. This remedy for the Contractor's failure to perform is in addition to any other right or remedy available to the Authority under this Contract.
   b. Refer to General Provisions, for additional information regarding the Authority's remedies.

J. Preconstruction Testing: Quality Control Engineer shall perform preconstruction testing for compliance with specified requirements for performance and test methods.
1. Contractor responsibilities include the following:
   a. Provide test specimens and assemblies representative or proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
   b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
   c. Fabricate and install test assemblies using installers who will perform the same tasks for the Project.
   d. When directed by the AR, remove assemblies; do not reuse materials on Project.

2. Quality Control Engineer Responsibilities: Submit a certified written report of each test, inspection, and similar quality control service directly to the AR, with copy to the Contractor. Reports shall be submitted within five (5) working days after the activity. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups/Sample Panels: Before installing portions of the Work requiring mockups and/or sample panels, build mock ups and/or sample panels 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 the AR
   2. Notify AR seven (7) days in advance of dates and times when mockups and/or sample panels will be constructed.
   3. Demonstrate the proposed range of aesthetic effects and workmanship.
   4. Obtain AR's approval of mockups or sample panels before starting work, fabrication, or construction.
   5. Maintain mockups and/or sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
   6. Demolish and remove mockups when directed by the AR

1.07 QUALITY CONTROL

A. Authority Responsibilities: The AR will review the activities of the Quality Control Engineer.

B. Contractor Responsibilities: Unless otherwise indicated, provide quality control services specified by the Contract Documents and required by authorities having jurisdiction through the Quality Control Engineer.
   1. All quality control services are to be provided through the Quality Control Engineering Firm.
   2. Notify the Quality Control Engineer and AR at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.
   3. Testing and inspecting requested by Contractor and not required by the Contractor Documents and Contractor’s responsibility.
   4. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
   5. Allow the Quality Control Engineer to remove material samples as required for testing.
   6. Furnish any labor necessary to assist the Quality Control Engineer in obtaining and handling samples.
   7. Provide water or electric power for quality control sampling, testing and inspections as required.

8. Provide access to the Work including scaffolding and walk boards as required for quality control sampling, testing and inspection.
9. Repair all damage or labels made on work surfaces as part of quality control sampling, testing and inspections.
10. Provide and maintain, including temperature control, for the sole use of the Quality Control Engineer, adequate facilities for the safe storage and proper curing of the concrete test specimens on the project site for the first 24 to 48 hours as required by ASTM C31.
11. Do not place concrete or cover portions of the Work until all inspections and testing have been completed and all deficiencies have been corrected to the Quality Control Engineer's and AR's satisfaction. Work, which is performed prior to the Quality Control Engineer's and AR's approval, is subject to removal and replacement at the Contractor's expense.
12. Additional sampling, testing and inspection shall be performed at the Contractor's expense when required by the AR due to:
    a. Changes in materials or proportions, changes in work sequencing, or changes in curing times or methods as requested by the Contractor.
    b. Testing of materials or concrete, which, due to failure by previous test or inspection, do not meet the Contract requirements.
    c. Failure by the Contractor to execute the Work as detailed or specified in the Contract Documents.

C. Quality Control Program:
1. The Contractor is responsible for all quality control for the Contract, with the exception of those tests or inspections specifically identified as being performed by others.
2. Omissions and errors in the Contract Document descriptions do not relieve the Contractor of his responsibility to perform all tests/inspections required within the scope of this Contract.
3. Inspections and tests performed by the AR are for the Authority’s Quality Assurance and do not relieve the Contractor from the responsibility of meeting the specified requirements.
    a. Inspections and tests performed by the AR are not to be considered a guarantee for acceptance of materials that will be delivered subsequent to the time the items were inspected or tested.
4. At no increase in Contract Price, bear the cost for the Contractor Quality Control inspections and tests required in accordance with the requirements of General Provisions.

D. Contractor’s Quality Control Plan (CQCP)
1. Before starting the other Work of this Contract, an approved Contractor’s Quality Control Plan (CQCP) that includes the fifteen quality elements listed in FTA IT-90-5001-02.1 must be developed and implemented for this Contract as specified in Section Quality Assurance.
    a. Not all of the quality elements required to be incorporated in the CQCP are specified in Section Quality Assurance; several of the required quality

elements, including FTA Quality Elements 6, 7, part of 8, 10, 11, and 12, are identified and specified in this Section.

2. Product Identification and Traceability [FTA Quality Element 6]:
   a. Establish and maintain measures for identifying and controlling items of production such as batches, materials, parts, and components, to prevent the use of incorrect or defective items and to assure that only correct and acceptable items are used or installed.
      1) Develop documented procedures within the Contractors' Quality Assurance Plan (CQAP) specified in Section Quality Assurance, to assure that procured items, equipment, and materials are physically identified.
         a) Provide traceability of items to required documents during all phases of production from receipt of raw materials, components, or subassemblies through the construction process, to delivery of final products.
            (1) Provide identification and traceability throughout all inspections, test activities, and record keeping.
            (2) Develop and maintain a documented system to clearly identify the inspection and test status of materials and equipment throughout construction.
            (3) For stored items, preserve item identification and traceability consistent with the expected duration and type of storage.
         b) Physically identify and control items to the extent possible from the time of receipt inspection through installation and testing.
            (1) Insure the identity of items by placing markings on or with the items or by placing the items in specifically identified physical locations.
               (a) Facilitate identification by means of stamps, tags, or other control devices attached to or accompanying the material or equipment.
               (b) Employ physical separation, procedural control, or other appropriate means where physical identification is impractical.
            (2) Mark, track, and control equipment and materials that require inspection or testing within specific time intervals.
            (3) Establish procedures to control the use of status tags, including logging, installation, and removal.
            (4) Define who is authorized to apply and remove status tags.
      2) Serialization Plans:
         a) Develop a comprehensive plan for tracking the serial numbers of equipment provided under this Contract.
            (1) Include the proposed numbering scheme, method for assigning numbers, and tracking tools and procedures.
            (2) Include the proposed organization of the serial number database.
         b) Maintain the serial number database and use it to track inventory and to establish equipment reliability.

3) Intentional unauthorized removal of non-conformance status tags will result in immediate dismissal and removal from the Work Site of all responsible personnel.
4) Segregate items that do not have identification, items for which record traceability has been lost, and items that do not conform to the requirements of the Contract to prevent their inadvertent incorporation into the Work of this Contract.

b. Receiving Incoming Products, and Final Inspection and Testing:
1) Specify and implement the procedures for receiving incoming products and for final inspection and testing, and document the results of these procedures.
a) Conform with the requirements specified in General Provisions, and establish material control procedures to ensure that equipment and materials accepted through receiving inspection comply with the procurement documents, and to assure that equipment and materials are properly received, inspected, stored, maintained, installed, and used.
2) Receiving Inspection:
a) Implement documented receiving inspection procedures for purchased items such as materials, parts, or equipment delivered to the Contractor.
b) Receiving Inspection Records:
(1) Develop and maintain Receiving Inspection Records, which at a minimum must contain the following information:
(a) Purchase order number.
(b) Item number.
(c) Supplier name.
(d) Quantity.
(e) Item description.
(f) Reference to applicable Contract requirements.
(g) Date received.
(h) Heat number, serial number, or other identification, as applicable.
(i) Inspection records for in-transit damage and gross defects.
(j) Verification of receipt of all required supporting documentation, including Certificates of Compliance and Certified Material Test Reports, and verification that these documents are traceable to the items received.
(k) Acceptability (accept/reject) and nonconformance report number, if applicable.
(l) Quality control person’s signature and date.
c) Receiving Inspection Log:
(1) Develop and maintain a Receiving Inspection Log, which at a minimum must contain the following information:
(a) Purchase order number.
(b) Quantity.
(c) Item description.

(d) Date received.
(e) Heat number, serial number, or other identification, as applicable.
(f) Acceptability (accept/reject) and nonconformance report number, if applicable.
(g) Quality control person's initials and date.

3. Process Control [FTA Quality Element 7]:
   a. Identify and plan the production and installation processes that directly affect quality, and ensure these processes are performed under controlled conditions.
      1) Handle, store, and preserve procured items, equipment, and materials from the time of receipt to the time of installation and testing to prevent damage, deterioration, distortion of shape or dimension, loss, degradation, loss of identification, or substitution.
      2) Use special devices, e.g., crates, boxes, containers, dividers, slings, material handling and transportation equipment, and other facilities, for handling material; and insure the special devices are maintained and periodically inspected.
      3) Provide only new materials for incorporation into the Work except where specified otherwise.
      4) Develop work instructions for production and installation processes that include:
         a) Sequencing work operations, including hold and witness points for required examinations, inspections, and tests, where such work is complex or when there are multi-discipline interfaces.
            (1) Hold points are mandatory.
            (2) Witness points may be waived by the establishing individual.
         b) Using suitable equipment.
         c) Providing a suitable work environment.
         d) Using qualified personnel and stating qualification requirements, e.g. certifications, credentials, or licenses.
         e) Conforming to referenced and other applicable codes, standards, and quality plans.
         f) Controlling and monitoring work processes during manufacturing, installation, and construction.
   b. Continuously monitor special processes, the result of which cannot be verified by subsequent inspection and testing.
      1) Conduct continuous monitoring and/or assure conformance with documented procedures during special processes such as welding, nondestructive examination, and heat treatment where the results cannot be verified during subsequent work operations.
      2) Use personnel approved by the AR and that have the experience, training, certification, and where required the license commensurate with the scope, complexity, or nature of the activity whenever performing special processes, i.e., welding, brazing; or inspection/test tasks.
      3) Special process procedures at a minimum must include the following.
         a) Requirements for the qualification of special process procedures.

b) Personnel qualifications required for performing the special process including certifications, credentials, or licenses.
c) Orientation into quality program requirements.
d) Training in applicable special process procedures.
e) Evaluation (initial and periodic) of the personnel performing special processes.

4. Inspection and Testing [FTA Quality Element 8]:
   a. Materials and fabrication procedures will be subject to inspection, sampling, and testing in the mill, shop, and field by the building official, and the Testing and Inspection Agency or Agencies for the duration of this Contract.
      1) The qualifications for the Testing and Inspection Agency or Agencies are specified in Section Quality Assurance.
      2) When material furnished or work performed by the Contractor fails to conform to the Contract Documents, the Testing and Inspection Agency is responsible for immediately reporting such deficiency to the AR and the Contractor.
      3) The Testing and Inspection Agency must submit certified written reports that document the results of all tests and inspections performed directly to the AR immediately after the work is performed.
         a) The reports must state whether the tested and inspected items comply with specified requirements or deviate from them.
      4) Inspections and tests performed by the Testing and Inspection Agency do not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
   b. Inspection and Test Plan:
      1) Develop an Inspection and Test Plan, consistent with the requirements of this Section, to plan inspection and testing procedures as necessary to verify the quality of the Work of this Contract.
         a) Identify all required inspections and tests required by each Specification Section, the required frequency of each, the accept/reject criteria of each, records required to document compliance, and the procedures or instruction to be used for control of each activity.
         b) Provide sufficient detail to allow the AR or any agency having jurisdictional authority over the Work, to find any and all operations to be inspected by that organization in the plan.
         c) Provide written inspection and test procedures that address at a minimum the following:
            (1) Test prerequisites.
            (2) Required tools, equipment, and instrumentation.
            (3) Personnel qualification requirements.
            (4) Necessary environmental conditions.
            (5) Acceptance criteria.
            (6) Nonconformance reporting requirements.
            (7) Data to be recorded.
            (8) Test Results reporting forms.
            (9) Identification of items inspected or tested.

2) Submit the Inspection and Test Plan to the AR for approval, and do not commence inspection or test activities until such approval is granted.
3) Implement and maintain the approved Inspection and Test Plan for the duration of this Contract.
   a) Using the Contractor's quality control personnel or an approved Testing and Inspecting Agency as appropriate, perform in-process testing and inspection in accordance with documented procedures reviewed and approved by the AR to verify conformance of an item or work activity to specified requirements.
      (1) Make procedures and instructions readily available to inspection and test personnel at the time and place of the inspection or test.
      (2) Perform acceptance testing and inspection using qualified personnel other than those performing the Work.
      (3) When methods of inspection and test are changed, reflect revisions in approved written procedures prior to implementation of the change on any Work.
      (4) Immediately report inspection/test results indicating nonconformance (failure) with specified requirements to the AR.
   b) Perform both inspections and process monitoring to ensure that the requirements specified for controlling work processes and the quality of the item are being achieved.
      (1) Verify that the methods and processes reflected in approved work procedures and instructions are completely and continuously followed.
      (2) Perform inspections and tests as necessary to verify the quality of the Work on items such as the following:
         (a) Items of the Work affecting safety.
         (b) Items that affect system reliability.
         (c) Items that affect service life.
         (d) Long lead-time items and custom manufactured items.
         (e) High visibility areas.
         (f) ADA compliance items.
   c) Prepare and submit records (reports) of inspection and test activities that address at a minimum the following:
      (1) Name of item(s) inspected/tested.
      (2) Specification reference by Section and Paragraph and revision level or revision date (where applicable).
      (3) Quantity of Items.
      (4) Location.
      (5) Inspection/test procedure reference.
      (6) Date.
      (7) Name of inspector/tester.
      (8) Observations/comments.
      (9) Specified requirements with the Section/Paragraph number reference.

(10) Deviations/non-conformances.
(11) Corrective action.
(12) Evaluation of results.
(13) Acceptability.
(14) Signature of authorized inspection and test personnel.

c. Certificates of Compliance and Certified Material Test Reports:
   1) Materials may be accepted on the basis of a Certificate of Compliance or Certified Material Test Report.
   2) Materials accepted on the basis of a Certificate of Compliance may be sampled and inspected/tested by the AR, or his designee, at any time.
   3) The fact that the materials were accepted on the basis of certification does not relieve the Contractor of his responsibility to provide materials and equipment that comply with the Specifications.
   4) Submit the Certificate of Compliance/Certified Material Test Report to the AR prior to incorporation of the item into the Work.

d. The AR may elect to perform additional inspections and/or tests of materials at the place of manufacture, the shipping point, or at the destination to verify compliance with applicable Specification requirements.
   1) Inspection and tests, conducted by persons or agencies other than the Contractor, do not in any way relieve the Contractor of responsibility for meeting the requirements of all Specifications and the referenced standards.

e. Refer to Section General Provisions, for additional testing and inspection requirements.

5. Inspection and Test Status (FTA Quality Element 10):
   a. Provide a means for identifying the inspection and test status of work during production and installation.
      1) Maintain inspection and test status by means of marking, stamps, tags, labels, routing cards, inspection records, test software, physical location, or other suitable means.
      2) Status identification must indicate the conformance or nonconformance with regard to inspections and tests performed.
   b. Establish controls to assure that only work that has passed the required inspections and tests are accepted.
      1) Prepare Daily Quality Control Reports for each day that Work is performed and which at a minimum identify tests conducted and results of inspections and tests.
         a) Record the status of completed, tested, and inspected items or construction work in Daily Quality Control Reports.
         b) Submit the Daily Quality Control Reports to the AR for information.
      2) Document nonconforming items or construction work on nonconformance reports issued in accordance with the requirements for nonconformance reporting specified in Subparagraph 1.09.D.6.
6. Nonconformance Reporting [FTA Quality Element 11]:
   a. A nonconformance exists when material furnished or Work performed does not comply with the requirements of the Contract, Specifications, codes,

standards, or any other Contract requirements, and is therefore considered defective.

1) Nonconforming Work also exists when either material or equipment exhibits a deficiency in physical inspection, test characteristics, or documentation.

b. Establish and maintain documented procedures to identify and control nonconforming work in order to ensure that only conforming Work is used for constructions.

1) Establish written procedures to define the methods and responsibilities for the identification, documentation, control, and processing of nonconforming equipment and material.
2) Apply this system for identifying and controlling nonconforming Work to the actions associated with installation and construction, and to all material and equipment that, for any reason, fails to conform to the Specifications or other applicable and approved product descriptions.
   a) Develop a mode of operation that emphasizes the identification, correction, and prevention of non-conformances in the Work.
3) The Contractor quality control personnel have the authority to stop that portion of the Work that does not comply with the Contract requirements.

c. Nonconformance Procedure:

1) Comply with the requirements regarding nonconforming and defective work General Provisions, and with the requirements for nonconforming Work specified in this Section.
2) Address the following within the nonconformance procedures to identify and prevent the use of nonconforming items/materials:
   a) Define “nonconformance”.
   b) Methods of identifying non-conformances.
   c) Nonconformance reporting requirements that include immediate verbal notification to the AR followed submission of a written Nonconformance Report to the AR.
   d) Application and removal of nonconformance status tags.
   e) Evaluations/recommendations.
   f) Physical segregation, removal from jobsite, or reassignment of nonconforming items to lesser applications.
      (1) Nonconformance items to be reassigned to lesser applications must be previously approved by the AR.
   g) Cause of non-conformance.
   h) Corrective action to be taken.
3) Nonconformance Report Log:
   a) Develop, maintain, and periodically submit a Nonconformance Report Log to the AR containing, at a minimum, the following information to enable tracking of all Nonconformance Reports:
      (1) Sequential, unique nonconformance report number.
      (2) Date issued.
      (3) Originator.
      (4) System, affected/drawing number/serial number.

(5) Brief description of the nonconformance and its source (e.g. Supplier, Subcontractor, welder).
(6) Recommended and approved disposition.
(7) Verification of corrective action.
(8) Date closed.
(9) Contractor Quality Control Manager's initials.
(10) Remarks, as applicable.

b) The disposition of all Nonconformance Reports must conform to the requirements of the required corrective action as specified in Subparagraph 1.09.D.7.

7. Corrective Action [FTA Quality Element 12]:
   a. The resolution of nonconforming item/material issues must be approved by the AR with input from the Contractor's project management and quality assurance personnel.
      1) Assign corrective action dispositions to Nonconformance Reports as follows:
         a) REPAIR – Nonconforming items or Work that are restored to a conforming condition by alternative means.
         b) REWORK – Nonconforming items or Work that are restored through additional normal processing.
         c) USE-AS-IS – Nonconforming items or Work that are to be used in its current condition.
         d) SCRAP – Nonconforming items that do not meet requirements and cannot be practically assigned REWORK or REPAIR dispositions to meet requirements.
      2) Re-inspect items having Nonconformance Reports assigned either a REPAIR or REWORK disposition in accordance with original requirements.
      3) Submit Nonconformance Reports with dispositions of REPAIR of USE-AS-IS to the AR for approval prior to the implementation of corrective action.
         a) The Authority may seek compensation for items assigned either a REPAIR or USE-AS-IS disposition.
      4) Immediately segregate items assigned a SCRAP disposition from conforming material, and remove them from the jobsite within 24 hours of disposition, as practicable.
   b. Establish and maintain written procedures of investigating the cause of nonconforming Work and for the corrective action needed to prevent recurrence of nonconforming Work.
      1) Investigate the root cause of nonconforming conditions and take the corrective actions needed to prevent recurrence.
      2) Ensure that corrective actions are completed in a timely fashion and that they are effective.
      3) Provide for analyzing processes to detect and eliminate potential causes of nonconforming work.
      4) Initiate preventative actions to deal with problems at a level corresponding to the risks encountered.

5) Include measures for implementing and recording changes in procedures resulting from corrective action.

E. Failure to Perform:
1. In the event the Contractor fails to adequately perform any or all of the provisions of this Section, the Authority, at its sole discretion, reserves the right to have the AR perform any or all of the provisions in this Section and back charge the Contractor for the actual cost to the Authority of such services.
   a. This remedy for the Contractor's failure to perform is in addition to any other right or remedy available to the Authority under this Contract.
   b. Refer to General Provisions, for additional information regarding the Authority's remedies.

F. Manufacturer's Field Services: Where indicated, engage a manufacturer's representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing to the AR within five (5) working days after the activity.

G. Quality Control Engineer's Responsibilities: Cooperate with the AR and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. The Quality Control Engineer shall perform all services independent of the Contractor and shall report directly to the AR. The services performed are for the benefit of the Authority and shall be executed in strict accordance with the Contract Documents.
2. The Quality Control Engineer shall be responsible for performing all Quality Control testing and inspection requirements specified in the Contract Documents, required by code, and required by jurisdictional agencies.
3. The Quality Control Engineer shall report all testing and inspection results directly to the AR independent of the results provided by copy to the Contractor.
4. Notify AR and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
5. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
6. Submit a certified written report, in duplicate, of each test, inspection, and similar quality control service directly to the AR. One copy shall be provided to the Contractor.
7. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
8. Do no perform any duties of the Contractor or AR.
9. The Quality Control Engineer shall perform quantity verifications as directed by the AR.

H. 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.

I. Coordination: Coordinate sequence of activities to accommodate required quality 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.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, the Contractor shall repair damaged construction and restore substrates and finishes.

B. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.

C. Protect construction exposed by or for quality control service activities.

D. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality control services.

END OF SECTION

SECTION 01510

TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies requirements for temporary utilities for use during construction.

B. Temporary utilities required include but are not limited to:

1. Water service and distribution.
2. Temporary electric power and light.
3. Telephone service.
4. Storm and sanitary sewer.

1.02 REFERENCES

A. American National Standards Institute (ANSI)

1. ANSI-A10 Series standards for Safety Requirements for Construction and Demolition

B. National Electrical Contractors Association (NECA)

1. NECA Electrical Design Library, Temporary Electrical Facilities

C. National Electrical Manufacturers Association (NEMA)

D. National Fire Protection Association (NFPA)

1. NFPA 70, National Electrical Code
2. NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations

E. Occupational Safety and Health Administration (OSHA)

F. Underwriters Laboratories (UL)

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01330, SUBMITTAL PROCEDURES, and with additional requirements as specified for each.

1. Reports for tests, inspections, meter readings, and similar procedures performed for temporary utilities.

2. Indicate the schedule for implementation and termination of each temporary utility as appropriate to the Authority as described in Section 01322, CONTRACT PROGRESS REPORTING.

1.04 QUALITY ASSURANCE

A. Comply with industry standards and applicable laws and regulations of Jurisdictional Authorities including but not limited to:

1. Building Code requirements.

2. Health and safety regulations.

3. Utility company regulations.

4. Police, Fire Department, and Rescue Squad rules.

5. Environmental protection regulations.

B. Comply with NFPA Code 241, ANSI-A10, and NECA Electrical Design Library, Temporary Electrical Facilities. For electrical service, comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70.

C. Arrange for the inspection and testing of each temporary utility before use, and coordinate all requirements for certifications and permits. The Contracting Officer Representative shall be notified sufficiently in advance, but with no less than 24 hours notice, so as to be present at all planned inspections and onsite activities.

1.05 PROJECT CONDITIONS

A. Incorporate into the Project Schedule dates for implementation and termination of each temporary utility. At the earliest practicable time and when acceptable to the Authority, change over from use of temporary service to use of the permanent service.

B. Keep temporary services and facilities clean and neat in appearance. Temporary utilities shall operate in a safe and efficient manner. Take all necessary fire prevention measures and shall ensure that utilities are not overloaded or permitted to interfere with progress of the Work. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on the Site.

C. Determine temporary utility services requirements and shall make arrangements with utility companies and governmental agencies to obtain such services.

D. Provide temporary electrical service of sufficient capacity to serve the temporary requirements during the life of the Contract. The source of temporary power for testing may be the temporary service, portable generator, or other approved system, which will deliver power at the voltage and other characteristics required to accomplish testing as specified. Circuits and construction for temporary systems

shall suit the needs of the Work and comply with NEC and the codes and regulations of the Jurisdictional Authorities.

E. Temporary services shall be furnished, installed, connected, and maintained by the Contractor as approved by the Contracting Officer Representative. Prior to completion of the Work, the Contractor shall remove all temporary services and restore affected areas as approved.

F. Shop drawings for all temporary utility and electrical services shall be submitted for approval. Power supply shall be of such quantity and type required to perform the Work. Maximum primary voltage shall be 600 volts, unless otherwise approved. Lighting equipment shall be of the type and quantity needed to provide illumination of all project areas. Materials for and installation of temporary services shall comply with OSHA requirements.

1.06 ACCESS TO FIRE HYDRANTS AND FIRE ALARM BOXES

A. Whenever the Work is being carried out, free access must be given to each fire hydrant, fire alarm box and standpipe; when required, hydrants shall be extended by suitable tubes or piping to an accessible point as approved and to the satisfaction of the jurisdictional fire department. Obstructions shall not be piled at any time or placed within 10 feet of any fire hydrant or fire alarm box and, where materials are placed in the vicinity of a fire hydrant or fire alarm box and to such height as to prevent the same from being readily seen, the position of such hydrants or fire alarm boxes shall be indicated by suitable signs and lights, both day and night.

B. Safeguard, maintain, and protect the wires, cables, ducts, manholes, posts, and poles, signals, and alarm boxes of fire departments. Do not cause interruption to the fire department fire alarm telegraph service, and in case of accident, shall promptly notify the fire department. No fire department wire, cable, duct, manhole, post or pole, signal, or fire alarm box shall be disturbed, except in the presence of a representative of the Bureau of Fire Alarm Telegraph. In case such wire, cable, duct, manhole, post or pole, signal, or fire alarm box is disturbed, the Contractor shall immediately notify the Contracting Officer Representative, and it shall be restored immediately to its original condition.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION (not used)

END OF SECTION

SECTION 01520

TEMPORARY CONSTRUCTION FACILITIES

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes requirements for temporary facilities for use during construction.

B. Temporary facilities required include but are not limited to temporary heating and cooling field offices, Contracting Officer Representative's Project office (co-located with Contractor's field office), parking area, on-site plant, sanitary facilities and drinking water, waste disposal services, rodent and pest control, first aid station, storage sheds, storage and laydown areas, and miscellaneous services and facilities.

1.02 REFERENCES

A. American National Standards Institute (ANSI)

1. ANSI-A10 Series Standards for Safety Requirements for Construction and Demolition

B. International Building Code (IBC)

C. National Electrical Contractors Association (NECA)

1. NECA Electrical Design Library, Temporary Electrical Facilities

D. National Electrical Manufacturers Association (NEMA)

E. National Fire Protection Association (NFPA)

1. NFPA 70, National Electrical Code

2. NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations

F. Occupational Safety and Health Administration (OSHA): 29 CFR § 1910

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01330, SUBMITTAL PROCEDURES, and with additional requirements as specified for each.

1. Site plans indicating all temporary facilities, utility connections, traffic flows, and working drawings of temporary facilities for approval by Authority and applicable Jurisdictional Authorities within 14 Days of Notice to Proceed.

2. Reports of the results of tests, inspections, meter readings, and similar procedures performed for temporary facilities for the Authority's information and records.

3. A plan of the on-Site plant layout for approval 14 Days prior to the start of construction.

4. A schedule indicating implementation and termination of each temporary facility within 14 Days prior to the start of construction or other period as may be approved by the Contracting Officer Representative.

1.04 QUALITY ASSURANCE

A. Comply with industry standards and applicable laws and regulations of Jurisdictional Authorities, including but not limited to:

1. Building Code requirements - local and international as applicable.

2. Health and safety regulations.

3. Utility company regulations.

4. Police, Fire Department and Rescue Squad rules.

5. Environmental protection regulations.

6. Governmental Agencies

B. Comply with NFPA Code 241, ANSI-A10 Construction Package, and NECA Electrical Design Library. For Electrical Service, comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70. Also comply with the IBC as applicable.

C. Arrange for the inspection and testing of each temporary facility before use and secure necessary certifications and permits. The Authority shall be kept informed of all planned inspections and onsite activities.

1.05 PROJECT CONDITIONS

A. Incorporate into the Project Schedule dates for implementation and termination of each temporary facility. At the earliest practicable time and when acceptable to the Authority, change over from use of temporary facilities to use of the permanent facilities if applicable.

B. Keep temporary facilities clean and neat in appearance. Temporary facilities shall be operated in a safe and efficient manner. Take the necessary fire prevention measures and do not overload facilities, or permit them to interfere with progress of the Work. Hazardous, dangerous, or unsanitary conditions and public nuisances shall not be allowed to develop or persist on the Site.

1.06 CONTRACTOR'S ON-SITE PLANT

A. All necessary construction in connection with the on-Site plant shall be done in a neat workmanlike manner to the Authority's satisfaction.

B. Sufficient construction plant shall be provided and maintained at points where work is in progress to adequately meet demands of the Work and with ample margin for emergencies or overload. The plant shall be of sufficient capacity, in the opinion of the Authority, to permit a rate of progress, which will ensure completion of the Work within the time specified in the Contract. The Authority shall have the right to reject or condemn any plant, apparatus, or staging, which in its opinion is unsafe, improper or inadequate. The Contractor is not relieved of its responsibility for the safe, proper, lawful construction, maintenance and use of such plant, apparatus, or staging, whether the Authority exercises this authority or not. Condemned plant or equipment shall be brought to acceptable condition or shall be removed from the Site.

C. The location of stationary equipment and the location of miscellaneous mobile equipment shall be subject to Authority Approval.

1.07 CONTRACTING OFFICER REPRESENTATIVE'S FACILITY

A. Locate, acquire, fit out facility, and co-locate Contractor's Key Staff for management activities with the Authority. The facility shall be located on or near the work Site and remain operational throughout the Contract closeout phase, which shall extend 90 Days beyond Final Completion. The facility shall be maintained by the Contractor at its own expense. The facility can be moved once during the lifetime of the Contract to a different location. Full utility hook-ups shall be provided until the facility is decommissioned. Relocation of the facility, if required, shall be coordinated with the Contracting Officer Representative.

B. The facility shall be complete with parking, and shall hereinafter be called field office. The field office shall be situated in or near the Work area at an approved location. The Contractor shall determine its own requirements for office space and parking; the facility as described below includes requirements specifically for the Contracting Officer Representative.

C. The field office shall be complete as specified and ready for occupancy by the Contracting Officer Representative within [45] Days of NTP. It shall be maintained and serviced by the Contractor as hereinafter specified until completion of the construction work and throughout the closeout phase as noted in Article 1.07A above. The building shall conform to local building codes, and international building codes as applicable, and shall have the basic features specified herein, with substitute materials allowable, subject to approval. The facility shall be fully winterized.

1. The Contractor shall obtain and pay all costs for hauling, building, and connecting permits. The field office shall be substantially constructed satisfactory to the Contracting Officer Representative. All materials shall be good commercial quality. The field office facility shall provide a minimum of [insert square feet] square feet of usable area to accommodate [insert number of staff] Authority

staff, with furniture, parking, and the following additional requirements: Exterior walls, ceilings and floors, shall be insulated; interior walls and ceiling surfaces shall be paneled with finished plywood or gypsum wallboard of not less than 1/2-inch thickness, or other suitable materials. Interior layout must be approved by the Contracting Officer Representative.

2. Construction shall be gypsum board on steel studding with lay-in acoustical tile and tile or carpeted flooring or equal. Floors shall be constructed to withstand a live load of 125 psf.

3. Painting:

   a. Exterior surfaces of buildings and all interior surfaces, other than factory-finished surfaces, shall be painted with two coats of an approved paint of approved color(s).

   b. No painting will be required on aluminum or stainless steel surfaces.

4. Provide offices for [insert number of staff] staff and cubicles for [insert number of staff] staff.

5. Two restrooms shall be provided, each with lavatory, toilet, mirror, soap holder, toilet-paper holder, paper-towel dispenser, and hot and cold water supply.

6. Lighting shall be provided to furnish a minimum of 100 foot-candles at desk height uniformly in all areas except restrooms. Restrooms shall be provided with adequate lighting.

7. Duplex electrical receptacles shall be provided around interior walls at approximately 10-foot spacing.

8. Uninterrupted power source (UPS) for all computers with the following technical requirements: [insert UPS technical requirements]

9. An electric water cooler shall be installed and supplied with bottled water.

10. Heating and air conditioning systems shall have thermostatic control. Systems shall be capable of maintaining office at ambient temperature of 72 degrees F.

11. Water, sewer, and electrical utility connections shall be provided as necessary.

12. Adequate access from public streets shall be provided to the field office together with adjacent space for [insert number of parking spaces] parking spaces. The access roadway and parking area shall be graded for drainage and surfaced with gravel, concrete, or bituminous pavement in an approved manner.

13. The field office shall be furnished with the following new furniture as approved:

    a. Desk, 60 inches by 30 inches; with three drawers and one file drawer, all with locks; with armchair: [Eight]

b. Secretary desk, 54 inches by 30 inches, file drawer, and paper rack with secretarial chair: [One]

c. Executive Desk, 72 inches by 36 inches with drawer lock and high-back armchair: [One]

d. Drafting table, 60 inches by 36 inches, with drawer and stool: [One]

e. Side chair: [Thirty]

f. Bookcase, 36 inches by 42 inches, with four shelves: [Ten]

g. File cabinet, letter size, four drawers, with lock: [Ten]

h. File cabinet, letter size, fireproof, four drawers, with lock: [Three]

i. Reference table, 54 inches by 30 inches: [Twelve]

j. Storage cabinet, 36 inches by 18 inches by 6 feet, with lock: [Two]

k. Rolling plan storage rack, six-stick: [Two]

l. Two drawer cabinet, 15 inches wide by 29 inches tall by 26 inches deep, with lock: [Ten]

m. Coat rack: Single sided, two shelf garment rack - [One]

n. Dry-Erase board, 60 inches by 36 inches: [One]

o. Eighteen cubic foot, frost free, refrigerator: [One]

p. 800-watt microwave oven: [One]

q. First aid kit containing eye and skin protection for emergencies

r. Fire extinguishers: As required by code, not less than three

14. All windows shall be provided with shades, blinds or curtains, and security grills.

15. The field office shall be furnished with the following new equipment as approved by the Contracting Officer Representative:

a. Facsimile machine: [One]

b. Copier/Network Printer/Scanner with the following functions: [One]

(1) High capacity, 115-volt operation

(2) Twenty bin sorter, 50 sheets per bin, at least 11-inch by 17-inch sheet size, with stapler function

c. Maintain the equipment for the duration of this Contract. Upon completion of the Work, the equipment shall become the property of the Contractor.

d. Maintenance and services shall be provided by the Contractor as follows:

(1) Repair and cleaning, twice weekly, of the field office, parking area and access road, including complete janitorial services and supplies, and snow removal.

(2) The furnishing of all utilities except telephone.

(3) During other than normal working hours, provide security measures and area protection equivalent to that normally used by the Contractor for its job Site shop and office facilities.

e. Upon completion of this Contract (Construction and Closeout phases), the complete facility shall become the property of the Contractor, who shall remove it and restore the Site.

1.08 SANITARY PROVISIONS

A. The OSHA standard for sanitation, 29 CFR § 1910.141 et. seq. shall be used. Prior to starting work, the Contractor shall furnish for use of its force on the Work necessary toilet conveniences secluded from public view. They shall be kept in a clean and sanitary condition and comply with the requirements and regulations of the area in which the work is performed. Potable water shall be provided with individual cups, and sanitary conditions for the water dispenser shall be maintained. A common drinking cup or other common utensils shall not be used.

1.09 WORK AND STORAGE/LAYDOWN AREA

A. The areas designated by the Authority as the Contractor's work and storage area will be provided to the Contractor without charge. Additional work and storage space, if required, shall be obtained by the Contractor. The Contractor's use of laydown areas other than those identified by the Authority must be approved by the Contracting Officer Representative prior to their use. The Contractor shall submit a materials storage plan as described in Section 01330, SUBMITTAL PROCEDURES, for approval 60 Days prior to the start of construction.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION (not used)

END OF SECTION

SECTION 01530

TEMPORARY DECKING

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies requirements for temporary decking and pedestrian bridges that may be required for the purpose of maintaining the flow of vehicular and pedestrian traffic during the construction period. Temporary decking and pedestrian bridges includes their support system over excavated areas.

B. Decking and temporary grade crossing for vehicular traffic as applicable shall be constructed of suitable materials in accordance with Jurisdictional Authority requirements.

C. Bridges for pedestrians shall be constructed of suitable materials in accordance with Jurisdictional Authority and ADAAG requirements.

D. When the deck beams or other members supporting such deck are required to carry the support of excavation loads, these members shall also be in compliance with the requirements of Section 02260, SUPPORT OF EXCAVATION.

1.02 RELATED SECTIONS

A. Section 02260, SUPPORT OF EXCAVATION

B. Section 02845, TRAFFIC CONTROL DEVICES

1.03 REFERENCES

A. Americans with Disabilities Act Accessible Guidelines (ADAAG)

1. Standards for Accessible Design

B. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO Standard Specification for Highway Bridges.

C. American Welding Society (AWS):

1. AWS D1.1 Structural Welding Code - Steel

D. ASTM International (ASTM):

1. ASTM D2555 Standard Practice for Establishing Clear Wood Strength Values

2. ASTM E274 Standard Test Method for Skid Resistance of Paved Surfaces Using a Full Scale Tire.

1.04 DESIGN CRITERIA

A. Base designs on WMATA Manual of Design Criteria as a minimum.

B. Design temporary decking and support system for AASHTO HS20 loading and impact, earth pressures, utility loads, and other applicable live impact and dead loads, including the Contractor's equipment, whether the temporary decking is intended for support of vehicular or pedestrian traffic.

C. When excavation or construction equipment is to be operated from decking, design decking using actual maximum loads in accordance with design criteria of referenced AASHTO specification, unless otherwise shown.

D. Design supporting members to allow clearance for existing and relocated utilities.

E. Provide suitable openings for access for servicing utilities and fire fighting. Provide flush covers for openings.

F. Bridges for pedestrians shall be constructed of approved suitable materials in accordance with local requirements, be provided with handrails or with sides tightly boarded in accordance with such requirements and shall have a minimum width of [6] feet or such greater minimum width as will accommodate the normal traffic flow at the particular location.

G. All designs shall comply with ADAAG regulations.

1.05 SUBMITTALS

A. Submit the following no less than 60 Days prior to the start of construction to the Authority for Approval as specified in Section 01330, SUBMITTAL PROCEDURES, and obtain Jurisdictional Authority approval for:

1. Working Drawings:

   a. Prior to installation of elements for support of excavation, submit Working Drawings and design calculations for temporary decking and pedestrian bridges.

   ~~b.~~ Show proposed procedures and methods of constructing temporary structures including support system and necessary construction details.

2. Certifications:

   a. If previously used materials are utilized, submit certified information concerning each previous use, such information shall include, but not be limited to, the following:

      (1) Purpose

      (2) Duration

      (3) Type of loading

B. Submit to the Jurisdictional Authority of the area where the Work is to be performed, for its approval, Working Drawings including maintenance of traffic comprehensive staging and decking plans prior to the time public traffic pattern closures and changes are proposed as specified in Section 01550, MAINTENANCE OF TRAFFIC, CONSTRUCTION SEQUENCE AND STAGING, ACCESS AND PARKING. Jurisdictional Authority approval must be obtained at least 30 Days prior to installation of temporary decking.

1.06 JOB CONDITIONS:

A. Responsibilities:

1. Design, construction, maintenance, and removal of temporary construction including decking and support systems are the responsibility of the Contractor.

2. Perform work in accordance with construction sequence and maintenance of traffic schedules acceptable to the Authority and requirements of the Jurisdictional Authorities as specified in Section 01550, MAINTENANCE OF TRAFFIC, ACCESS AND PARKING.

3. Provide access to Authority personnel for inspections of temporary decking as requested by the Contracting Officer Representative.

4. Maintain vehicular and pedestrian access to buildings at levels existing prior to start of Contract work. Maintain persons with disabilities access in accordance with ADAAG.

5. Perform work in accordance with specified safety requirements as described in Section 01114, SAFETY/ENVIRONMENTAL REQUIREMENTS.

PART 2 PRODUCTS

2.01 MATERIALS

A. Timber, Steel, Concrete, and Other Materials:

1. Used materials are permitted in lieu of new materials provided they are sound and free from defects, which might impair their strength.

2. Timber: Structural lumber, visually graded in accordance ASTM D2555, minimum working stress: 1,100 psi.

B. Welding: Have welding performed by certified welders and in accordance with the requirements of the AWS D1.1.

PART 3 EXECUTION

3.01 INSTALLATION

A. Comply with the requirements of Section 02260, SUPPORT OF EXCAVATION. Install and maintain decking at design elevations. Accessibility and decking surfaces and slopes shall be in accordance with ADAAG regulations.

B. Mechanically laminate decking elements in panels not less than 5 feet wide.

C. Fabricate, install, and maintain pedestrian bridges at design elevations and as shown on the approved Working Drawings and in accordance with local requirements. All profile grades and cross-slopes or other features required in an accessible path shall be provided and maintained to ADAAG requirements.

D. Provide and maintain skid-resistant surface.

E. If asphalt or asphaltic concrete is used on decking, mechanically bond asphalt or asphaltic concrete to decking.

F. Maintain decking free of snow, ice, water, mud, and debris.

G. Place premixed asphaltic patching material to provide smooth transitions between existing pavement surfaces and decking and between existing pavement surfaces and pedestrian bridges, and elsewhere as required to provide proper drainage and prevent ponding of water.

H. As removal of pavement and sidewalk progress, furnish and install barricades in accordance with Section 01560, TEMPORARY BARRIERS AND ENCLOSURES, and requirements of the Jurisdictional Authorities.

I. Along sides of decked areas for pedestrian walkways where such walkways are adjacent to vehicular traffic, install concrete barriers as specified in Section 01560, TEMPORARY BARRIERS AND ENCLOSURES, and Section 02845, TRAFFIC CONTROL DEVICES, as shown on approved maintenance of traffic plan as specified in Section 01550, MAINTENANCE OF TRAFFIC, ACCESS AND PARKING.

J. Install wooden fence as specified in Section 01560, TEMPORARY BARRIERS AND ENCLOSURES, along sides of decked areas for pedestrian walkways where such walkways are adjacent to open areas, staging/storage areas, and other areas used by the Contractor. Paint barricades and fences and maintain in good repair as specified in Section 01560, TEMPORARY BARRIERS AND ENCLOSURES.

K. Erect and maintain load limit and other signs as specified in Section 01580, PROJECT SIGNS, to restrict loading on decking so that it does not exceed maximum design loading.

L. Remove temporary decking along with support systems when no longer required. Comply with the requirements of Section 02260, SUPPORT OF EXCAVATION, when removing support system.

3.02 FIELD QUALITY CONTROL

A. Allowable tolerances:

1. Maintain surface elevations at abutting elements within plus or minus 1/4 inch.

2. Do not allow horizontal gaps to exceed 3/8 inch or ADAAG requirements whichever is more stringent.

3. All profile grades and cross-slopes, curb ramps, ramps, or other features required in an accessible path shall be provided and maintained to ADAAG requirements

B. Skid-Resistant Surface. Provide skid-resistant surface having a Skid Number at 30 mph (SN 30) of no less than 35 when measured in accordance with ASTM E274, and skid resistance shall be in accordance with ADAAG regulations.

C. Protect existing vegetation, structures, utilities and improvements.

3.03 VENTILATION

A. When excavations are decked, provide ventilation as required by the applicable code requirements and Jurisdictional Authorities. Provide ventilation, which meets specified safety requirements as described in Section 01114, SAFETY/ENVIRONMENTAL REQUIREMENTS.

3.04 ILLUMINATION

A. In areas covered by decking, supply and maintain illumination of sufficient intensity to permit safe and expeditious conduct of all phases of construction and inspection of support system, lagging, bracing, and utilities maintained in place.

B. Provide illumination, which meets specified safety requirements as described in Section 01114, SAFETY/ENVIRONMENTAL REQUIREMENTS.

END OF SECTION

SECTION 01550

MAINTENANCE OF TRAFFIC, ACCESS, AND PARKING

PART 1 GENERAL

1.01 SUMMARY

A. This work shall consist of maintaining and protecting traffic through areas of construction, public and private entrances, constructing and obliterating detours, and protecting the traveling public within the limits of the project in accordance with the contract documents.

1.02 RELATED SECTIONS

A. Section 01560 – Temporary Barriers and Enclosures

B. Section 07180 – Traffic Coatings

C. Section 07190 – Water Repellents

D. Section 09910 – Traffic Striping and Painting

1.03 REQUIREMENTS

A. Contractor:
   1. Maintain vehicular parking to site and within site that are not under construction.
   2. Remove temporary equipment and facilities when no longer required.
   3. Restore grounds to original conditions.

1.04 MATERIALS

A. Signalization, barricades, channelizing devices, safety devices, and pavement markings shall conform to the requirements specified in Section 01 56 00, and the Virginia Work Area Protection Manual except where otherwise indicated. Retro reflective surfaces shall conform to the requirements of Virginia DOT Sections 235, 247, and 702, as applicable.

B. All signage and pavement markings at facilities located in the state of Maryland shall comply with “Standard Specifications for Construction and Materials” dated January 2001, as published by the Maryland Department (MDOT) of Transportation State Highway Administration (SHA) and latest revisions or additions, including specifications herein, and latest revisions.

C. Temporary pavement markers shall conform to the requirements of Virginia DOT Section 235 and Maryland DOT.

D. Construction pavement markings shall conform to the requirements of Virginia DOT Section 246 and Maryland DOT.

E. Construction signs shall conform to the requirements of Virginia DOT Section 247 and Maryland DOT.

F. Post mounted and wall mounted traffic control and informational signs, traffic control signals, traffic cones and drums, flares and lights as required by the Authority.

G. Temporary traffic striping and markings shall be in accordance with Specification Section 09910 and the Authority.

1.05 ROADS AND PARKING AREAS

A. Provide access for emergency vehicles. Maintain driveways a minimum of 15 feet wide between and around combustible materials in storage and mobilization areas.

B. Keep fire hydrants and water control valves free from obstruction or damage and accessible for use.

C. Additional access roads other than provided herein, requested by any Contractor shall be at the requesting Contractor's expense and approved by the AR. Removal and restoration of the area to original condition shall also be at that contractor's expense.

1.06 TRAFFIC CONTROL

A. Provide and operate traffic control and directional signals in all areas under Coordinating Contractor's control.

B. Provide traffic control in accord with appropriate articles in the IDOT Standard Specifications for Road and Bridge Construction, Section 700, and National Manual on Uniform Traffic Control Devices.

C. Construction Parking Control.
   1. Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, using agency's operations or other construction operations.

PART 2 EXECUTION

2.01 CONSTRUCTION

A. Construction methods at Contractor's option for temporary facilities which will be removed when no longer needed; adequate to provide specified results.

B. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Authority's operations.

C. Maintain vehicular access to and through parking areas not affected by construction.

D. Prevent construction parking vehicle on or adjacent to access roads or in non-designated areas.

2.02 MAINTENANCE

A. Maintain roads, walks and parking areas in a sound, clean condition. Maintenance shall consist of maintaining roadways to allow customers to all other areas that are not under construction.

B. Repair or replace all damages during progress of construction work.

2.03 REMOVAL

A. Completely remove temporary materials or construction when access needs can be met by use of permanent construction or when directed by AR.

B. Restore areas to original conditions at completion of work as directed by AR.

2.04 TRAFFIC SIGNS AND SIGNALS

A. At approaches to site and on site, install at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.

B. Relocated as Work progresses, to maintain effective traffic control.

END SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01560

TEMPORARY BARRIERS AND ENCLOSURES

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes:
   1. Temporary Barricades and Warning Signs.
   2. Temporary Safety Fencing.
   3. Construction Railings.
   4. Pollution Control.
   5. Protection of Work, Personnel and Materials.

1.02 RELATED SECTIONS

A. Section 01550 – Access Roads, Parking Areas and Parking Control

1.03 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited, to the following:
   1. Building Code requirements.
   2. Health and safety regulations.
   3. Utility company regulations.
   4. Owner insurance company regulations/requirements.
   5. Police, Fire Department and Rescue Squad rules.
   6. Environmental protection regulations.
   7. City ordinance and regulations.

1.04 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles in accordance with Section 01550.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Authority. Provide materials suitable for use intended.

PART 3 EXECUTION

3.01 TEMPORARY BARRICADES AND WARNING SIGNS.

A. Roads, Parking Areas and Sidewalks:
   1. The Contractor shall provide, erect and maintain as necessary for his work, strong and suitable barricades, danger signals, signs, warning lights and other traffic control devices, and shall take all necessary precautions for the protection of the work and safety of the public.
   2. All barricades and obstructions shall be illuminated at night and all lights for this purpose shall be kept illuminated from sunset to sunrise.
   3. Sufficient barricades shall be erected to keep vehicles from being driven on or into work under construction.
   4. The Contractor shall erect warning signs in advance of any place on the project where operations may interfere with the use of the facility by vehicular or pedestrian traffic, and at all other points where the new work crosses or coincides with an existing roadway, traffic lane(s) or pedestrian walkways. Such warning signs shall be constructed and erected in accordance with the Manual on Uniform Traffic Control Devices, or as directed by the AR.
   5. The Contractor shall furnish, erect and maintain warning and direction signs in the number required by the AR and at locations designated by the AR throughout the limits of the project. For street and highway type traffic, the signs shall conform in every respect to the requirements of the Manual on Uniform Traffic Control Devices (MdMUTCD) for Streets and Highways. Signs must be freshly painted and adequately reflectorized before being placed on any project. No work may be performed or begun unless an adequate number of signs of the proper category are in place.
   6. In cases where the Contractor's sequence of operations results in grade differentials which would be hazardous to vehicular or pedestrian traffic the Contractor shall, at the direction of the AR provide suitable substantial barriers to the extent determined by the AR.

B. The Contractor's responsibility for the maintenance of barricades, signs and lights shall continue until the Authority accepts the Work. The Contractor shall provide and maintain other warning signs and barricades in other areas and around their respective work as may be required for the safety of all those employed in the work, plant operating personnel, or those visiting the site.

C. Materials that constitute temporary barricades, signs and lights are property of Contractor.

3.02 TEMPORARY SAFETY FENCING

A. Protective Safety Fencing:
   1. The Contractor shall provide and erect, when required or shown on the Contract Drawings or directed by the AR, temporary project safety fencing at the work site.

2. The safety fencing shall be a high visibility, orange colored, high density polyethylene grid or approved equal, a minimum of 4 feet high, supported and tightly secured to steel posts located on maximum 6-feet centers.

B. Fencing shall be maintained by the Contractor during the life of the Contract and, upon completion and acceptance of the work, shall become the property of the Contractor and shall be removed from the work site.

3.03 CONSTRUCTION RAILINGS

A. Provide construction railings at least 42” in height and sufficient to direct pedestrians around construction areas.

B. Railing shall be maintained by the Contractor during the life of the Contract and, upon completion and acceptance of the work, shall become the property of the Contractor and shall be removed from the work site

3.04 POLLUTION CONTROL

A. The Contractor shall prevent polluting air with dust and particulate matter.

B. The Contractor shall provide systems for control of atmospheric pollutants to prevent toxic concentrations of chemicals and to prevent harmful dispersal of pollutants into the atmosphere.

C. All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, or reactant of other classification, must show approval of the EPA and other recognized certifying agencies. Use of all such chemicals and disposal of residues shall be in strict conformance with regulatory requirements.

D. All Contractor equipment used during construction shall conform to all current federal, state and local laws and regulations.

3.05 PROTECTION OF WORK, PERSONNEL AND MATERIALS

A. During the progress of the work and up to the date of final payment, the Contractor shall be solely responsible for the care and protection of all work, personnel, equipment and materials covered by the Contract.

B. In order to prevent damage, injury or loss, actions taken by the Contractor shall include, but not be limited to, the following:
   1. Store materials, supplies, and equipment in an orderly, safe manner that will not interfere with the progress of the work or the work of any other Contractor or utility service company.
   2. Provide suitable storage facilities for all materials that are subject to injury by exposure to weather, theft or breakage.

3. Place upon the work or any part thereof only such loads as are consistent with the safety of that portion of the work.
4. Clean up frequently all refuse, rubbish, scrap materials, and debris caused by his operations, to the end that at all times the site of the work shall present a safe, orderly and workmanlike appearance

C. The Contractor shall protect the existing work and material from damage by his workmen and shall be responsible for repairing any such damage at no additional cost to the Authority.

3.06 CLEANING

A. Remove debris resulting from work specified herein from project site.

END OF SECTION

SECTION 01570

TEMPORARY CONTROLS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes security, site, environmental, construction noise, vibration, pollution abatement, use of explosives, controls and management of historical and scientific specimens, required to allow construction to proceed.

1.02 REFERENCES

A. U.S. Code, Title 42 (The Public Health and Welfare):

1. Chapter 15B (Air Pollution Control), Section 1857, et seq., as amended by Pub. L. 91-604)

2. U.S. Code, Title 33 (Navigation and Navigable Waters):

3. Chapter 26 (Water Pollution Prevention and Control), Section 308 (33 U.S.C. 1251 et seq., as amended by Pub. L. 92-500)

B. Society of Automotive Engineers, Inc., SAE J366b and SAE J952b

1.03 SUBMITTALS

A. Submit the following for approval 60 Days prior to start of construction in accordance with Section 01330, SUBMITTAL PROCEDURES, and with the additional requirements as specified for each:

1. All necessary Working Drawings, specifications, permits, and certifications necessary to comply with local Jurisdictional Authority's erosion and sediment control statues, ordinances, and requirements including, but not limited to current DC Standards and Specifications for Soil Erosion and Sediment Control (DC E&S).

2. Required evidence that the governing air pollution criteria will be met. These criteria and related documents will be retained by the Authority for on-Site examination by FTA as applicable.

3. Program for pollution control prior to beginning operations

4. Proposed haul routes.

5. Plan indicating monitoring locations, including the timing of monitoring measurements to be taken at the construction Site boundaries and at nearby residential, commercial, and industrial property lines.

6. Report articles of historical or scientific value.

1.04 SITE SECURITY

A. Watchmen: Employ watchmen in adequate numbers to safeguard the Site during non-working hours, night-shift operations, and holidays. If the Authority at any time determines the staff insufficient or incompetent, personnel increases or replacements shall be provided immediately at no additional cost to the Authority.

1.05 EROSION AND SEDIMENT CONTROL

A. Erosion and sediment materials: No erosion or sediment materials shall be allowed to enter natural or man-made water or sewage removal systems. Erosion materials from excavations, borrow areas, or stockpiled fill shall be contained within the Site. Develop methods to control waste and erosion including such means as filtration, settlement, and manual removal.

B. Comply with and provide all necessary drawings, specifications, permits, and certifications necessary to comply with local Jurisdictional Authority's erosion and sediment control statutes, ordinances, and requirements including, but not limited to current DC Standards and Specifications for Soil Erosion and Sediment Control (DC E&S).

1.06 POLLUTION ABATEMENT

A. Conduct operations in a manner to minimize pollution of the environment surrounding the area of work. Specific controls shall be applied as follows:

1. Material transport: Trucks leaving the Site and entering paved public streets shall be cleaned of mud and dirt clinging to the body and wheels of the vehicle. Trucks arriving and leaving the Site with materials shall be loaded so as to prevent dropping materials and debris on the streets. Trucks carrying dirt from the Site shall have their loads covered to minimize fugitive dust. Maintain a suitable vehicle cleaning installation and inspection installation with permanent crew for this purpose. Spills of materials in public areas shall be removed immediately.

2. Waste materials: No waste materials shall be allowed to enter natural or man-made water or sewage removal systems. Develop methods to control waste including such means as filtration, settlement, and manual removal.

3. Burning: No burning of waste will be allowed without written permission from the Authority. When permission is granted, burning shall be conducted in accordance with the regulations of the Jurisdictional Authority. Submit request to the affected jurisdiction for approval.

4. Dust control: By water sprinkling or by other approved methods, continuously control dust generated by construction operations.

5. Noise control: Refer to Article 1.08 below.

6. Submit evidence that the governing air pollution criteria will be met. These criteria and related documents will be retained by the Authority for on-Site examination by FTA as applicable.

7. Submit a program for pollution control that is in compliance with the Air Act and the Water Act prior to beginning operations.

8. Clean air and water:

   a. The Contractor agrees as follows:

      (1) To comply with all the requirements of Section 114 of the Clean Air Act, as amended (42 U.S.C. 1857, et seq., as amended by Pub. L. 91-604) and Section 308 of the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq., as amended by Pub. L. 92-500), respectively, relating to inspection, monitoring, entry, reports and information, as well as other requirements specified in Section 114 and Section 308 of the Air Act and the Water Act, respectively, and all regulations and guidelines issued there under before the award of this Contract.

      (2) That no portion of the Work required by this Contract will be performed in a Facility listed on the Environmental Protection Agency List of Violating Facilities on the date when this Contract was awarded unless and until the EPA eliminates the name of such Facility or Facilities from such listing.

      (3) To use its best management practices to comply with clean air standards and clean water standards at the Facility in which or Site on which the Work is being performed.

   b. The terms used in this Article have the following meanings:

      (1) The term Air Act means the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Pub. L. 91-604).

      (2) The term Water Act means Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Pub. L. 92-500).

      (3) The term Clean Air Standards means any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions or other requirements which are contained in, issued under or otherwise adopted pursuant to the Air Act or Executive Order 11738, an applicable implementation plan as described in Section 110(d) of the Clean Air Act (42 U.S.C. 1857c-5(d)), an approved implementation procedure or plan under Section 111(c) or Section 111(d), respectively, of the Air Act (42 U.S.C. 1857c-6(c) or (d)), or an approved implementation procedure under Section 112(d) of the Air Act (42 U.S.C. 1857c-7(d)).

      (4) The term Clean Water Standards means any enforceable limitation, control, condition, prohibition, standard or other requirement, which is promulgated pursuant to the Water Act or contained in a permit issued to a discharger by the EPA or by a State under an approved program, as authorized by Section 402 of the Water Act (33 U.S.C. 1342), or by local

government to ensure compliance with pretreatment regulations as required by Section 307 of the Water Act (33 U.S.C. 1317).

(5) The term compliance means compliance with Clean Air or Water Standards. Compliance shall also mean compliance with a schedule or plan ordered or approved by a court of competent jurisdiction, the EPA or an air or water pollution control agency in accordance with the requirements of the Air Act or Water Act and regulations issued pursuant thereto.

(6) The term Facility means any building, plant, installation, structure, mine, vessel, or other floating craft, location or site of operations, owned, leased, or supervised by Contractor or Subcontractor, to be utilized in the performance of a contract or subcontract. Where a location or site of operations contains or includes more than one building, plant installation, or structure, the entire location or site shall be deemed to be a Facility except where the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent Facilities are co-located in one geographical area.

1.07 ENVIRONMENTAL CONTROL

A. Maintain temperature and humidity to protect the Work in progress and in place, as well as permanent equipment and materials, stored and installed, against damage from heat, cold, and dampness and take such steps as necessary to protect such work from other adverse conditions.

1.08 CONSTRUCTION NOISE CONTROL

A. Noise control: Take every action possible to minimize the noise caused by construction operations. When required by Jurisdictional Authorities, noise producing work shall be performed in less sensitive hours of the day or week as directed. Noise produced by the Work shall be maintained at or below the decibel levels specified and within the periods specified.

1. Protection of the public and employees:

a. Noise abatement measures and precautions shall be taken in order to reduce exposure to noise. Permissible noise exposure shall be calculated in accordance with the procedures established under the Walsh-Healy Public Contracts Act. Sound levels for public noise exposure due to construction will be measured at the property line of adjacent residential, commercial, or industrial property or at the property line of the public right-of-way, or 50 feet from the noise source, whichever is greatest, when work is in progress in the public right-of-way, while construction work is in progress. Employee noise exposure levels shall be measured at the employees' normal workstation. In either case sound levels shall not exceed the following:

Exposure per Day	**Sound Level**

(hours)	(dBA)
8	90
6	92
4	95
3	97
2	100
1-/12	102
1	105
1/2	110
1/4 or less	115

b. Above-ground, repetitive, high-level impact noise will be permitted only between 8:00 AM and 9:00 PM. Repetitive impact noises in the receiving property shall not exceed the following dB limitations:

Duration of Impact Noise	Commercial or Residential Zone	Industrial Zone
More than 12 minutes in any hour	70	77
Less than 30 seconds in any hour	85	92
Less than 3 minutes in any hour	80	87
Less than 12 minutes of any hour	75	82

c. In underground or tunnel construction work, where the above requirements may not be obtained, provide individual auditory protection.

2. Noise restrictions at affected property: In addition to the provisions of Article 1.02A.1 above, sound level for noise due to construction activities shall be monitored at the property line of property affected acoustically by the Contractor's operations and plant. Sound levels for noise from equipment shall be measured at the property line on the A-weighting network of a General Purpose sound level meter at slow response. To minimize the effect of reflective sound waves at buildings, measurements may be taken 3 to 6 feet in front of any building face.

   a. Construction equipment: Sound levels for unscheduled, intermittent, short-term noise from equipment shall not exceed the following dBA levels:

      (1) Residential Property

(a) Daily, 7:00 AM to 9:00 PM: 75 dBA

(b) Daily, 9:00 PM to 10:00 PM: 55 dBA

(c) Daily, 10:00 PM to 7:00 AM: 50 dBA

(2) Business, Industrial, and Commercial Property:

(a) Daily, including Sundays and Legal Holidays, 7:00 AM to 9:00 PM: 82 dBA

(b) Daily, including Sundays and Legal Holidays, 9:00 PM to 7:00 AM: 62 dBA

b. Mobile equipment in the public right-of-way: Truck or other powered equipment, which moves off the Site in the public right-of-way and that produces a maximum sound level exceeding the following limits when moving in the public right-of-way shall not be used on this Contract. The sound level limits specified are referenced to a distance of 50 feet from the equipment. Sound levels shall be measured in conformity with the Standards and Recommended Practices established by the Society of Automotive Engineers, Inc., including the latest revisions to SAE J366b and SAE J952b.

(1) Mobile construction and industrial machinery as defined in Article 1.08A.3 below:

(a) Sound Level Limits

(i) Manufactured before July 1, 1975: 90 dBA

(ii) Manufactured after July 1, 1975: 80 dBA

(iii) Manufactured after July 1, 1982: 77 dBA

(2) Trucks:

(a) Sound Level Limits

(i) Manufactured before July 1, 1975: 88 dBA

(ii) Manufactured after July 1, 1975: 83 dBA

(iii) Manufactured after July 1, 1982: 80 dBA

c. Noise abatement measures: Provide such equipment and sound-deadening devices and take such noise abatement measures that are necessary to comply with the requirements of this Contract, consisting of, but not limited to the following:

(1) Shields or other physical barriers to restrict the transmission of noise.

(2) Soundproof housings or enclosures for noise-producing machinery.

(3) Efficient silencers on air intakes for equipment.

(4) Efficient intake and exhaust mufflers on internal combustion engines.

(5) Lining of hoppers and storage bins with sound-deadening material.

(6) Conducting truck loading, unloading and hauling operations so that noise is kept to a minimum.

(7) Routing of construction equipment and vehicles carrying spoil, concrete, or other materials over streets that will cause the least disturbance to residents in the vicinity of the Work. The Contracting Officer Representative shall be informed in writing in accordance with Section 01330, SUBMITTAL PROCEDURES, of the proposed haul routes prior to the Contractor's securing a permit from the local government.

(8) Siting of stationary equipment shall be subject to Approval in accordance with Section 01520, TEMPORARY CONSTRUCTION FACILITIES.

3. Definitions: The following definitions shall be used in differentiating mobile equipment from stationary equipment:

a. Mobile construction equipment: Any motorized vehicle powered by an internal combustion engine or electric drive, which is capable of being operated as a vehicle either on the construction Site or in the public right-of-way.

(1) Construction equipment is mobile equipment any time it is operated in an automotive mode when performing construction tasks. Such equipment includes compactors, paving machines, front-end loaders, back hoes, scrapers, pavers, ditchers, and trucks.

(2) Some construction equipment while in transit may have the characteristic of mobile equipment, but for the purposes of this definition are not to be so considered. Such equipment includes generators, power shovels, cranes, pile drivers, drilling rigs, concrete mixers, pumps, trash compactors, bar benders, and other similar truck-mounted devices.

b. Stationary construction equipment: Any device, tool, or other mechanical system powered by an internal combustion engine, pneumatic engine, or electric motor, which does not employ any of the above power sources for automotive propulsion for more than 10 minutes out of every working hour while engaged in construction tasks. Examples of such equipment include truck-mounted compressors, generators, power shovels, pile drivers, cranes, drilling rigs, concrete mixers, pumps, trash compactors, bar benders, augers, and other similar truck-mounted devices.

1.09 CONSTRUCTION VIBRATION CONTROL

A. Do not cause or permit, beyond the property line of a source, vibration of sufficient intensity to cause another person to be aware of the vibration by such direct means as sensation of touch or visual observation of moving objects. The observer shall be

located at or within the property line of the receiving property when vibration determinations are made. Prepare and submit in accordance with Section 01330, SUBMITTAL PROCEDURES, a plan indicating monitoring locations, including the timing of monitoring measurements to be taken at the construction Site boundaries and at nearby residential, commercial, and industrial property lines. Comply with vibration limitation requirements of environmental reports, if provided.

1.10 EXPLOSIVES

A. The use of explosives for the performance of Contract work will not be permitted.

1.11 HISTORICAL AND SCIENTIFIC SPECIMENS

A. Articles of historical or scientific value, including, but not limited to, coins, fossils, and articles of antiquity, which may be uncovered by the Contractor during the progress of the Work, shall become the property of the Authority. Work in the area where discovered shall cease, and such findings shall be reported immediately to the Contracting Officer Representative in accordance with Section 01330, SUBMITTAL PROCEDURES, who will determine the method of removal, where necessary, and the final disposition thereof.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION (not used)

END OF SECTION

SECTION 01580

PROJECT SIGNS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the requirements for Project signs that will be required at the Site during the construction of the Project.

1.02 PROJECT IDENTIFICATION SIGNS

A. Furnish Authority Project identification signs in the locations at the Site selected by the Contracting Officer Representative.

B. Sign size, content, lettering, and format for the large permanent-mount WMATA sign shall be as directed by the Authority and shall be shown on the Contractor's Working Drawings.

1. Refer to Contract Drawings for signage details.

C. Signs shall be installed 20 Days after Notice to Proceed is given, shall be maintained during the Work, and shall be removed upon the completion of the Project.

1.03 WARNING SIGNS AND INSTRUCTIONAL SAFETY SIGNS

A. Provide "No Trespassing" signs, load limit on decking, and other warning and instructional safety aluminum signs with minimum 2-inch high Helvetica Medium style lettering and mount at locations on fencing/barriers/barricades/pedestrian bridges and on other areas as directed. Sign panel size and thickness shall be as directed. Mount the signs with stainless-steel cap screws with hex nuts and lock washers.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION (not used)

END OF SECTION

SECTION 01610

BASIC PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in construction of the Project.

B. Administrative procedures for handling requests for substitutions made after award of the Contract are included under Section 01630, PRODUCT SUBSTITUTION PROCEDURES.

1.02 DEFINITIONS

A. As used herein, the term brand name includes identification of products by make and model. If items called for in the Contract Documents have been identified by a brand name or equal description, such identification is intended to be descriptive, but not restrictive, and is to indicate the quality and characteristics of products that will be satisfactory. Contract Specifications identifying equal products including products of the brand name manufacturer other than the one described by brand name as specified in Section 01630, PRODUCT SUBSTITUTION PROCEDURES, will be considered if such products are clearly identified and are determined by the Designer and the Authority to meet fully the salient characteristics of the products specified in the Contract Documents.

1.03 SUBMITTALS

A. Submit for review an initial product list with 30 Days of NTP in accordance with Section 01330, SUBMITTAL PROCEDURES. A written explanation for omissions of data and for known variations from Contract requirements shall be included.

B. Submit for review and Approval a completed product list including a written explanation for omissions of data and for variations from Contract requirements within 30 Days after date of commencement of the construction work. Authority will notify Contractor of acceptance or rejection of the documentation within 21 Days of receipt of the submittal.

C. Authority Acceptance of the product list does not constitute a waiver of the requirement that products comply with the Contract Documents.

1.04 QUALITY ASSURANCE

A. Provide products of the same kind from a single source.

B. Except for required labels and operating data, the manufacturer's or producer's nameplates or trademarks shall not be attached or imprinted on exposed surfaces.

1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service connected or power-operated equipment. The nameplate shall contain the following information and other essential operating data:

   a. Name of product and manufacturer

   b. Model and serial number

   c. Capacity

   d. Speed

   e. Ratings

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. All products shall be delivered, stored, and handled in accordance with the manufacturer's recommendations so as to prevent damage, deterioration, loss, or invalidation of the manufacturer's warranty.

B. Schedule delivery to minimize long-term storage at the Site and to prevent overcrowding of construction storage and staging areas.

C. Coordinate the time of delivery with the installation schedule to ensure that hazardous, easily damaged, or those items sensitive to deterioration, theft, and other losses are stored for a minimum holding period.

D. Products shall be delivered to the Site in the manufacturer's original sealed container or other appropriate packaging, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

E. Products shall be inspected upon delivery by the Contractor to ensure compliance with the Contract Documents, and to ensure that products are undamaged and properly protected. Documentation noting the time, date, and manner of delivery shall be maintained by the Contractor. A statement attesting to the inspection of the products at time of delivery shall be included in the documentation signed by the Contractor's authorized representative.

F. Products shall be stored at the Site in a manner that will facilitate inspection and measurement of quantity or counting of units. Heavy materials shall be stored in a manner that will not damage supporting construction. Products subject to damage by the elements shall be stored under cover in weather-tight enclosures with ventilation adequate to prevent condensation. Temperature and humidity shall be maintained within range required by manufacturer's instructions.

PART 2 PRODUCTS

2.01 PRODUCT SELECTION

A. Provide products that comply with the Contract Documents. All products to be installed in the Work shall be undamaged and, unless otherwise permitted, unused at the time of installation. Products shall include all accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and suitable for the intended use.

B. Unless otherwise specified, provide standard products of the type that have been produced and used successfully in similar situations on other Authority projects of a similar nature.

C. Procedures governing product selection include:

1. Where only a single product or manufacturer is named and the notation “no substitution is permitted” is included in the specification, provide the product indicated. No substitutions will be permitted.

2. Where two or more products or manufacturers are named followed by the notation “no substitutions are permitted” is included in the specification, provide one of the products indicated. No substitutions will be permitted.

3. Where the Contract Documents list products or manufacturers that are available and acceptable for incorporation into the Work, accompanied by the term ...or equal or ...or approved equal, the Contractor may propose any available product that complies with Contract requirements. Comply with the requirement of Section 01630, PRODUCT SUBSTITUTION PROCEDURES, to obtain approval for use of an unnamed product.

4. Where the Contract Documents list the salient features that explicitly describe a product or assembly and a brand name is not included, provide a product or assembly that provides the listed features and otherwise complies with the Contract requirements.

5. Where the Contract Documents explicitly require compliance with performance requirements, and the product complies with those requirements based on the manufacturer’s recommended use of the product for the application indicated in the Contract Drawings (as evidenced in published product literature, or by the manufacturer’s certification of performance), the Contractor may submit the product for incorporation into the Work.

6. Where the Contract Documents require only compliance with an imposed code, standard, or regulation, the Contractor may select a product that complies with the standards, codes, or regulations specified.

7. Visual Matching: Where specifications require matching an established item, the Authority’s decision will be final on whether a proposed product matches satisfactorily. Where no product is available that adequately matches adjacent

products or complies with the other specified requirements, comply with provisions of Section 01630, PRODUCT SUBSTITUTION PROCEDURES, for selection of an alternate product.

8. Where specified product requirements include the phrase ...as selected from manufacturer's standard colors, patterns, textures..., select a manufacturer that provides a range of colors in a product that meets all other Contract Document requirements. In this situation, standard shall imply regularly or routinely produced.

PART 3 EXECUTION

3.01 PRODUCT LIST

A. Prepare a product list in tabular form acceptable to the Authority showing products specified in the Contract Documents. Coordinate the timing of delivery of products on the product list with the Contractor's Project Schedule as specified in Section 01322, CONTRACT PROGRESS REPORTING, and Contract Document Submittal Log as specified in Section 01330, SUBMITTAL PROCEDURES. At a minimum, provide the following information for each product:

1. Related specification Section number
2. Generic name used in the Contract Documents.
3. Proprietary name, model number, and similar designation
4. Manufacturer's name and address
5. Supplier's name and address
6. Installer's name and address
7. Projected delivery date and length of delivery period

B. Within 14 Days of receipt of product list submittals, Contracting Officer Representative will notify the Contractor of Authority acceptance or rejection of the product list. If rejected, product list shall be corrected by the Contractor and resubmitted for review.

3.02 INSTALLATION OF PRODUCTS

A. Comply with the manufacturer's instructions and recommendations for installation of all products installed under this Contract unless otherwise specified. Products shall be accurately located, aligned with other elements of the Work, and securely installed in place. All exposed surfaces shall be clean as specified in Section 01740, CLEANING, and protected as necessary to prevent damage and deterioration as specified in Section 01723, PROTECTION OF ADJACENT CONSTRUCTION.

END OF SECTION

SECTION 01630

PRODUCT SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for handling requests for substitutions made after award of the Contract.

B. Other requirements governing the Contractor's selection of products and product options are included under Section 01610, BASIC PRODUCT REQUIREMENTS.

1.02 DEFINITIONS

A. Definitions used in this Section are not intended to change the meaning of other terms used in the Contract Documents.

B. Contractor requests for changes in products, materials, equipment, and methods of construction as required or specified by Contract Documents are considered requests for substitutions. The following are not considered substitutions:

1. Revisions to Contract Documents requested by the Authority.

2. Specified options of products and construction methods included in Contract Documents. Note that products submitted under an or equal or not limited to provision are considered to be substitutions as specified in Section 00210, SUPPLEMENTARY INSTRUCTIONS TO BIDDERS.

3. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.03 SUBMITTALS

A. Requests for substitution from the Contractor during construction will be considered by the Authority if received with adequate time to allow for Authority review and Approval without delaying the Project Schedule. Requests received that may delay the Project Schedule will be considered or rejected at the sole discretion of the Authority.

1. Submit one electronic copy in Adobe (.PDF) file format of the Brand Name or Equal Form, Section 00433, BRAND NAME OR EQUAL FORM, for each request for substitution to the Contracting Officer Representative for consideration of the form and in accordance with procedures required for Change Order proposals as specified in Section 00748, CHANGES, as deemed appropriate by the Contracting Officer Representative.

2. In each substitution request, identify the product and fabrication or installation method to be replaced. The related WMATA Standard Specification Section or Contract Drawing numbers shall be referenced in the submittal. Complete

documentation showing compliance with the requirements for substitutions shall also be submitted including the following information as appropriate:

a. Product Data, including drawings, fabrication, and installation procedures

b. Samples, where samples of the specified product are requested

c. A detailed comparison of significant qualities/salient features of the proposed substitution with those of the material or work specified. Significant qualities shall include elements such as size, weight, durability, performance, visual effect, code compliance, maintenance requirements, energy usage, and environmental considerations.

d. Coordination information, including a list of changes or modifications made necessary to other parts of the Work and to construction performed by the Authority or separate contractors.

e. A statement indicating the substitution's effect on the Contractor's Construction Schedule. Indicate the effect of the proposed substitution on overall Period of Performance.

f. Cost comparison between the product specified and the requested substitution, including a proposal of the net change, if any in the Contract Price.

g. Certification by the Contractor that the substitution proposed is equal to or better in every respect to that required under the Contract, and that the product will perform as intended. Include a waiver of rights to additional payment or time that may subsequently become necessary should the product fail to perform adequately, or because of changes to other work were required as a consequence of the substitution.

h. Failure by the Contractor to include the above requirements in the submittal may be cause for rejection of the submittal in its entirety.

i. If deemed necessary and within 14 Days of receipt of the submittal, the Contracting Officer Representative may request additional information or documentation that, in its sole judgment is required for the evaluation of the substitution request. Within 21 Days of receipt of the original substitution request or of requested additional information or documentation, the Contractor will be notified of acceptance or rejection of the proposed substitution. If a decision on the use of a proposed substitute cannot be made or obtained within the time allocated, the product specified by name in the Contract Documents shall be used.

1.04 SUBSTITUTION PROCEDURE

A. The Contractor's request for substitution may be rejected by the Contracting Officer Representative if the substitution would involve:

1. Extensive revisions to Contract Documents

2. A proposed change not in keeping with the general intent of Contract Documents
3. An untimely request, not fully documented when submitted
4. A request that is directly related to an or equal clause or similar language in the Contract Documents
5. A product or method of construction that could not be provided within the Period of Performance
6. A product or method of construction that could not be approved by a governing authority
7. Additional responsibilities or expense to the Authority (including additional expenses for redesign and evaluation services, increased cost of related construction, and other similar considerations) that outweighs any advantage that is being offered to the Authority as a result of the substitution
8. A method of construction that cannot be provided in a manner that is compatible with other materials, the product cannot be coordinated with other materials, and a warranty cannot be provided for the product in accordance with the requirements of the Contract even though the Contractor expresses a willingness to certify that the apparent deficiencies can be corrected.

B. Neither the Contractor's submittal nor the Authority's review or Approval of Shop Drawings, product data, or samples that relate to a substitution constitutes an Approval of the requested substitution. Submission of Shop Drawing, product data, or sample submittals does not relieve the Contractor from fulfilling Contract requirements for substitutions.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION (not used)

END OF SECTION

SECTION 01711

ACCEPTANCE OF CONDITIONS

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies basic requirements for determining acceptable conditions for installation.

1.02 SUBMITTALS

A. One electronic copy of the preconstruction inspection records

1.03 PRECONSTRUCTION INSPECTION REQUIREMENTS

A. Prior to beginning construction work, the Contractor shall inform the Authority of buildings or structures on which it intends to perform work or which performance of the Work will affect.

B. Conditional inspection of buildings or structures in the immediate vicinity of the Project, which may reasonably be expected to be affected by the Work, will be performed jointly by the Authority and the Contractor. This inspection will be conducted prior to the commencement of construction work to determine pre-existing conditions. After this inspection, the Authority will not assume any responsibility for damages arising from the Work performed and it shall be the responsibility of the Contractor to correct all damages caused by performance of the Work.

C. Examine substrates, areas, and conditions, with Authority personnel present, for compliance with requirements for installed tolerance and other conditions affecting performance. Record observations from the required preconstruction inspection.

D. Where a written inspection report requires listing conditions detrimental to performance of the Work, include the following:

1. Description of the Work
2. List of detrimental conditions, including substrates
3. List of unacceptable installation tolerances
4. Recommended corrections

1.04 EXAMINATION

A. General: Verify dimensions shown on existing work and dimensions required for work that is to connect with work not in place in accordance with Section 01721, LAYOUT OF WORK AND FIELD ENGINEERING.

B. Existing Conditions

1. The existence and location of Site improvements, above and below-ground utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of above and below-ground utilities, mechanical and electrical systems, and other construction affecting the Work. Verify the location and point of connection of utility services.

2. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, water service pipes, and electrical services.

3. Furnish location data for work related to the Project that must be performed by public utilities serving the Project Site.

C. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

D. Examine rough-in for mechanical and electrical systems to verify actual location of connections before equipment and fixture installation.

E. Examine new and existing facilities for suitable conditions where products and systems are to be installed.

1.05 ACCEPTANCE OF CONDITIONS

A. Examine substrates, areas, and conditions, with contract personnel present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

   a. Description of the Work

   b. List of detrimental conditions, including substrates

   c. List of unacceptable installation tolerances

   d. Recommended corrections

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

4. Examine new and existing facilities for suitable conditions where products and systems are to be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Proceeding with work indicates acceptance of surfaces and conditions.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION (not used)

END OF SECTION

SECTION 01721

LAYOUT OF WORK AND FIELD ENGINEERING

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes general procedural requirements for layout of work and field engineering including, examination, preparation, construction layout, installation, survey personnel, equipment and calibration requirements, survey standards, surveys procedures, and formats for figures and reports.

1.02 RELATED SECTIONS

A. Section 01711 – ACCEPTANCE OF CONDITIONS

1.03 REFERENCES

A. DIN (Deutsches Institut fur Normung) 18723 – Specification for Theodolite Accuracy

B. Federal Geodetic Control Committee (FGCC):

1. Standards and Specifications for Geodetic Control Networks

C. National Oceanic and Atmospheric Administration (NOAA):

1. Manual National Ocean Survey (NOS), National Geodetic Survey (NGS) 3 Geodetic Leveling

D. National Society of Professional Surveyors (NSPS)

1. American Congress on Surveying and Mapping (ACSM).

1.04 SUBMITTALS

A. Survey personnel qualification data: Resumé and proof of certification or registration for all project surveyors. Resumés shall include information to demonstrate their capabilities and experience. Include lists of three completed projects with owner, project names, project duration, project description, project addresses, and phone numbers for the Survey Manager and survey crew chiefs.

B. Survey equipment: List of equipment and instruments to be used on the Project and include manufacturer specifications, date of purchase and last date of service for all instruments. Notify the Contracting Officer Representative when changes to equipment are made and submit an updated list of equipment and instruments.

C. Electronic distance measuring instruments: All measurements, computations, and results from the required calibration exercise.

D. Procedures for Control Surveys, Structural As-built Surveys, Movement Detection Surveys, Early Alignment As-built Surveys, and Hi-Lo Surveys, Post Construction Alignment As-built Surveys and Final Trackway Monumentation Surveys.

E. Horizontal and vertical trackway alignment revisions with supporting calculations and data.

F. Supporting documents, calculations, and data for required remedial actions.

G. Numbering sequence for trackway vertical control monumentation.

H. Log of layout control work. Record deviations from required lines and levels.

I. Survey data reduction and calculations for Bid Schedule items of work.

J. Post construction Monument Record Sheets.

1.05 QUALITY ASSURANCE

A. Verify and maintain records to document personnel certification; equipment maintenance, calibration and adjustment; and use of required procedures for field work and office computations. These records shall be maintained by the surveyor in responsible charge of the Work. Verification of compliance shall be included in the Contractor's overall Quality Assurance program and provided to the Contracting Officer Representative quarterly or upon request.

B. Survey Personnel

1. Ensure that all personnel are qualified to perform the Work.

2. Provide a Survey Manager to plan, execute, and verify all survey work (or survey work as established by the Contracting Officer Representative).

3. The Authority may choose to withhold payment for all construction work if the Contractor fails to provide qualified survey personnel.

4. All personnel performing or assisting in survey activities, including construction layout, shall be Certified Survey Technicians (CST) by and through the National Society of Professional Surveyors (NSPS) - American Congress on Surveying and Mapping (ACSM).

a. Each member of the Contractor's survey staff shall be certified in one or more of the Certified Survey Technician levels when assigned to a WMATA project. There are four levels of certification in the CST program. Certification is by experience and examination. Refer to NSPS Figure 1.05-1 for the levels of the CST Program.

b. The Authority will accept registration as a Land Surveyor or Property Line Surveyor, in Virginia, Maryland, or the District of Columbia in lieu of CST certification.

c. Survey consultants hired by the Contractor to provide survey services are bound by the same CST requirements contained in the Contract.

d. Surveyors working under the direction of a Licensed Surveyor or Property Line Surveyor are not exempt from the CST requirement.

e. Use of craft personnel as substitute for temporary survey staff is not acceptable unless they are a Certified Survey Technician.

f. With concurrence by the Contracting Officer Representative and WMATA Quality Assurance Manager, a Contractor's surveyor without CST certification may temporarily work on a WMATA contract prior to taking the CST exam, if the surveyor:

(1) Fulfills the minimum education and or experience requirements for the position held as described in the CST Program Book.

(2) Submits a copy of the CST application to the Contracting Officer Representative along with other documentation of education and or work experience.

(3) Is scheduled to take the next available CST exam.

(4) Requests in writing, a temporary waiver of the CST requirement pending the outcome of the results of the CST exam with the understanding that failure to pass the CST exam will result in said surveyor's removal from the WMATA Contract.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. The Authority has established, or will establish, such general reference points including horizontal control points and vertical benchmarks as will enable the Contractor to proceed with the Work. If the Contractor finds that previously established reference points have been destroyed or displaced, or that none have been established, it shall promptly notify the Contracting Officer Representative.

B. The Contractor shall lay out its work from reference points established by previous construction or from established reference points shown in the Contract and shall be responsible for all measurements in connection therewith. The Contractor shall furnish stakes, templates, platforms, equipment, tools, materials, and labor as may be required in laying out any part of the Work from the reference points established by previous construction or by the Authority. The Contractor will be held responsible for the execution of the Work to such lines and grades as directed.

C. Protect and preserve the established reference points and shall make no changes in locations without approval by the Authority. Reference points lost, disturbed by

construction, destroyed, or which require shifting because of necessary changes in grades or locations shall, subject to prior approval, be replaced and accurately located at the Contractor's expense by a registered surveyor in the area where the Work is to be performed or a qualified certified survey technician (CST Level IV). Reference points replaced by the Contractor's surveyor shall be done in accordance with the FGCC Standards and Specifications for Geodetic Control Networks using First Order, Class 1 specifications for horizontal control work and Second Order, Class 1 specifications for vertical control work.

D. For the purpose of this Section, the Contractor shall provide competent engineering services as necessary to execute the Work. It shall verify the dimensions shown before undertaking construction work and shall be responsible for the accuracy of the finished Work.

3.02 EXAMINATION

A. General: Dimensions shown on existing work and dimensions required for work that is to connect with work not in place shall be verified by the Contractor by actual measurement of the existing work. Discrepancies between the Contract Documents and the existing conditions shall be referred to the Contracting Officer Representative before work affected thereby has been performed.

1. The Contractor shall compare drawings and verify the dimensions before laying out the Work and shall be responsible for errors, which might have been avoided thereby.

2. Dimensions and descriptions given on the Contract Documents for adjacent work shall be verified by the Contractor. It is the responsibility of the Contractor to verify all as-built conditions and interface information by actual field measurement.

B. Existing Conditions: The existence and location of site improvements, utilities, both underground and above ground, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work. Call Miss Utility at 1-(800) 257-7777 before beginning any excavation or demolition project.

1. Before construction, verify the location and points of connection of utility services and the locations and invert elevations at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project Site.

C. Acceptance of Conditions: In accordance with Section 01775, CLOSEOUT.

3.03 PREPARATION

A. Existing Utility Information: Furnish information to local Utility and the Contracting Officer Representative 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 and obtain approval from authorities having jurisdiction.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Authority or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify the Contracting Officer Representative and Utility representative not less than 5 working days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without written permission from the Utility and the Authority.

C. 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.

D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Contract Drawings.

E. Review of Contract Documents and Field Conditions: Immediately upon discovery of the need for clarification of the Contract Documents, submit a Request for Information to the Contracting Officer Representative. Include a detailed description of the problem encountered, together with recommendations for changing the Contract Documents.

3.04 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on the Contract Drawings. If discrepancies are discovered, notify Contracting Officer Representative promptly.

B. General: Engage qualified Certified Survey Technician(s) to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each stage of construction and elsewhere as needed to locate each element of the Project.

2. Establish dimensions within tolerances indicated. Do not scale Contract Drawings to obtain required dimensions.

3. Inform installers of lines and levels to which they must comply.

4. Check the location, level, and plumb, of every major element as the Work progresses.

5. Notify the Contracting Officer Representative when deviations from required lines and levels exceed allowable tolerances.

6. Close Site surveys with an error of closure equal to or less than the standard established or referenced herein.

C. The tolerances generally applicable in setting survey stakes or marks shall be as set forth below. These tolerances shall not supersede stricter tolerances required by the Contract Documents and shall not otherwise relieve the Contractor of responsibility for measurements in compliance therewith. The tolerances listed below are not to be used for setting or re-establishing primary and secondary control markers or final alignment monumentation.

1. Tolerances: Tolerances in setting survey stakes or markers shall not exceed the following:

Horizontal Survey Stakes or Markers	**Distance**	**Tangent**
Horizontal marks on hubs on centerline and offset centerlines.	1:35,000	0.02 ft.
Intermediate stakes or hubs on centerlines and offset centerlines.	1:35,000	0.02 ft.
Rough excavation and embankment for roads and other work not otherwise provided.	1:10,000	0.50 ft.
Trimming of excavation and embankment unless otherwise provided.	1:10,000	0.50 ft.
Structures-Building construction.	1:35,000	0.02 ft.
Trimming or preparation of earth subgrade for trackbeds, roadways, and concrete pipes.	1:20,000	0.04 ft.
Trackbed and roadway sub-base and base, steel pipe and other work not otherwise provided for.	1:20,000	0.04 ft.
Track invert and roadway surfacing, steel reinforcement, concrete pipe and other formed concrete.	1:35,000	0.02 ft.

Vertical Grade Stakes or Markers	Elevation (Plus/Minus)
Rough excavation and embankment for roads and other work not otherwise provided.	0.20 ft.
Trimming of excavation and embankment unless otherwise provided.	0.20 ft.
Structures-Building construction.	0.01 ft.
Trimming or preparation of earth sub-grade for trackbeds, roadways, concrete pipe and other concrete structures.	0.05 ft.
Trackbed and roadway sub-base and base, steel pipe and other work not otherwise provided for.	0.05 ft.
Track invert and roadway surfacing, steel reinforcement, concrete pipe and other formed concrete.	0.02 ft. (Track invert only minus 0.00 ft. high, plus 0.04 ft. low)
Equipment Installation.	As required by manufacturer.

D. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

E. Building Lines and Levels: Locate and lay out control lines and grades for structures, building foundations, column grids, and floor grades, including those required for mechanical and electrical work. Transfer survey reference line markings and elevations for use with control lines and grades. Level foundations and piers from two or more locations.

F. 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 to the Contracting Officer Representative upon request.

3.05 FIELD ENGINEERING

A. Identification: Authority will provide and identify existing benchmarks and control points to be used for the duration of the Contract.

B. Reference Points: Locate existing and verify by field traverse permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent primary benchmarks, deep benchmarks, and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval by the Contracting Officer Representative. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to the Contracting Officer Representative 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 permanent secondary control points on Project Site, referenced to data established by survey control points. Comply with WMATA Standard Drawing for Survey Monuments.

1. Record benchmark locations, with horizontal and vertical data, on record copy of Contract Drawings.

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. When the Contract Specifications require Bid Schedule items of work to be measured by surveying methods, perform all such surveys, including control surveys run for establishing the measurement reference lines. Perform all survey data reduction and calculations and supply the reduced survey data in an understandable and readable format.

3.06 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 unless otherwise specified.

B. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for uniform spacing.

C. The Contractor’s surveys are a part of the Work and may be checked by the Authority at any time. The Contractor shall be responsible for lines, grades, or measurements which do not comply with specified or proper tolerances, or which are otherwise defective, and for any resultant defects in the Work. The Contractor will be required to conduct re-surveys or check surveys to correct errors indicated by review of the Work.

3.07 SURVEY EQUIPMENT AND CALIBRATION REQUIREMENTS

A. Survey Equipment*:* All electronic distance measuring instruments (or total station theodolites) shall be checked by the Contractor against a National Geodetic Survey (NGS) range of known distances at least once every 6 months.

1. All distance measurements shall be computed using the procedures in NOS NGS-10, Use of Calibration Base Lines. The actual measurements shall be recorded, atmospheric corrections applied, and then adjusted by least squares to compute a constant, as well as, a relative correction factor (scale correction).

2. National Geodetic Survey has established specific calibration baselines for the purpose of comparing survey equipment to known monumentation to verify the instruments vertical angles, horizontal angles, and difference in elevation for compliance with the manufacturer's specifications. Verification of angle measurement and difference in elevation shall only be done by the Contractor if all other methods of verification acceptable to the Authority have been exhausted.

3. Bring each electronic distance meter (EDM) or total station theodolite to the Corbin, VA Geo-magnetic observatory (phone 703-373-7605) or similar NGS facility and compare their instrument(s) to known NGS values whenever there is any question as to the correct operation, accuracy and functionality of the Contractor's survey equipment. Minimally, this will be done every 6 months or after a damaged instrument has been repaired and before it is put back in service. The Contractor shall supply the Contracting Officer Representative with all appropriate documentation from this exercise.

4. All total station distance measuring devices and prisms shall be serviced every 6 months and checked frequently over lines of known distances. Generally, this exercise shall be conducted in the spring and fall.

5. Results of this calibration exercise shall be forwarded to the Authority. Correction factor's shall be posted in the Contractor's office computing area and applied as required to maintain the desired accuracy.

6. Adjustment and certification documents from a supplier or manufacture are not allowed as a substitution for the distance calibration exercise at a NGS or similar facility.

7. Records of instrument calibration and adjustment shall be maintained as a part of the Contractor's quality control program.

8. Use of the NGS baseline for checking distances is not intended to take the place of normal maintenance, cleaning, and adjustment of the Contractor's instruments.

9. Every 6 months, or whenever the difference between direct and reverse readings of the theodolite depart from 180 degrees by more than 30 seconds, the instrument shall be adjusted for collimation error. Readjustment of the crosshairs and level bubble shall be done whenever their misadjustments affect the instrument reading by the amount of the least count.

10. Instruments found to be in disrepair or out of adjustment shall be removed and repaired or replaced.

11. All steel tapes shall be compared with the Contractor's EDM at least every 6 months. The Contractor shall number all tapes and measuring chains, record comparisons, compute correction factors, and forward to the Authority upon request or whenever equipment is changed. In addition, tape correction information shall be posted in the Contractor's office computing area and applied as required to maintain the desired accuracy.

12. Provide and maintain the ability in-house to check and adjust all tribrachs for eccentricity. Adjustment checks shall be made weekly or as necessary. A record of adjustments to all tribrachs shall be kept current and made available to the Authority monthly or upon request. Each tribrach shall be numbered and tagged with the date of the last adjustment.

3.08 SURVEY STANDARDS

A. Maintain accuracy standards for all control surveys performed under the terms of this Contract in accordance with the following table:

Primary horizontal control surveys	First order
Primary vertical control surveys	Second order, Class I
Secondary horizontal control surveys	Second order, Class I
Secondary vertical control surveys	Second order, Class II

1. Primary control is defined as the original control provided to the Contractor at the start of the Contract. Secondary control is defined as the control established and used by the Contractor during construction. All secondary control traverse stations shall be set with permanent markers.

2. Control surveys and computations including surveys of main control lines to determine alignment of major structure components shall be performed in accordance with Second Order Class I requirements.

3. Unless specified, the Contractor will not be required to perform First-Order survey work unless Contractor destroys primary control points included in the Contract Documents or set by WMATA after contract NTP. GPS shall not be used by the Contractor to re-establish destroyed primary control unless approved by the Contracting Officer Representative.

4. The Contractor should expect all primary or secondary horizontal control traverses they perform to meet a 1:50,000 distance accuracy closure. All vertical control traverses shall have a closure accuracy that does not fall below that specified for Second Order, Class II surveys.

5. Survey procedures and accuracy are a function of the types of survey that is being performed. The Contractor is responsible for ensuring the use of proper procedures to maintain accuracy requirements contained in the Contract.

6. Use the closed traverse method in setting controls by starting at and ending at known or previously established traverse stations and benchmarks.

7. All distances over 100 feet shall be measured by the use of electronic distance measuring instrument (EDMI). Critical distances under 100 feet shall be checked with a distance meter.

B. Horizontal Traverse

1. Conventional traverse work shall be performed in accordance with the requirements defined in the FGCC Standards and Specifications for Geodetic Control Networks, Federal Geodetic Control Committee.

2. All survey field data shall be provided to the Authority upon request in a Star*Net digital input file format.

   a. All reduced horizontal traverse measurements shall be provided in a set reduction report in an ASCII text file format which clearly lists the following data:

      (1) Individual observations in an orderly format along with the mean angle from each direct and reverse observation.

      (2) Horizontal angle mean, vertical angle mean and slope distance mean for each set of observations.

      (3) Standard deviation of the observations, and maximum, minimum, range and collimation error for each set of observations. Refer to Figure 3.08-1 for a sample set reduction report.

3. Accuracy requirements:

   a. First Order control surveys:

      (1) Horizontal and vertical angle circle reading observation accuracy (standard deviation) of 0.5 seconds (DIN 18723) and read to 0.1 of a second.

      (2) Occupied station centering (eccentricity) accuracy of 1 mm.

      (3) Electronic distances measuring accuracy (standard deviation) of 1 mm plus or minus 1 ppm and read to 0.001 feet.

   b. Second Order control surveys:

      (1) Horizontal and vertical angle circle reading observation accuracy (standard deviation) of 1.0 second (DIN 18723) and read to 1.0 second or less if possible.

      (2) Occupied station-centering (eccentricity) accuracy of 1 mm.

      (3) Electronic distances measuring accuracy (standard deviation) of 2 mm plus or minus 2 ppm and read to 0.001 feet.

(4) All horizontal traverse adjustments shall be performed using a minimally constrained Least Squares adjustment method which will produce the following output:

(a) Summary of unadjusted input observations

(b) Statistical summary

(c) Chi Square test

(d) Adjusted observations and residuals

(e) Residual summary

(f) Adjusted bearings and horizontal distances (grid and ground)

(g) Horizontal unadjusted traverse closures

(h) Adjusted coordinates

(i) Convergence angles and grid factors at stations

(j) Standard deviations, error propagation and error ellipses

(5) All horizontal traverse adjustment results shall be provided to the Authority upon request.

C. Vertical Traverse

1. Differential leveling shall be performed in accordance with the requirements for Second-Order, Class I geodetic leveling surveys as defined in the Standards and Specifications for Geodetic Control Networks, Federal Geodetic Control Committee (FGCC), and NOAA Manual NOS NGS 3 Geodetic Leveling, National Geodetic Survey (NGS).

a. The survey Subcontractor shall provide documentation of staff calibration, which includes certificates for expansion coefficient and length calibration.

2. All reduced vertical traverse data shall be provided to the Authority upon request in a Star*Net-Lev digital input file format.

a. All vertical traverse data shall be provided as a data reduction report in an ASCII text file format, which clearly lists the following data:

(1) Individual observations with the point identifier,

(2) Distance from instrument to staff (rod) for each observation,

(3) Backsight staff (rod) reading and foresight staff (rod) reading,

(4) Number of measurements taken and standard deviation per staff (rod) reading, and

(5) Cumulative station differences

3. Accuracy Requirements:

   a. Differential leveling observation accuracy (standard deviation) of 0.4 mm and read to 0.0001 feet

4. The Contractor may use electronic digital levels and bar coded leveling staffs. The use of leveling staffs with ground plate (turning turtle) is required.

5. Use calibrated invar staffs (level rods) for all control work including final vertical monumentation installation.

6. Use semi-precise level rods or equal equipment for level work.

7. All vertical traverse adjustments shall be performed using a minimally constrained Least Squares adjustment method after a vertical traverse meets the minimum closure requirements referenced herein.

8. All vertical traverse adjustment results shall be provided to the Authority upon request.

3.09 SURVEYS AND PROCEDURES

A. Control Surveys

1. Verify Project primary control monumentation and provide adjustment computations to the Contracting Officer Representative.

2. Replace primary control monuments that have been destroyed or damaged and provide adjustment computations to the Contracting Officer Representative.

   a. Provide Monument Record Sheets to the Contracting Officer Representative.

3. Establish secondary control monumentation along the Authority's construction project and provide adjustment computations to the Contracting Officer Representative.

   a. Horizontal and vertical control discs shall be installed in accordance with WMATA Standards.

   b. Horizontal and vertical control discs set on direct fixation trackways shall be recessed to protect them from disturbance.

   c. Provide Monument Record Sheets to the Contracting Officer Representative.

B. Structural As-Builts

1. General Requirements: Structural as-builts are required to check for out-of-tolerance construction, which may impact other structures or compromise train clearances along the trackway.

a. All methods, equipment and procedures used by the Contractor to perform structural checks shall be approved by the Contracting Officer Representative prior to commencement of the Work.

b. This survey data must be analyzed by the Contractor and the Authority for compliance with construction and rail tolerances.

c. This survey data must be analyzed by the Contractor and the Authority to determine what remedial action, if any, may be required to address out-of-tolerance construction and the impact of structural misalignment on the final placement of other structures and rail.

(1) If the survey data reveals out-of-tolerance construction, which will impact the placement of other structures along the trackway, the Contractor shall take appropriate remedial action to comply with the Contract Documents.

(a) If minimally out-of-tolerance, perform horizontal and vertical alignment revisions to minimize the impact of the misalignment on the future placement of adjoining structures and rail along the trackway.

(b) If significantly out-of-tolerance and an acceptable alignment revision cannot be used to compensate for out-of-tolerance construction, then demolish and remove the structure and re-install.

(2) All alignment revisions and remedial actions shall be approved by the Contracting Officer Representative prior to commencement of the Work.

2. Verify existing primary horizontal and vertical controls and re-establish, if destroyed or disturbed, and provide adjustment computations to the Contracting Officer Representative.

3. Provide Monument Record Sheets to the Contracting Officer Representative.

4. Establish a secondary horizontal and vertical control system on the Authority's structures and reference to the approved project primary horizontal and vertical control system. The secondary control system established on or within trackway structures shall be used for detailed cross sections, Hi-Lo surveys and placement of final trackway monumentation. The secondary control system shall be adequately referenced so it can be readily recovered. Horizontal and vertical control discs shall be installed in accordance with WMATA standard.

a. Horizontal and vertical control discs set on direct fixation trackways shall be recessed to protect them from disturbance.

b. Provide Monument Record Sheets to the Contracting Officer Representative.

5. Verify structural concrete placement for compliance with Contract Documents, and provide the final results to the Contracting Officer Representative when requested.

C. Post Construction Alignment As-built Surveys

1. General Requirements: Post construction alignment as-built surveys are required to check trackway structures for compliance with Contract Documents and to check for out-of-tolerance construction, which may impact train clearance tolerances.

2. All methods, equipment, and procedures used by the Contractor to perform post construction alignment as-built surveys shall be approved by the Contracting Officer Representative prior to commencement of the Work.

    a. This survey data must be analyzed by the Contractor and the Authority for compliance with construction and rail tolerances.

    b. This survey data must be analyzed by the Contractor and the Authority to determine what remedial action, if any, may be required to address out-of-tolerance construction and the impact of structural misalignment on the final placement of the rail.

        (1) If the survey data reveals out-of-tolerance construction, which will impact the placement of other structures along the trackway, the Contractor shall take appropriate remedial action to comply with the Contract Documents.

            (a) If minimally out-of-tolerance, perform horizontal and vertical alignment revisions to minimize the impact of the misalignment on the future placement of adjoining structures and rail along the trackway.

            (b) If significantly out-of-tolerance and an acceptable alignment revision cannot be used to compensate for out-of-tolerance construction, then demolish and remove the structure and re-install.

        (2) All alignment revisions and remedial actions shall be approved by the Contracting Officer Representative prior to commencement of the Work.

3. Verify existing primary horizontal and vertical controls and re-establish, if destroyed or disturbed, and provide adjustment computations to the Contracting Officer Representative for approval. Provide Monument Record Sheets to the Contracting Officer Representative.

4. Establish a secondary horizontal and vertical control system on the Authority's structures and reference to the approved project primary horizontal and vertical control system. The secondary control system established on or within trackway structures shall be used for detailed as-built cross sections, hi-lo surveys, and placement of final trackway monumentation. The secondary control system shall be adequately referenced so it can be readily recovered.

    a. Horizontal and vertical control discs shall be installed in accordance with WMATA Standards.

    b. Horizontal and vertical control discs set on direct fixation trackways shall be recessed to protect them from disturbance.

    c. Provide Monument Record Sheets to the Contracting Officer Representative.

5. Provide a report to the Contracting Officer Representative comparing the as-built location of the structure to the plan location as well as the theoretical dynamic outline of the train along the tunnels, retained areas, and aerial structures.

    a. These cross sections must show computed clearances between the as-built location of the structure as well as the theoretical dynamic outline of the train.

    b. This data must be analyzed by the Contractor and the Authority for compliance with construction and train clearance tolerances.

    c. This data must be analyzed by the Contractor and the Authority to determine what remedial action, if any, may be required to address out-of-tolerance construction and the impact of structural misalignment on the final placement of the tracks.

6. Install and reference all permanent, secondary, and final monumentation required for construction, trackwork, and other system-wide facilities.

    a. Provide Monument Record Sheets to the Contracting Officer Representative.

7. Coordinate the post construction alignment as-built survey work with the Contracting Officer Representative.

3.10 FIGURES AND REPORT FORMATS

Figure 1.05-1

Levels of the Certified Survey Technician Program

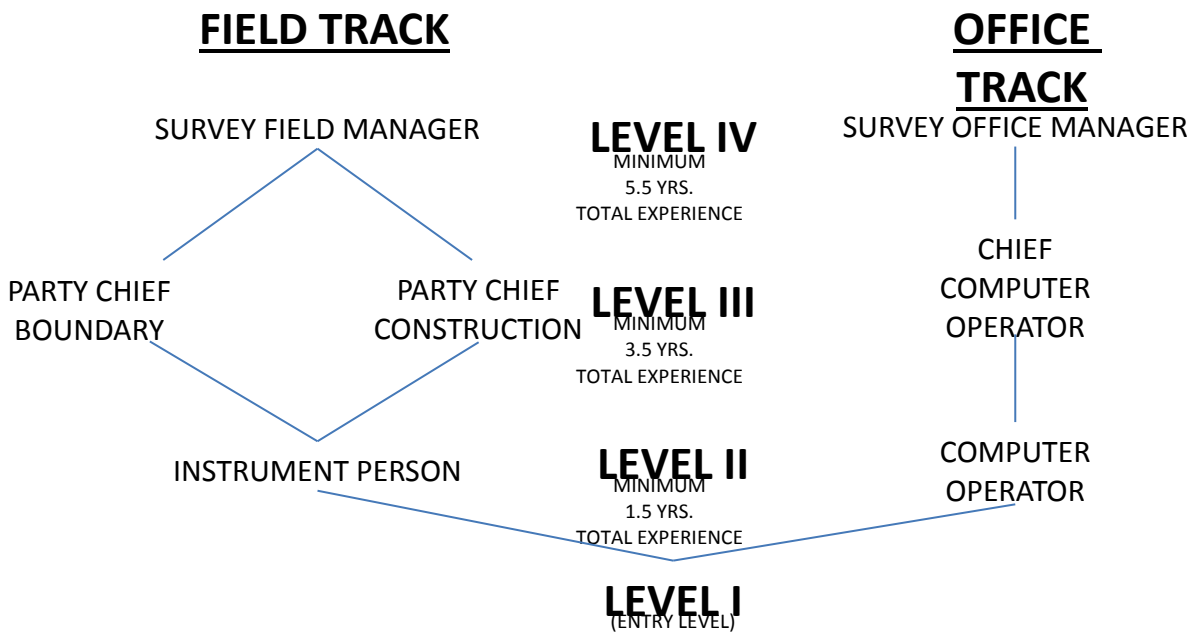


Figure 3.08-1

TRAVERSE SET REDUCTION

PR:METRO2.PRJ DT:05/01/01 ID:METRO CENTER NM:TRAVERSE

Occupied Station: Pt. No. 101, A-101 METRO B/D
Backsight: Pt. No. 100, A-100 METRO B/D
Foresight: Pt. No. 102, A-102 METRO B/D

HORIZONTAL ANGLE REDUCTION

Set Rejection Criterion: Deviation from Mean greater than 3 inches

Set No.	Face	Backsight	Foresight	Horiz. Angle	Mean Dev.
1	1	0-00-00.0	191-05-13.0		
	2	180-00-01.0	11-05-12.4		
	Mean	0-00-00.50	191-05-12.70	191-05-12.20	0-00-01.03
2	1	359-59-59.6	191-05-14.0		
	2	180-00-01.0	11-05-12.1		
	Mean	0-00-00.30	191-05-13.05	191-05-12.75	0-00-00.48
3	1	359-59-59.5	191-05-13.0		
	2	179-59-59.8	11-05-12.2		
	Mean	359-59-59.65	191-05-12.60	191-05-12.95	0-00-00.27
4	1	359-59-57.2	191-05-13.1		
	2	179-59-59.7	11-05-13.8		
	Mean	359-59-58.45	191-05-13.45	191-05-15.00	- 0-00-01.78

Mean Horiz. Angle: 191-05-13.23

Std. Deviation (obs): 0-00-01.23

Std. Deviation (mean): 0-00-00.61

Maximum: 191-05-15.00

Minimum: 191-05-12.20

Range: 0-00-02.80

Collimation Error: 0-00-02.5

BACKSIGHT ZENITH/SLOPE DISTANCE REDUCTION

Zenith Rejection Criterion: Deviation from Mean greater than 5 inches
Slope Distance Rejection Criterion: Deviation from Mean greater than 0.01 feet

Set No.	Face	Zenith	Mean Dev.	Slope Distance	Mean Dev.
5	1	90-27-40.6		215.316	
	2	269-32-20.3		215.316	
	Mean	90-27-40.15	0-00-00.08	215.316	0.00
6	1	90-27-41.7		215.316	
	2	269-32-20.5		215.316	
	Mean	90-27-40.60	0-00-00.53	215.316	0.00
7	1	90-27-40.4		215.316	
	2	269-32-21.5		215.316	
	Mean	90-27-39.45	0-00-00.61	215.316	0.00

Mean Zenith Angle: 90-27-40.07
Std. Deviation (obs): 0-00-00.57
Std. Deviation (mean): 0-00-00.33
Maximum: 90-27-40.60
Minimum: 90-27-39.45
Range: 0-00-01.15
Collimation Error: 0-00-02.2

Mean Slope Distance : 215.316
Std. Deviation (obs): 0.000
Std. Deviation (mean): 0.000

FORESIGHT ZENITH/SLOPE DISTANCE REDUCTION

Zenith Rejection Criterion: Deviation from Mean greater than 5 inches
Slope Distance Rejection Criterion: Deviation from Mean greater than 0.01 feet

Set No.	Face	Zenith	Mean Dev.	Slope Distance	Mean Dev.
5	1	89-29-50.9		275.692	
	2	270-30-10.5		275.691	
	Mean	89-29-50.20	0-00-01.01	275.692	0.00
6	1	89-29-52.1		275.692	
	2	270-30-09.3		275.691	
	Mean	89-29-51.40	0-00-00.18	275.692	0.00
7	1	89-29-52.6		275.692	
	2	270-30-08.5		275.691	
	Mean	89-29-52.05	0-00-00.83	275.692	0.00

END OF SECTION

SECTION 01722

MOBILIZATION

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes specifications for the following:

1. Organization and mobilization of Contractor's forces;

2. Design, fabrication, and transportation of construction plant and equipment to the Site and setting up of same;

3. Transporting various tools, materials, and equipment to the Site; and

4. Erection of temporary buildings and facilities required for staging and construction operations.

B. Mobilization shall include mobilization of all construction equipment, temporary facilities, materials, supplies, appurtenances, staffed and ready for commencing and prosecuting the Work; and the subsequent demobilization and removal from the Site of said equipment, appurtenances, and the like upon completion of the Work.

C. Mobilization shall also include assembly and delivery to the Site of plant, equipment, materials, and supplies necessary for the prosecution of work, which are not intended to be incorporated in the Work; the clearing of and preparation of the Contractor's work area; the complete assembly, in working order, of equipment necessary to perform the required work; personnel services preparatory to commencing actual work; and all other preparatory work required to permit commencement of the actual work on construction items for which payment is provided under the Contract.

1.02 SUBMITTALS

A. Refer to Section 01330, SUBMITTAL PROCEDURES, for submittal requirements and procedures for the following submittals:

1. A layout of the construction sites including fences, roads, parking, buildings, staging, and storage areas, within 7 Days after the Notice to Proceed

2. Schedule for mobilization of field office within 7 Days after Notice to Proceed

PART 2 PRODUCTS (not used)

PART 3 EXECUTION

3.01 DELIVERY

A. Delivery to the jobsite of construction tools, equipment, materials, and supplies shall be accomplished in conformance with local governing ordinances and regulations.

3.02 TOOLS AND SUPPLIES

A. Provide construction tools, equipment, materials, and supplies of the types and quantities that will facilitate the timely execution of the Work.

B. Provide personnel, products, construction materials, equipment, tools, and supplies at the jobsite at the time they are scheduled to be installed or utilized.

3.03 PLANT LOCATION

A. Locate plant or plants appropriately close to the portion of the Work for which it will be used.

3.04 DEMOBILIZATION

A. Upon completion of the Work, remove construction tools, apparatus, equipment, unused materials, and supplies, plant, temporary facilities, and personnel from the jobsite.

B. Restore all areas utilized for the Contractor’s temporary facilities and staging purposes to their original, natural state or, when called for in the Contract Documents, complete such areas as indicated.

END OF SECTION

SECTION 01723

PROTECTION OF ADJACENT CONSTRUCTION

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies the appropriate methods for protection of adjacent construction when performing installations and improvements in and around existing facilities.

1.02 PROTECTION OF EXISTING SURFACES

A. Existing surfaces shall be carefully protected during construction operations under this Contract to avoid damaging existing surfaces.

1. Existing surfaces shall be protected by the Contractor from all possible damages including chipping, staining, and corroding during performance of the Work.

2. If damage occurs, the Contractor shall repair or replace to match original undisturbed conditions.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION (not used)

END OF SECTION

SECTION 01731

CUTTING AND PATCHING

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies the appropriate methods for performing cutting and patching when installations occur in existing facilities or for improvements including selective demolition, salvaging of materials and equipment, and restoring of pavement and other surfaces and improved areas from damage caused by the Contractor's operations.

1.02 SUBMITTALS

A. Written Request: Submit a written request for approval by the Contracting Officer Representative prior to cutting and patching. A written request is required for any cutting or alteration, which affects:

1. The work of the Authority or any separate contractor,
2. The structural value or integrity of any element of the Project,
3. The integrity or effectiveness of weather exposed or moisture-resistant elements or systems,
4. Building aesthetic qualities for exterior areas or in occupied spaces, or
5. The efficiency, operation life, maintenance, or safety of operational systems.

B. Cutting and Patching Proposal: Include in written request the following:

1. Describe the extent of cutting and patching required. Show how it will be performed and indicate why if cannot be avoided.
2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
3. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.

C. Structural Elements: Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure to satisfy requirements.

D. Should conditions of work or schedule indicate change of materials or methods, submit written recommendations to the Contracting Officer Representative, including:

1. Conditions indicating change,

2. Recommendations for alternative materials or methods, and

3. Resubmittal as required for substitution.

E. Approval by the Contracting Officer Representative to proceed with cutting and patching work does not waive the Authority's right to later require complete removal and replacement of any part of the Work found to be unsatisfactory.

1.03 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load carrying capacity or load deflection ratio. Obtain prior approval from the Contracting Officer Representative of the cutting and patching procedures proposed.

B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety. Obtain prior approval from the Contracting Officer Representative of the cutting and patching procedures proposed.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Contracting Officer Representative's opinion, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching.

1. If possible, retain the original installer or fabricator to cut and patch exposed Work. If it is impossible to engage the original installer or fabricator, engage another recognized experienced and specialized firm.

2. Remove and replace construction cut and patched in a visually unsatisfactory manner.

1.04 EMBEDDED ITEMS

A. When reinforcing steel, conduit or other items embedded in the concrete are encountered in a drilling or coring operation, the operation shall be stopped and the Contracting Officer Representative immediately notified. Determine whether the embedded item may be cut through and if determined to be permissible, obtain Contracting Officer Representative's concurrence before doing so. If it is not permissible to cut through the embedded item, holes shall be drilled in another location and the original holes patched as directed by Contracting Officer Representative.

1.05 PAVEMENT AND IMPROVED AREAS RESTORATION

A. As applicable, secure permits from the Jurisdictional Authority for all pavement restoration within the limits of said Jurisdictional Authority. Submit Working Drawings of such pavement restoration prepared in accordance with the requirements of the

Contract Documents and the Jurisdictional Authority to the Jurisdictional Authority for approval.

B. During construction operations on this Contract, certain areas currently grassed, landscaped, or otherwise improved may be disturbed or damaged. Restore such areas as specified in Section 00736, PROTECTION OF EXISTING VEGETATION, STRUCTURES, UTILITIES AND IMPROVEMENTS.

C. Existing surfaces marred or damaged by operations under this Contract shall be repaired or replaced by the Contractor to the condition prior to being marred or damaged as approved by the Contracting Officer Representative.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible if identical materials are unavailable or cannot be used, use materials whose installed performance will equal or surpass that of existing materials.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.

B. After uncovering work, inspect conditions affecting installation of new products.

C. Report unsatisfactory or questionable conditions to the Contracting Officer Representative in writing, and do not proceed with the Work until the Contracting Officer Representative has provided further instruction.

3.02 PREPARATION PRIOR TO CUTTING AND PATCHING

A. Temporary Support: Provide shoring, bracing, and support as required to maintain structural integrity of the affected portion of the Work.

B. Protection: Protect existing equipment during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.03 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay. Cut

existing construction to provide for installation of other components or performance of other construction activities and the subsequent patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or elements adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.

1. In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

3. Cut through concrete and masonry using a cutting machine such as a carborundurn saw or diamond core drill.

4. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated, or abandoned. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after bypassing and cutting.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.

2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3. Where removal of walls or partitions extends from one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.

4. Where patching occurs within a smooth painted surface, apply a primer and second coat over the patched area and extend the final coat over the entire unbroken area containing the patch.

5. Patch, repair, or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.04 CLEANING

A. General: Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Completely remove paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION

SECTION 01740

CLEANING

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes specifications for furnishing all labor, materials, equipment, and services, and performing all operations necessary for, and properly incidental to, cleanup during construction and final cleaning of the facilities and site prior to Acceptance by the Authority.

1.02 RELATED SECTIONS

A. [Division 16, Electrical], for conduit cleaning.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION

3.01 CLEANUP DURING CONSTRUCTION

A. Keep the entire Site in a neat and orderly condition at all times during construction. Conduct a general cleanup of the Site daily as a part of the Work. Provide general daily cleanup and disposal service for removal of waste and rubbish from the jobsite. Clean material as necessary prior to incorporating into the Work.

B. Dispose and recycle waste, trash, and debris in a safe, acceptable manner, in accordance with applicable laws and ordinances and as prescribed by Jurisdictional Authorities. Do not bury waste material and debris on the Site. Burning of trash and debris on the Site is prohibited.

C. Provide daily litter pickup within Project limits. Provide adequate number of trash receptacles for worker’s lunches, cigarette butts, and other miscellaneous garbage.

3.02 FINAL CLEANING OF FACILITIES

A. Prior to final inspection by the Contracting Officer Representative, and after all construction work is essentially complete, thoroughly clean facilities utilizing professional facility cleaners.

B. Items to be cleaned include, but are not limited to, all glass, doors, opening frames, grilles, trim, exposed non-ferrous metal surfaces, floor coverings, light fixtures and plates, plumbing fixtures and trim, and all finish surfaces throughout the construction.

C. Vacuum-clean where appropriate and remove all spots, smears, dust, debris, hand prints, and defacements of every sort, including those of vandals. Use commercial cleaning compounds where necessary.

D. Follow the recommendations of the manufacturers of the materials and items to be cleaned for all cleaning, polishing, and treatment such as waxing or sealing.

3.03 FINAL SITE CLEANUP

A. Prior to final inspection, thoroughly clean the entire Site so it is in a neat, acceptable condition. Remove from the entire Site all construction equipment and facilities, construction waste and unused materials, dunnage, loose rock and stones, excess earth, and debris of any description resulting from the Work.

B. Hose down and scrub clean where necessary all pavement and paved walks.

C. Thoroughly remove mortar droppings from concrete slabs and pavement. Hose down and scrub clean all concrete flatwork and exposed vertical surfaces of concrete and masonry. Clean all rail surfaces, special trackwork, track drains, handholes, and manholes.

D. All drainage systems shall be free and clear. All drainage systems and sewers shall be pressure cleaned and inspected, and all catch basins and sumps shall be cleaned.

E. All conduits shall be cleaned and openings protected as specified in [Division 16, Electrical].

F. All spare material shall be delivered to the Authority.

END OF SECTION

SECTION 01775

CLOSEOUT

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes specifications for performing all operations necessary for and incidental to closing out a Contract and assisting in the Authority's final inspection.

B. This Section includes procedures for closeout submittals including the following:

1. Operation and maintenance manuals;
2. As-Built Drawings and Specifications;
3. Spare parts list, delivery information, and distribution of spare parts;
4. Training manuals, lesson plans, and student's training manuals and electronic media of such, as applicable;
5. Survey record log;
6. Correspondence file;
7. Releases;
8. Vouchers;
9. Records for design (if provided by Contractor), inspection, testing and other quality elements;
10. Request for final payment;
11. Certifications, affidavits, and warranties and guarantees; and
12. Correction of deficiencies submittals as applicable

C. This Section establishes required actions by the Contractor for facility systems and subsystems commissioning that include the preparation of an asset database, the preparation of preventive maintenance instructions, and labeling and packaging of spare parts.

1.02 CLOSEOUT SCHEDULE AND PROCEDURE

A. Changes from Original Conditions:

1. Upon completion of the Work and prior to Substantial Completion, the Contractor shall examine each property to determine changes from the original conditions established by the preconstruction inspection, and Section 01711, ACCEPTANCE OF CONDITIONS, and shall furnish a written description to the

Contracting Officer Representative of measures taken to correct damage that may have resulted from performance of this Contract, and shall obtain a written release from each owner accepting condition of the building or structure, corrections, or both, thereby relinquishing any claim against the Contractor. In the event any owner refuses to furnish a release of claims, the Contractor shall notify the Contracting Officer Representative in writing.

2. The Authority will not assume responsibility for alleged damages arising from the Work performed under this Contract.

B. Requirements Preparatory to Final Inspection by the Authority:

1. Notify the Contracting Officer Representative to perform a preliminary final inspection for the purpose of determining the state of completion of the Work. Notify the Contracting Officer Representative at least 14 Days in advance of requested inspection. The Contracting Officer Representative will perform the inspection within 3 working days of the requested date. From the information gathered from this inspection, the Contracting Officer Representative will prepare a Punch List of work to be performed, corrected, or completed before the Work will be accepted. All work on the Punch List shall be completed by the Contractor prior to final inspection.

2. Temporary facilities, except as may be required during Punch List work, shall be removed from the Site.

3. Clean the Site and all applicable appurtenances and improvements as specified in Section 01740, CLEANING.

4. Properly mount operating instructions for equipment and post as specified or required.

C. Final Inspection by the Authority:

1. After all requirements preparatory to the final inspection have been completed as hereinbefore specified, notify the Contracting Officer Representative to perform the final inspection. Notice shall be given at least 14 Days in advance of the time the Work will be available for final inspection. The Contracting Officer Representative will perform the inspection within 3 working days of the requested date.

2. Contractor or its principal superintendent, authorized to act on behalf of the Contractor, shall accompany the Contracting Officer Representative on the final inspection, as well as any principal Subcontractors that the Contracting Officer Representative may request to be present.

3. If the Work has been completed in accordance with the Contract Documents, and no further corrective measures are required, the Contracting Officer Representative will accept the Work and will issue a Certificate of Completion as evidence of acceptance.

4. If the Work has been substantially completed in accordance with the Contract Documents, and the Work can be used for its intended purpose with only minor corrective measures required, the Contracting Officer Representative will conditionally accept the Work and will issue a Certificate of Substantial Completion based upon the Contractor's assurance that corrective measures will be completed within the shortest practicable time. A fixed schedule for such corrective measures shall be submitted to the Contracting Officer Representative for approval.

5. If the Work has not been substantially completed in accordance with the Contract Documents, and several or many corrective measures are still required, the Contracting Officer Representative will not issue a Certificate of Substantial Completion. Instead, a new Punch List will be prepared based on the information gathered from the final inspection, and the Contractor will be required to complete this work and then call for another final inspection, following the procedure outlined above.

D. Asset Database:

1. Prepare a database listing each system and subsystem asset with attribute data to include asset name, asset location, manufacturer name and contact information, model number, serial number, expected useful life, warranty period with start and end date, digital link to warranty documentation, digital link to Operation and Maintenance Manual, spare parts provided for the asset, and special tools required to perform asset maintenance.

2. Sample asset tables are attached at the end of this Section for the Contractor's guidance in preparing the asset database.

E. Preventive Maintenance Instructions:

1. Prepare preventive maintenance instructions for each asset, including asset name, asset location, manufacturer name, model number, serial number, maintenance instructions for each asset and each scheduled maintenance based on requirements of the associated Operations and Maintenance Manual, and identification of special test equipment required to test the asset subsequent to performing maintenance.

2. A sample preventive maintenance instruction is attached at the end of this Section for the Contractor's guidance in preparing the preventive maintenance instructions.

1.03 SUBMITTALS

A. Make all submittals in accordance with Section 01330, SUBMITTAL PROCEDURES, and as specified below.

B. Operation and Maintenance:

1. Furnish manuals for equipment and systems as required by the Contract Documents.

2. Data copy included from standard catalogs shall be edited to reflect only conditions pertinent to this Contract.

3. Data copy shall be suitable for dry-copy reproduction on standard office copy machines.

4. Hard copy manuals shall be prepared using the following materials:

   a. Binder:

      (1) One of following:

         (a) Loose-leaf; three-ring with elliptical rings; stiff cover with covering resistant to oil, water, and wear; reinforced hinges; label holder on spine; mechanical device to open, close and lock rings; and sheet lifters. Size for 8-1/2-inch by 11-inch paper, 3-inch maximum capacity.

         (b) Loose-leaf three-post binder conforming to FS UU-B-320, Type II, Class 2, with covering resistant to oil, water, and wear; label holder on spine; size for 8-1/2-inch by 11-inch paper; capacity as required, 4-inch maximum thickness.

      (2) When the assembled data exceeds the capacity of one binder, provide additional binders as necessary.

   b. Pages:

      (1) Originals: White, 60-pound bond with plastic-reinforced binding edge.

      (2) Catalog data: Offset-printed copy on white paper, with plastic-reinforced edge.

      (3) Standard: 8-1/2 inches by 11 inches.

      (4) Fold-out: 11 inches by 8-1/2 inches for binding portion of page plus 7-1/2 inches for each additional portion of folded page; title and page number visible without unfolding. Provide a filler at the binding edge of fold-out pages, equal in thickness to the folded portion.

      (5) Holes punched for standard three-ring binder.

      (6) Consecutively numbered.

5. Electronic Copies shall accompany the paper copies of all submittals of all manuals. These electronic copies shall be submitted in an editable, non-copyrighted Microsoft Office format. There shall be two electronic copies per submitted manual delivered one each to the programs office and to the applicable training department.

6. Manuals shall include the following data:

   a. Table of contents.

b. Design-Builder's name, address and telephone number, with similar data for its 24-hour service organization.

c. Manufacturer's name, address and telephone number, with similar data for its local representative, distributor, and service agency.

d. Catalog, model, and serial number of equipment installed. Include WMATA unit numbers where applicable.

e. Description of equipment.

f. Detailed Theory of Operation of each system and subsystem to Lowest Repairable Unit (LRU)

g. Troubleshooting and Diagnostic Procedures for each piece of equipment delivered to LRU

h. Block Diagrams and Schematics of equipment as installed

i. Software administrative procedures for data input, failure diagnosis and system restoration

j. Statement of warranty as specified.

k. Description of modification, servicing and repairs performed prior to start of warranty.

l. Dates warranty begins and expires.

m. Standard starting, stopping and operating procedures.

n. Emergency and special operating procedures.

o. Routine maintenance procedures.

p. Servicing and lubrication schedule.

q. Manufacturer's printed operating and maintenance instructions, manufacturer's parts list, illustrations, and diagrams.

r. One copy of each wiring diagram.

s. List of spare parts, prices and recommended stock quantities for routine maintenance of the equipment for 1 year and list of spare parts that are considered critical and for which extended time frames for acquisition would create undesirable down-time for equipment.

t. List of special tools required to perform inspection, adjustment, maintenance, and repair. Special tools are those developed to perform a unique function related to the particular equipment and not available from commercial sources.

u. Copy of each approved Shop Drawing of equipment and system. Include drawings, which show outline dimensions, weights, and assembly data. Do not include drawings, which show manufacturing details.

7. Manuals submittal schedule:

a. Four copies of sample formats and outlines of contents in draft form 120 Days prior to the time scheduled for operation inspection, testing, or acceptance of the equipment.

b. Four copies of complete manual in final form 45 Days prior to the time scheduled for operation inspection, testing, or acceptance of the equipment.

c. Four bound sets and electronic media of approved manual before the time scheduled for operation inspection, testing, or acceptance of the equipment.

(1) Electronic copy files shall be in latest version of Adobe (.PDF) file format. Files shall be submitted in accordance with Section 01330, SUBMITTAL PROCEDURES.

(2) Shop Drawings submitted with manuals shall be in AutoCAD (.DWG) file format. Line work shall be shown on designated layers in accordance with standard CAD layering guidelines as specified in the WMATA CAD Manual. Images shall be clear, sharp, and readily legible.

(3) The Authority reserves the right to have any images, illustrations, diagrams, and drawings resubmitted until the Contracting Officer Representative approves their legibility.

d. In addition to the other requirements of this Section, if manufacturer's hardcopy illustrations, diagrams, and drawings are also used in the preparation of Operation and Maintenance manual illustrations, diagrams, and drawings, they shall also be furnished in Adobe (.PDF) file formats.

8. If operation and maintenance training is included in the Contract, provide to each trainee, hard and electronic copies of approved operation and maintenance manuals for this purpose as specified in Section 01820, DEMONSTRATION AND TRAINING.

C. As-Built Drawings and Specifications:

1. General:

a. As-Built Drawings shall include Shop Drawings, Working Drawings, and field prepared drawings.

b. Maintain a hard copy drawing and specification record of as-built conditions on a set of Contract Documents as the Work progresses. The Contract Documents shall be kept current with all Modifications issued by the Authority. The hard copy drawing and specification record shall be maintained at the Contractor's field office. Periodic review of the

completeness of the hard copy record will be conducted by the Authority as deemed necessary to ensure the record is kept up to date.

2. As-Built Drawings:

   a. Draft Deliverable: Submit to the Authority, for review and comment, separate sets of draft As-Built Drawings in both an AutoCAD (.DWG) file format and an Adobe (.PDF) file format (.PDF files shall be capable of printing full-size drawings.), in print quality black and white, with all fonts embedded. The latest versions of both file formats shall be used. All line work shall be shown in accordance with the WMATA CAD Manual. Images shall be clear, sharp, and readily legible. The Authority reserves the right to have drawing(s) resubmitted until the Contracting Officer Representative accepts the legibility of the drawing contained in the file. In addition, submit one set of full-size and two sets of half-size black ink on white paper copies of draft As-Built Drawings for review and comment by the Authority in accordance with Section 01330, SUBMITTAL PROCEDURES.

   b. Upon return of one set of full-size black ink on white paper copy of the draft As-Built Drawings with Authority comments, incorporate additions and corrections resulting from Authority review comments. Contractor shall direct specific attention, by annotation on resubmitted As-Built Drawings, to revisions other than the corrections requested by the Contracting Officer Representative on previous submittals.

   c. Final Deliverable: By the date scheduled for receipt of final approved As-Built Drawing deliverables in the Contract Schedule, separate sets of As-Built Drawings in both an AutoCAD (.DWG) file format and an Adobe (.PDF) file format, in print quality black and white, with all fonts embedded. Submit one set of full-size and two sets of half-size black ink on white paper copies, produced from the Adobe file, to the Contracting Officer Representative for review and Approval. If this submittal is found to be incomplete it will be returned to the Contractor with comments for re-submittal.

   d. The completed As-Built Drawings do not require the signature of the Engineer or Architect of Record. Each completed As-Built Drawing produced in Adobe (.PDF) electronic format shall have the signature of an officer of the Contractor's organization, certifying compliance with as-built conditions, using a stamp as follows:

AS-BUILT

I CERTIFY THAT THIS DRAWING
ACCURATELY DEPICTS THE WORK
CONSTRUCTED AS OF

_____
(date)

_____
(an officer of the Contractor)

_____
Contractor's Name

3. As-Built Specifications:

   a. By the date scheduled for receipt of final approved As-Built Specification deliverables in the Contract Schedule, submit As-Built Specifications in both latest version of MSWord (.DOCX) file format with tracked changes and an Adobe (.PDF) file format, in print quality black and white. Submit two bound sets of black ink on white paper copies produced from the Adobe (.PDF) format to the Contracting Officer Representative for review and acceptance in accordance with Section 01330, SUBMITTAL PROCEDURES.

D. As-Built Project Schedule:

   1. Submit one electronic copy of the approved As-Built Project Schedule as required.

E. Spare Parts:

   1. This Contract includes the requirement for spare parts, either specifically identified in the price schedule or to be identified later during the term of the Contract. Ensure that all spare parts required by this Contract are provided and delivered in accordance with the following paragraphs.

   2. Submit to the Authority the one electronic copy of the list of required spare parts specifically identified in the Contract Documents. The list provided by the Contractor shall include part name, model number, part number, serial number, stock number, component name, location for use, manufacturer's name and contact information, unit cost, quantity, available packaging, special storage and handling instructions, replacement schedule, and anticipated annual usage. In addition, the spare parts listing shall include the following additional information as appropriate:

      a. Group the list by system and subsystem for inventory system identification. Include order and procurement information for subassemblies and components.

      b. Correlate the required quantities with the reliability requirements and lead time considering the following classifications:

         (1) Wear: Components which may be expected to require regular replacement under normal maintenance schedule and operations, such as mechanical parts subject to continuous operation within projected mean time between failure levels.

         (2) Consumables or expendables: Components which are consumed, used up, destroyed, or upon failure, are otherwise made unusable for their

intended purpose and are economically unrecoverable except for inherent scrap value.

(3) Recoverable or repairable: Components, which upon failure are capable of being repaired or remanufactured to a serviceable, operational condition and maintained available for use within their initial intended purpose. Such items shall be accounted for via appropriate asset records.

(4) Long lead: Components, which are not available on short notice from commercial distributors or within 48 hours from the manufacturer, such as specially made or selected components.

(5) Cross referencing: Where replacement components are common to more than one system or subsystem, include a cross reference and indexing system in the replacement components list.

(6) Non-unique parts: In all components lists, items which are not unique to the system and have been manufactured by others shall be identified by the manufacturer's name and part number, as well as by the Contractor's component number, if any.

3. Within 30 Days after the Contractor submits the required spare parts listing, the Authority will provide the Contractor with shipping instructions and with WMATA stock numbers for each item the Contractor is required to furnish. Spare parts shall be packaged such that parts for a particular asset or a particular facility are grouped together. The Contractor shall ship, within a 25-mile radius of the Project, the required parts to the designated points specified by the Authority and shall include the Contract number, manufacturer part number, quantity, unit price, and WMATA part number on the shipping document.

4. The identification of the individual manufacturer's part numbers shall be cross referenced to the assigned WMATA stock numbers by including a column with appropriate heading adjacent to the manufacturer's part numbers in any parts manual or listing provided in accordance with Article 1.03E.2 above.

5. Parts furnished in accordance with this provision shall not be used to satisfy replacement needs under any warranty provision of this Contract.

6. Spare parts shall be the same in all respects as their counterparts furnished as part of the assembled equipment to be delivered under the terms of this Contract.

7. Unless otherwise specified in this Contract, the spare parts shall be delivered at the same time as the counterpart equipment delivery. The spare parts shall be properly packaged or crated so as to prevent damage during shipment and long-term storage. The spare parts shall be labeled in accordance with the instructions contained in Article 1.03E.3 above.

F. Asset Database as described above.

G. Preventive Maintenance Instructions as described above.

H. Survey Field Notes in accordance with Section 01330, SUBMITTAL PROCEDURES:

1. As applicable, submit electronic media of the following as specified in Section 01721, LAYOUT OF WORK AND FIELD ENGINEERING:

a. Survey Record Log.

I. Releases and Vouchers:

1. As applicable, submit one original hard copy and electronic media, in Adobe (.PDF) file format, of releases and vouchers.

J. Records for Inspection, Testing, and Other Quality Elements:

1. Submit one original hard copy and electronic media, in Adobe (.PDF) file format, of records for inspection, testing or other quality elements as more fully specified in Section 01470, QUALITY MANAGEMENT SYSTEM.

K. Request for Final Payment:

1. Submit one original hard copy and electronic media, in Adobe (.PDF) file format, of final payment request. Final Settlement will be made in accordance with Section 00744, METHOD OF PAYMENT.

L. Correction of Deficiencies Submittals:

1. As applicable, submit original hard copy and electronic media, in Adobe (.PDF) file format, of Schedule of Deficiency Corrections, Recommendation for Corrective Actions, together with supporting information, Data and Reports applicable to any correction, and a Technical and Cost Proposal to amend the Contract to permit acceptance of the affected materials, equipment, systems, or subsystems as specified in Section 00758, CORRECTION OF DEFICIENCIES.

M. Certifications, Affidavits, and Warranties and Guarantees:

1. Required Affidavits, Certificates, Written Descriptions and Releases and Warranties and Guarantees provided by the Contractor; i.e., Certificates of Acceptance and Compliance, Certification that all facilities were constructed in conformance with ADAAG regulations (Form attached at end of Section), of System Safety and Security, of Substantial Completion, and of Final Payment; Written Description of measures taken to correct damage that may have resulted from performance of this Contract; Written Releases; Contractor's executed Affidavit of Payment of All Applicable Taxes and License Fees in connection with the Contract and Affidavit of Payment of Debts and Claims; Consent of Surety Company to Final Payment; Warranties and Guarantees as specified in Section 00757, WARRANTY/GUARANTEE OF CONSTRUCTION, and Section 00758, CORRECTION OF DEFICIENCIES, and various Sections of the Contract Specifications as applicable: Submit the original hard copy and one electronic copy in Adobe (.PDF) file format.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION (not used)

END OF SECTION

SECTION 01820

DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the general requirements for operation and maintenance training for equipment and systems provided by the Contractor and the general requirements for a Project performance demonstration.

1.02 DEFINITIONS

A. Acronyms used in this specification have the following definitions:

1. TSMT – Technical Skills and Maintenance Training
2. ROQT – Rail Operations Quality Training
3. TTDC – Technical Training Document Control

1.03 SUBMITTALS

A. Submit in accordance with Section 01330, SUBMITTAL PROCEDURES, the following at the times stated:

1. Training plan preliminary submittal: One electronic copy and one printed paper copy not later than 60 Days after commencement of construction work. Submittal shall include at a minimum:

   a. Instructional outline: A complete, accurate, and detailed listing of topics to be addressed in the instructional program using the specified content list.

   b. Specimens of instructional material to be used

   c. Descriptions of audio-visual material and equipment to be used

2. Training plan intermediate submittal: One electronic copy and one printed paper copy not later than 60 Days after approval of preliminary submittal.

   a. All material submitted for preliminary submittal incorporating or resolving comments.

   b. Complete instructional plans including audio-visual aids and descriptions of instructional techniques and procedures.

3. Training plan final submittal: One electronic copy and one printed paper copy not later than 30 Days prior to scheduled date for operation inspection, testing, or acceptance of the equipment.

a. All material submitted for intermediate submittal incorporating or resolving comments.

4. Training contract closeout submittal: As specified in Section 01775, CLOSEOUT.

5. Training instructor's qualifications.

6. A complete set of all training manuals, handouts, aides and presentations, for instructor and student, shall be provided at the end of the vendor's first training class to each of the audience's training groups (two sets when there are two supporting training groups, etc.) in an approved, editable electronic format, and free from copyright restrictions.

7. Printed copies of each student guide and student-learning materials (schematics, books of plans, etc., as determined useful) shall be prepared and bound by equipment's training provider. Provide one printed copy for each student to use during training and to keep after class completion

8. Printed copies of the instructor's guide, student guide, presentation, and all supplemental training materials for each of the audience group's training instructors (not to exceed five copies), free from copyright restrictions, shall be provided at the end of the first vendor training session.

9. Performance demonstration plan and procedures: submit for Approval as part of the final design review package but no later than 90 Days prior to first performance demonstration.

1.04 OPERATION AND MAINTENANCE TRAINING

A. General:

1. Where specified, develop and conduct a program to train selected Authority personnel in the operation and maintenance of equipment and systems furnished.

2. Furnish instructors, instructional materials, and audio-visual aids and equipment.

3. The Authority will furnish physical facilities.

B. Operations training:

1. Operations training shall be tailored specifically to the WMATA equipment being purchased and training shall be designed to teach all trainees the functional use of all of the major modes of equipment operation.

2. The training shall be sufficient in quality and scope to bring personnel to a level of operating proficiency such that vendor support is not needed during routine equipment operation in any mode or capacity.

C. Maintenance training:

1. Maintenance training shall be tailored specifically to the WMATA equipment being purchased and shall be designed to develop the knowledge and skills required to maintain and repair all item(s) delivered under the Contract. Maintenance training shall address the detailed theory of operation, maintenance, testing, repair, overhaul, replacement, alignment, and troubleshooting of the delivered equipment (hardware and software).

D. Other Training:

1. Any other training (as determined by WMATA) necessary to support the safe operation, use, or maintenance of the equipment.

E. Training Plan:

1. Training plan shall contain an organized summary of the events, and associated times, necessary for the completion of all materials necessary to successfully perform the required training. The plan shall be submitted to the applicable end user's training group(s) (TTDC, TSMT, or ROQT currently) within a Contract specified period after NTP has been issued. The training plan must address all deliverables using a timeline that includes periods for review, feedback, resubmission, approval, and delivery accomplishing all by a Contract-determined date related to the equipment being placed into service. The training plan shall include the following:

   a. Course list including course title, duration, audience, audience size, and purpose

   b. Instructor qualifications: A description of the instructor's qualifications for each class must be submitted to the end user's training group(s) (TTDC, TSMT, or ROQT currently) for approval as part of the training plan. The description (resumé, curriculum vitae, or other description of instructional qualifications) shall document a thorough knowledge of the subject equipment, an understanding of the adult learning process, and demonstrated experience in vocational instruction.

   c. Audience qualifications and prerequisites: For the purpose of course development and presentation, vendors shall assume all WMATA students are high school graduates (or equivalent)

   d. Instruction and testing methods to be utilized

   e. Summary of the strategies to be employed in the accomplishment of the training

   f. Proposed schedule of delivery of materials and training

F. Instructor's Guide:

1. The instructor's guide for each course shall contain all the information and direction necessary for the instructor to make an effective presentation. The instructor's guides shall include adequate guidelines to conduct a comprehensive

training program. Individual lessons within the course shall be organized as separate blocks (or modules), which may be taught as a unit. In some instances, the same standard operating procedures could be used for train operators, transportation supervisors, and central control supervisors. The instructor's guide shall contain, at a minimum:

a. Program overview stating the overall program goals

b. Training syllabus

c. Lesson plans arranged as a session by session outline containing the following:

(1) Overview of each lesson

(2) Outline of major topics to be covered including timelines for each course, lesson, and topic

(3) Outline of learning objectives for each major topic

(4) Information regarding important subjects and terms to be emphasized during each section of the training

(5) References to the associated Student Guide pages and presentation slides

d. Suggested instructional methods/learning activities

e. Required equipment or resources needed for effective instruction

f. Test question pool(s) with each question referenced to the respective learning objective(s) and student guide or other instructional materials

2. A guide (FAQ) providing questions/problems and answers as related to course content

G. Student's Guides:

1. Student guides for each course that shall contain all the information and direction necessary the student to interact effectively in the learning environment. The student guides shall be written in a fully developed prose format, developed in the same modular format as the instructor's guides. The student's guides should contain, at a minimum:

a. Program overview/introduction

b. Statement of overall program goals

c. All major topics to be covered

d. Student learning objectives associated with each of the major topics stated in quantifiable terms

e. All illustrations, block diagrams, charts, schematics, wiring diagrams, logic flow diagrams, troubleshooting guides, graphics, and visual aids that may be used during course presentation to enhance presentation content and provide a seamless facilitation of instruction

f. Supplemental materials that may be necessary to facilitate theoretical discussions

H. Training Presentations:

1. Training Presentations shall be matched to the instructor guides and student guides and shall facilitate seamless, effective communication of the course information to the target audience.

2. Training Presentation format(s) shall be agreed upon by the target audience's training group(s) (TTDC, TSMT, ROQT, currently).

I. Training Aides:

1. Depending upon the equipment or system(s), a functional mockup or a functional representation may be required. These may be in the form of animated illustrations, animated schematics, model(s) of the equipment, actual device(s), interactive video training, or any accepted media format as determined by the audience's training group.

2. All mockups become the property of audience's training group after completion of the final scheduled training class. Supplemental materials shall be demonstrated as fully operable during the first training class. All necessary repairs to the supplemental materials are the responsibility of the vendor for the duration of vendor training sessions.

J. OEM Operator's Manual(s) describing the equipment's or system's operation in each mode and capacity of use.

1. OEM Technical Manuals describing the detailed theory of operation, maintenance, testing, repair, overhaul, replacement, alignment, and troubleshooting shall be delivered to the appropriate training groups.

1.05 MATERIALS AND INSTRUCTION

A. Training materials shall be provided and approved by audience's training groups (TTDC, TSMT or ROQT) prior to the final acceptance of training schedule or training date(s).

B. Training materials updates are required when, in the scope of the Contract, changes or Modifications are made that affect the operation or maintenance of the contracted item(s).

C. Instruction shall include material covered in the operation and maintenance manuals as well as the following:

1. Detailed theory of operation to one level below Lowest Repairable Unit (LRU)
2. Practical aspects of operation
3. Description of system, equipment, and components
4. Functional characteristics of system, equipment, and components
5. Emergency operating procedures
6. Location, removal, and reinstallation of components
7. Maintenance procedures
8. Servicing intervals and schedules
9. Block diagrams of equipment hardware and software functionality as installed
10. Schematics of equipment hardware as installed
11. Diagnosis and problem solving (troubleshooting)
12. Repair
13. Overhaul

D. Daily class duration shall be a nominal 7-1/2-hour shift, with advantageous combinations of theoretical/classroom instruction and hands-on practice, utilizing operational equipment, presentations, mockups, and test equipment as applicable. For on-the-job training (OJT) at work locations as applicable, training shall include participation in installation activities, fault diagnosis, and equipment alignment/adjustment exercises.

E. Operating and maintenance training shall be completed prior to the time scheduled for operation inspection, testing, or acceptance of the equipment. In addition to the retainage specified in Section 00744, METHOD OF PAYMENT, payment will be withheld until training is complete and accepted.

F. Furnish to applicable training group, a minimum of four O&M Manuals as described in Section 01775, CLOSEOUT, for each piece of equipment and system, unless otherwise specified, and a minimum of one editable, non-copyrighted electronic copy in a Microsoft Office format, as specified.

1.06 PROJECT PERFORMANCE DEMONSTRATION

A. Integrated system testing shall culminate in a project performance demonstration that shall simulate all operations and shall exercise all systems and system elements. Prepare performance demonstration plan and procedures. Include testing of anticipated normal and abnormal operations, in addition to simulations of emergency operations. Performance demonstration plan shall delineate the following:

1. Tests to be performed
2. Date and time when each test is to be performed
3. An outline of the test parameters
4. Pass/fail criteria, which must be quantified and measurable

B. The project performance demonstration shall include those static and dynamic tests used to demonstrate that the Design-Builder designed the systems and subsystems according to the specification and the performance specified, and shall include:

1. All necessary functional and performance testing conducted during construction and manufacture of the system elements; and
2. Operational tests, which include integrated testing of system interfaces to assure that the Project as a whole is capable of operating as specified.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION (not used)

END OF SECTION

SECTION 02250

SHORING

PART 1 GENERAL

1.01 SUMMARY

A. This work shall consist of providing the necessary labor, materials, equipment and supervision for the installation of shoring to support structural elements during execution of the work, as shown in the Contract Drawing.

1.02 SUBMITTALS

A. Contractor shall submit shop drawings for the temporary shoring shown in the Contract Drawings

B. Temporary Shoring Plans: Temporary shoring plans shall be submitted with design calculations and supporting data for review and approval by the AR and Quality Control Engineer. Shop drawings and calculations shall be sealed by a Professional Engineer, licensed in the Commonwealth of Virginia for the Vienna North and West Falls Church Garages and State of Maryland for the New Carrollton, Largo Town Center North & South and White Flint Garages. Shop drawings shall include all details and components required to construct the temporary shoring, design loadings, specifications, required inspection and testing, material specifications and procedures for erection.

PART 2 PRODUCTS

2.01 MATERIALS

A. The Contractor shall submit copies of product literature showing capacities and installation details for all shoring equipment.

B. Previously used materials may be used if approved by the AR. All previously used materials shall be designed with appropriate increase in factor of safety or decreased in design capacity to compensate for previous damage. The Contractor's Professional Engineer shall inspect and certify that previously used materials meet the requirements of the working drawings.

PART 3 EXECUTION

3.01 SHORING INSTALLATION

A. Shoring shall be installed in accordance with the we did not produce shoring drawings or the shop drawing submittals produced under Section 3.2. The shoring design in the Contract Drawings assumes a construction live load of 50 psf. If construction equipment, construction sequence, or Contractor means and methods produce a construction live load in excess of 50 psf, shoring shall be designed by the Contractor

under Section 3.02. No demolition shall proceed prior to review and approval of the shoring installation by the Quality Control Engineer and the AR.

3.02 SHORING DESIGN REQUIREMENTS – TEMPORARY SHORING SYSTEMS

A. Design of Shoring components shall conform to accepted engineering practice. The minimum construction live load shall be 50 psf. Higher construction live loads shall be used if warranted by construction equipment, sequence, means and/or methods. If multiple level shoring is required, it shall be supplied and installed at no additional cost to the Authority. The work area size shall be adjusted as required so as not to exceed the maximum number of parking spaces which can be taken out of service at any one time as indicated in the Contract Drawings.

B. Design calculations shall be included for portions of the existing structure that will either directly or indirectly support the temporary shoring. As-built dimensions, materials, and conditions shall be based on the original plans and field verification by Contractor.

C. If the temporary shoring is to be directly supported by the existing structure, connections shall be made by direct bearing or the use of suitable anchors. If mechanical anchors (wedge anchors, sleeve anchors, expansion shields, or similar proprietary anchors) or adhesive or epoxy resin anchors are used in the shoring, installation of the anchors shall be monitored by the Quality Control Engineer. Inspection instructions shall be included in the submittal.

D. Special Shoring: Special shoring required to support demolition equipment loads shall also be designed and submitted in accordance with this section.

E. The Designer of the Alternate shoring system shall attend a site meeting to be attended by the AR, Quality Control Engineer and Contractor to review the alternate shoring system requirements with the parties.

3.03 SHORING INSTALLATION CERTIFICATION – TEMPORARY SHORING SYSTEMS

A. A Professional Engineer registered in the Commonwealth of Virginia and State of Maryland shall be retained by the Contractor and shall inspect the alternate shoring systems during and after installation in each work area or phase of construction and shall submit a written certification that the shoring has been installed in accordance with the approved shop drawings. If the shoring system is to be modified at various phases of the work, certification is required for each phase. No demolition shall proceed prior to review and approval of the certification by the AR.

3.04 ACCESS

A. Drive Lanes:
   1. Contractor shall provide warning devices, signs and guards for shoring components to protect shoring components from vehicle impact.

3.05 REMOVAL OF SHORING

A. Upon completion of the work, the Contractor shall remove all shoring materials from Authority property. Shoring may be removed when field cured concrete test specimens reach a compressive strength of 4000 psi. Concrete shall be tested in accordance with Specifications Section 03010 as applicable.

B. Anchor bolts and/or other connections to existing components shall be removed and all holes repaired in accordance with Section 03010.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 02410

SELECTIVE DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

A. The work shall consist of providing the necessary labor, materials, equipment and supervision for demolition and removal of selected portions of prestressed concrete parking structure.

1.02 RELATED SECTIONS

A. Section 01100 – Summary of Work

1.03 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Reinstall: Remove items as indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.

C. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the AR, items may be removed to an off-site, protected storage location, during selective demolition and then cleaned and reinstalled in their original locations.

1.04 MATERIALS

A. Except for items or materials indicated to be reused, reinstalled, or otherwise indicated to remain the Authority's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor’s option.

1.05 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Specifications Sections, unless otherwise indicated.

B. Proposed dust-control measures.

C. Proposed sediment, wastewater treatment, and debris control measures.

D. Proposed maintenance of traffic controls.

E. Proposed method of identifying and marking prestressing tendons.

F. Proposed shoring plans.

G. Proposed noise-control measures.

H. Schedule of selective demolition activities indicating the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
   2. Interruption of utility services.
   3. Coordination for shutoff, capping, and continuation of utility services.
   4. Use of elevator and stairs.
   5. Detailed sequence of selective demolition and removal work to ensure uninterrupted progress of Authority's on-site operations.
   6. Coordination of Authority's continuing occupancy of portions of existing building.
   7. Locations of temporary partitions and means of egress.
   8. Public safety.
   9. Inventory of items to be removed and stored.

1.06 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Pre-demolition Conference: Conduct conference at project site to comply with pre-installation conference requirements. The AR and Quality Control Engineer shall be present at all pre-demolition conferences and shall be solely responsible for granting the Contractor approval to begin demolition.

D. Standards: Comply with ANSI A10.6 and NFPA 241.

1.07 PROJECT CONDITIONS

A. Property immediately adjacent to selective demolition areas is occupied by others. Conduct selective demolition so Authority's operations will not be disrupted. Provide not less than 72 hours notice to Authority's of activities that will affect the operations.
   1. Comply with requirements specified in Division 01 Section 01110 "Summary of Work".

B. The Authority assumes no responsibility for actual condition of components to be selectively demolished.
   1. Conditions existing at time of inspection for bidding purposes will be maintained by Authority as far as practical.

2. Asbestos: it is not expected that asbestos will be encountered in the work. If any materials suspected of containing asbestos are encountered, do not disturb the materials. Immediately notify the AR.
   a. Asbestos will be removed by the Authority.
3. Lead: it is not expected that lead will be encountered in the work. If any materials suspected of containing lead are encountered, do not disturb the materials. Immediately notify the AR.
   a. Lead will be removed by the Authority.

C. Protection of the Prestressed Members: The existing structural double tees and beams at all garage levels are prestressed and contain bonded prestressed tendons. Extreme caution shall be used when any drilling, cutting, chipping or coring is to be performed by the Contractor. All such activities shall be cleared by the ground penetrating radar or X-ray. The Contractor shall be responsible for repair of prestressed tendons damaged by the Contractor's negligence.

D. Storage or sale of removed items or materials on-site will not be permitted.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

1.08 SCHEDULING

A. Arrange selective demolition schedule so as not to interfere with Authority's on-site operations.

1.09 WARRANTY

A. Existing Special Warranty: Remove, replace, patch and repair materials and surfaces cut, marred or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

B. Authority shall provide a list of existing warranties held on components that may be affected by selective demolition.

PART 2 PRODUCTS

2.01 REPAIR MATERIALS

A. Use repair materials identical to existing materials.
   1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
   2. Use materials whose installed performance equal or surpass that of existing materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that utilities have been temporarily supported or moved, disconnected and/or capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to the AR.

E. Survey the condition of the garage structure to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.

F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.02 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain in service and protect them against damage during selective demolition operations.
   1. Do not interrupt existing utilities serving occupied or operating facilities, expect when authorized in writing by the Authority. Provide temporary services during interruptions to existing utilities, as acceptable to Authority and to governing authorities.
   2. Provide not less than 72 hours notice to Authority if shutdown of service is required during changeover.

B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services installed in or attached to components of the structures to be selectively demolished.
   1. Authority will arrange to shut off indicated utilities when required and requested by Contractor.
   2. Arrange to shut off indicated utility companies.
   3. Where utility services are required to be removed, relocated, or abandoned, provide bypass connectors to maintain continuity of service before proceeding with selective demolition.

C. Utility Requirements: See AR for temporary support, shutting off, disconnecting, removing and sealing or capping utility services. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.03 PREPARATION

A. The Contractor shall be responsible for maintaining the garage drainage system, including drains, pipes, sumps, and pumps, open and functioning properly at all times. Prior to the start of demolition the Contractor shall clean all existing drains and snake drain lines to assure function. The Contractor shall flush or snake the system as often as necessary to comply with this requirement at no cost to the Authority. Upon completion of the project the Contractor shall clean all drains and snake drain lines to assure function.

B. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Authority and governmental authorities having jurisdiction.

C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of the public around selective demolition area.
   1. Erect temporary protection, such as walks, fences, overhead protection, shoring where required by authorities having jurisdiction.
   2. Protect existing finishes that are to remain and are exposed during selective demolition operations.
   3. Cover and protect components and equipment that have not been removed.
   4. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

D. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
   1. Strengthen or add new supports when required during progress of selective demolition.

3.04 POLLUTION CONTROLS

A. Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental protection regulations.
   1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

B. Remove, collect, and transport wastewater, sediment and construction debris in a manner that will prevent spillage on adjacent surfaces areas and waterways.

C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.05 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
   2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
   3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
   5. Maintain adequate ventilation when using cutting torches.
   6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
   7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
   8. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
   9. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.

B. Remove and dispose of existing concrete debris, concrete sediment, reinforcing steel and other removed components from the site.

3.06 PATCHING AND REPAIRS

A. Promptly patch and repair holes and damaged surfaces caused to adjacent construction by selective demolition operations.
   1. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
   2. Completely fill holes and depressions in existing concrete to remain with an approved patching material, applied according to manufacturer’s printed recommendations.

B. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.

3.07 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.08 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

B. Wash, rake or broom clean the work area, staging area, and areas adjacent and affected by the work on completion of selective demolition operation.

C. At the completion of the project, perform a complete wash down of the garage levels including floors, perimeter walls, columns, ceilings, stairwells and access roads.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 02420

SELECTIVE ELECTRICAL DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: The work specified in this Section consists of material for demolition, replacement and salvaging existing electrical systems, wiring, raceways, supports, equipment and minor repair of underlying structure.

B. Related Sections:
   1. Refer to Procurement Documents

1.02 REFERENCES

A. Reference Standards
   1. U. S. Government:
      a. Federal Transit Administration (FTA):
   2. 49 CFR 661 Buy America Requirements

B. National Fire Protection Association (NFPA):
   1. NFPA 70 National Electrical Code (NEC)

1.03 SUBMITTALS

A. Submit demolition plan.

1.04 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Buy America Act:
      a. Except for those products which are exempt under the specific statutory waivers stipulated in 49 CFR 661, all other products supplied under this Section must comply with the requirements of the Buy America Act.

1.05 COORDINATION AND SEQUENCING

A. Coordinate all power outages with Authority.

B. Perform demolition and replacement in a manner not to delay or interfere with other operations of work in the Project and operations of the Authority.

1.06 SCHEDULING

A. Schedule all work with the Authority through the Authority's designated representative. Start no work in an area until a schedule has been prepared, submitted and approved.

B. Coordinate the work schedule with the Authority, and other Contractors. Coordinate the work so not to interfere or conflict with the performance of work by the Authority and the Authority's tenants.

1.07 PROJECT/SITE CONDITIONS

A. Care shall be used so not to impede the ongoing work of any tenant.

B. Demolition and replacement work, as specified herein, is not intended to be performed as a wrecking operation but as work relative to the performance of the various construction operations of the Project.

C. Existing Conditions:
   1. Demolition information shown or otherwise indicated on the Drawings is based on visual field examination. While the information provided is believed to be correct, no assurance is implied relative to its total completeness or accuracy. The Contractor shall report discrepancies to the Construction Manager for disposition of the Authority before disturbing existing installations.
   2. The Contractor hereby distinctly agrees that the Construction Manager, the Engineer, nor the Authority is responsible for the correctness or sufficiency of the information given and after his own Site Investigation:
      a. That he must have no claim for delay or extra compensation or damage on account of the information given; and
      b. That he must have no claim for relief from any obligation or responsibility under the Contract with respect to the above stated stipulations.

D. Protection: Exercise care during demolition work to confine demolition operations to the areas as indicated on the Drawings. The physical means and methods used for protection are at the Contractor's option. However, the Contractor will be completely responsible for replacement and restitution work, of whatever nature, at no expense to the Authority.
   1. Additionally, if public safety is endangered during the progress of the demolition work, provide adequate protective measures to protect public pedestrian and vehicular traffic on streets and walkways.
   2. Signs, signals and barricades shall conform to the requirements of Federal, State and local laws, rules, regulations, precautions, orders and decrees.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Basic Electrical Materials: Those products such as conduit, raceway, wire and cable, support devices, fasteners, and control devices as required for work of this Section are specified in other Sections.

B. Equipment along with machinery and apparatus, motorized or otherwise, used to perform the demolition may be chosen at the Contractor's discretion. However, the chosen equipment shall perform the work within the limits of the Contract requirements.

C. Patching Materials: Patching materials shall match, as nearly as practical, the existing material for each surface being patched.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify that measurements and existing circuiting arrangements are as shown on Drawings.

B. Equipment, machinery and apparatus, motorized or otherwise, used to perform the demolition work may be used as chosen at the Contractor's discretion, but which will perform the work within the limits of the Contract requirements.

C. Verify that abandoned wiring and electrical equipment serve only the abandoned facility.

3.02 DEMOLITION

A. General: The means and methods of performing electrical demolition and removal operations are the sole responsibility of the Contractor except as otherwise specified. Use equipment and methods that do not damage items to remain or salvaged and areas adjacent to demolition operations. Use methods that do not interfere with Authority's operations and which do not cause excessive dust. Remove debris as it accumulates.

B. Equipment used, and methods of demolition and removal will be subject to approval of the Construction Manager and the Authority.

C. System De-activation: Prior to demolition and removal work, de-activate existing electrical systems.

D. Use means and methods for permanent disconnection, which render the remaining electrical systems and apparatus in conformity with NFPA 70.

E. Coordinate electrical power outages with requirements in Section 26 05 00.

F. Cutting: Perform cutting work of existing structure materials by such methods as will prevent extensive damage beyond the immediate area of cutting.

G. Debris Removal: Dispose of demolition debris off site in a lawful manner. Containerize or otherwise store debris as work is in progress.

H. Patching: After demolition and removal work is performed patch the existing structure as required to match surrounding finish and appearance including the appropriate surface decoration.

I. Abandoned Electrical Equipment and Apparatus: Existing electrical equipment and apparatus in or on the structures not claimed as salvage by the Authority shall

become the property of the Contractor and may not be disposed of on the site but removed and disposed of in a lawful manner off-site.

J. Salvage: The Authority shall have the right to claim as salvage any items and materials removed under the work of this Section. Should such right of salvage be exercised by the Authority, move and neatly store removed items on the site in a location agreeable to the Authority and in a manner approved by the Authority.

END OF SECTION

SECTION 03010

MAINTENANCE OF CONCRETE

PART 1 GENERAL

1.01 SUMMARY:

A. Section Includes: The work specified in this section consists of repairs to portions of the existing concrete. Types of repair to be made include but are not limited to:
   1. Repair of surface spalls and cracks in existing concrete.
   2. Full depth double tee edge and deck repair
   3. Replacement of drainage downspout at locations of severe water infiltration.

B. Related work specified elsewhere:
   1. 5500 Metal Fabrications
   2. 07180 Traffic Bearing Membrane
   3. 07920 Joint Sealants
   4. 09970 Special Coatings for Steel
   5. 07190 Water Repellents
   6. 05100 Structural Metal Framing
   7. 03100 Concrete Formwork
   8. 03200 Concrete Reinforcement

1.02 REFERENCES:

A. ASTM International (ASTM):
   1. ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
   2. ASTM C109, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
   3. ASTM C267, Standard Test Methods for Chemical Resistance of Mortars, Grouts, and Monolithic Surfacings and Polymer Concretes.
   4. ASTM C348, Standard Test Method for Flexural Strength of Hydraulic Cement Mortars.
   5. ASTM C496, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
   6. ASTM C1202, Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration.
   7. ASTM D1042, Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.

B. Army Corps of Engineers (USACE):
   1. CRD C48, Standard Test Method for Water Permeability of Concrete

C. American Concrete Institute (ACI):
   1. ACI 301-10 Specifications for Structural Concrete.

1.03 SUBMITTALS:

A. Product Data: Submit manufacturer's descriptive product data and current specifications for materials proposed for the work of this section. Provide a certification stating that the repair materials meet the specified requirements.

1.04 QUALITY ASSURANCE:

A. Concrete Repair Product Manufacturer Qualifications: The manufacturer of the specified product shall have in existence, for a minimum of 10 years, a program of training, certifying, and technically supporting a nationally organized Approved Contractor Program with annual re-certification of its participants.

B. Contractor Qualifications: Contractor shall have at least five years of experience in concrete repair services. The Contractor shall also be an Approved Contractor of the manufacturer of the specified product, who has completed a program of instruction in the use of the specified material, and shall provide a notarized certification from the manufacturer attesting to their Approved Contractor status.
   1. Contractors shall provide the Engineer with two job references where they have successfully repaired existing concrete with the specified product.

C. Manufacturer's Representative Services: The Contractor shall arrange for and provide the services of the product manufacturer's technical representative to be on-site during the startup repair operation.
   1. Services shall include detailed instructions to the Contractor's personnel on the use of the concrete repair materials.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Delivery and Handling: Deliver the specified product in original, unopened containers with the manufacturer’s name, labels, product identification, and batch numbers.

B. Storage: Store the specified product as recommended by the manufacturer.

1.06 PROJECT CONDITIONS:

A. The Contractor shall inspect the existing concrete surfaces and confirm the locations, limits, and type of repairs required. Repairs of deteriorated concrete specified by types and quantities are listed on the Contract Drawings. The Contractor shall not perform any repair work without prior approval of the Engineer.

B. Reinforcement may be encountered within the repair region.

PART 2 PRODUCTS

2.01 EPOXY RESIN AND REPAIR MORTARS:

A. Gravity Crack Repair (Keynote 8): Low viscosity and high strength epoxy resin.

1. Conforms to ASTM C-881
2. Tensile Properties, ASTM D 638
   a. Tensile Strength at 7 days: 8500 psi minimum
3. Bond Strength, ASTM C-882
   a. Bond Strength at 2 days 4,000 psi minimum.
4. Compressive Strength: ASTM D-695
   a. Compressive Strength at 28 days: neat at 90 degrees 10,500 psi minimum.

5. Acceptable Manufacturer:
   a. Sika Corporation: Sikadur® 35, Hi-MOD, LV
   b. Approved Equal

B. Overhead Crack Repair (Keynote 7): Moisture-tolerant, high modulus and high strength epoxy resin.

1. Conforms to ASTM C-881
2. Tensile Properties, ASTM D 638
   a. Tensile Strength at 14 days: 4000 psi minimum
3. Bond Strength, ASTM C-882
   a. Bond Strength at 2 days 3,000 psi minimum for dry cure condition.
   b. Bond Strength at 2 days 2,500 psi minimum for moist cure condition.
4. Compressive Strength: ASTM D-695
   a. Compressive Strength at 1 day: 8,000 psi minimum at 73 degree F and 1,400 psi minimum at 40 degrees F.
   b. Compressive Strength at 7 days: 9000 psi minimum.
5. Acceptable Manufacturer:
   a. Sika Corporation: Sikadur® Injection Gel Epoxy or approved Equal

C. Polymer Repair Mortar:
1. Repair of Horizontal Surfaces (Keynote 5, 11, 14, 15 and 20) :
   a. Polymer-modified, cementitious, 2-component, free-flow self-leveling mortar such as SikaTop 111 Plus as manufactured by Sika Corporation or approved equal.
   b. Polymer-modified, cementitious, 2-component, trowel-grade patching mortar such as SikaTop 122 Plus as manufactured by Sika Corporation or approved equal.

c. Shrinkage properties: ASTM C 157 at 28 days

1) 1” x 1” x 11-1/4” shrinkage less than 0.05%
2) 3” x 3” x 11-1/4” shrinkage less than 0.022%

d. Compressive properties: ASTM C 109 at 28 days

1) Compressive strength: 5,000 psi minimum

e. Tensile properties: ASTM C 496 at 28 days

1) Tensile strength: 700 psi minimum

f. Flexural properties: ASTM C 293 at 28 days

1) Flexural strength: 1,500 psi minimum

2. Repair of Vertical and Overhead Surfaces (Keynote 10, 12, 13, 16, 17, 26, 37 and 38):
   a. Polymer-modified, cementitious, 2-component, fast-setting mortar such as SikaTop 123 Plus, Gel Mortar, as manufactured by Sika Corporation or approved equal.
   b. Shrinkage properties: ASTM C 157 at 28 days
      1) 1” x 1” x 11-1/4” shrinkage less than 0.05%
      2) 3” x 3” x 11-1/4” shrinkage less than 0.038%
   c. Compressive properties: ASTM C 109 at 28 days
      1) Compressive strength: 7,000 psi minimum
   d. Tensile properties: ASTM C 496 at 28 days
      1) Tensile strength: 750 psi minimum
   e. Flexural properties: ASTM C 293 at 28 days
      1) Flexural strength: 2,000 psi minimum

D. Bonding Compound
   1. Provide Bonding Compound on excavated surfaces
   2. Acceptable Manufacturer:
      a. Sika Corporation: Sikadur 32, Hi-Mod or approved equal

E. Epoxy Adhesive for Rebar Installation
   1. Hilti HIT-HY-150 Max or approved equal

F. Crack Injection, Vertical Crack Repair (Keynote 9): A two-component, super low-viscosity, crack healing, epoxy resin for both dry and damp cracks that structurally improves concrete surface.
   1. Tensile Properties, ASTM D-638
      a. Tensile Strength at 7 days: 7,100 psi
   2. Bond Strength, ASTM C-882

a. Hardened Concrete to Hardened Concrete at 2 days: 2,500 psi
b. Hardened Concrete to Steel at 2 days: 1,500 psi

3. Flexural Properties, ASTM D-790
   a. Flexural Strength at 7 days: 8,500 psi
4. Shear Strength, ASTM D-732
   a. Shear Strength at 7 days: 5,800 psi
5. Flexural Properties, ASTM D-790
   a. Flexural Strength at 7 days: 8,500 psi
6. Acceptable Manufacturer:
   a. Sika Corporation: Sikadur 55 SLV or approved equal.

2.02 MATERIAL SUBSTITUTIONS:

A. The use of other than the specified products will be considered providing the contractor requests their use in writing to the Engineer. This request shall also be accompanied by (a) A certificate of compliance from an approved independent testing laboratory that the proposed substitute products meet or exceed the specified performance criteria, tested in accordance with the specified test standards; and (b) Documented proof that the proposed substitute products have a five year proven record of performance, confirmed by actual field tests and five successful installations that the Engineer can investigate.

PART 3 EXECUTION

3.01 PREPARATION:

A. Repair procedures are defined in this section with additional guidelines given on the Contract Drawings.

3.02 CONCRETE CRACK INJECTION REPAIR AT VERTICAL FACE

A. Repair Procedure:
   1. Crack must be clean and sound. All efflorescence shall be removed prior to injecting.
   2. Drill 5/8” diameter holes along the side of the crack/joint at a 45° angle.
   3. Follow manufacturer’s recommendations for installation.
   4. Once ports are used and crack/joint is completely injected, knock off outside of port, and cover the hole with polymer repair mortar.

3.03 GRAVITY REPAIR OF CONCRETE CRACK

A. General: This work consists of gravity repair of horizontal cracks as indicated on the drawings.
   1. Crack must be clean.
   2. Seal underside of slab surface prior to filling if cracks reflect through structural slab.

3. Provide temporary dam each side of crack and fill the crack with epoxy. Remove temporary dam when epoxy hardens and remove any harden epoxy on top surface.
4. Follow manufacturer's recommendations for application.

3.04 CONCRETE CRACK INJECTION REPAIR AT UNDERSIDE

A. General: This work consists of underside crack repair of overhead cracks as indicated on the drawings.
   1. Structural crack repairs shall not exceed more than ¼ inch in width.
   2. Clean out crack with hand tools or high pressure air blast. Vacuum clean the existing surface at crack location.
   3. Crack less than ¼ inch width shall be veed out to min. ¼ inch deep prior to filling. For cracks wider than ¼ inch, patch with epoxy repair mortar.
   4. Drill holes for ports to a width and depth sufficient to assure a snug fit of the port. Clean out debris with high pressure air blast and vacuum.
   5. Insert ports and seal surface of crack with epoxy surface sealant. Seal shall extend above concrete surface a minimum of 1/16 inch and extend a minimum of 1 inch on either side of the crack.
   6. Allow a minimum of 8 hours curing time before initiating injection process.
   7. Inject injection gel epoxy paste from underside. Allow curing of epoxy gel paste per manufacturer's recommendation.
   8. Remove epoxy surface sealant and sealer to the satisfaction of the Authority's representative.
   9. Cut off grout tube flush with concrete face. Apply patch over injection ports.
   10. Grind epoxy surface sealant smooth to about 1/32 inch over crack and feathered concrete edge.
   11. Follow manufacturer's recommendations for additional information.

3.05 SHALLOW CONCRETE SPALL (KEYNOTES 5, 11, 14, 16, 17 AND 38):

A. General: This work consists of the removal of unsound concrete and the repair of spalled and delaminated concrete surfaces for an area of three square feet (3) or less, and one inch or less in depth using repair mortar, unless otherwise indicated on the drawings.

B. Repair Procedure:
   1. Inspection: Inspect concrete surfaces to be repaired under work of this section to determine the exact limits and locations of those areas to be repaired.
   2. Make a half-inch-deep saw cut around the perimeter of the repair area. Remove spalled, scaled, loose, and deteriorated concrete to sound concrete. Use maximum 30 pound size pneumatic hammer or other approved method to remove deteriorated concrete. Thoroughly blast and vacuum the newly exposed area prior to installing repair mortar. Remove all debris from the site.

C. Minimum ambient and substrate temperature at time of application: 45º F and rising.

3.06 DEEP CONCRETE SPALL (KEYNOTES 10, 11, 13, 15, 16 AND 37):

A. General Requirements: This consists of the removal of unsound concrete and the repair of spalled and delaminated concrete surfaces in areas greater than three (3) square feet and greater than one inch (1") deep, using repair mortar with pea gravel. Contact manufacturer for recommended amount of pea gravel.

B. Mixing:
   1. Follow manufacturers' recommendations.

C. Repair Procedure:
   1. Inspection: Inspect concrete surfaces intended to be repaired under work of this section to determine the exact limits and locations of those areas.
   2. Make a half-inch deep saw cut around the perimeter of the repair area. Remove spalled, scaled, loose, and deteriorated concrete to sound concrete. Minimum depth of concrete removal shall be 4 inches. Thoroughly blast and vacuum the newly exposed area prior to forming. Remove all resulting debris from the site.
   3. Remove unsound concrete material in a manner to facilitate uniform placement of mortar; slope upper area of excavated voids evenly to within one inch (1") of the face of the concrete to preclude entrapping air and forming hollow spots in the freshly placed mortar. Within one inch (1") of the surface, the upper outline shall be essentially normal (perpendicular) to the surface.
   4. Render all surfaces of exposed concrete and reinforcing steel free of oil, solvent, grease, dirt, dust, bitumen, rust, loose particles, and foreign matter.
   5. If reinforcing steel is encountered, use caution where reinforcing steel is uncovered so as not to damage the steel or its bond in the surrounding concrete. Do not use pneumatic tools in direct contact with reinforcing steel. Use maximum 30 pound size hammer for chipping behind reinforcing steel. Exposed reinforcing shall remain in place except where otherwise indicated for removal by direction of the Engineer or the Contract Drawings. Blast reinforcing steel in accordance with SSPC-SP-6, Commercial Blast Cleaning, to remove all contaminants, rust and rust scale.
      a. In areas where reinforcing steel is found to be surrounded by deteriorated concrete or has at least one-half its surface area exposed or has less than 1" cover, the depth of removal shall be such as to include all deteriorated concrete but not less than 3/4" below or behind the reinforcing steel.
      b. Where the existing reinforcing steel is severely corroded or damaged, cut out reinforcing steel and replace with new reinforcing steel of the same size and spacing. Where existing steel is determined by the Engineer to have insufficient cover, either replace reinforcing or adjust as directed. Attach new steel behind existing steel with a minimum lap of 16". Remove concrete to a minimum depth of 3/4" behind the new steel.
   6. Provide Bonding compound on excavated surfaces.

3.07 FULL DEPTH CONCRETE SPALL (KEYNOTE 12, 20 AND 26):

A. General Requirements: This consists of the removal of unsound concrete and the repair of spalled and delaminated concrete surfaces in areas as noted on drawings, using cast-in-place concrete.

B. Mixing:
   1. Follow manufacturers' recommendations.

C. Repair Procedure:
   1. Inspection: Inspect concrete surfaces intended to be repaired under work of this section to determine the exact limits and locations of those areas.
   2. Make a half-inch deep saw cut (or as noted on drawings) around the perimeter of the repair area. Remove spalled, scaled, loose, and deteriorated concrete to sound concrete. Thoroughly blast and vacuum the newly exposed area prior to forming. Remove all resulting debris from the site.
   3. Remove unsound concrete material in a manner to facilitate uniform placement of fresh mortar; slope upper area of excavated voids evenly to within one inch (1") of the face of the concrete to preclude entrapping air and forming hollow spots in the freshly placed concrete. Within one inch (1") of the surface, the upper outline shall be essentially normal (perpendicular) to the surface.
   4. Render all surfaces of exposed concrete and reinforcing steel free of oil, solvent, grease, dirt, dust, bitumen, rust, loose particles, and foreign matter.
   5. Use caution where reinforcing steel is uncovered so as not to damage the steel. Do not use pneumatic tools in direct contact with reinforcing steel. Use maximum 30 pound size hammer for chipping behind reinforcing steel. Exposed reinforcing shall remain in place except where otherwise indicated for removal by direction of the Engineer or the Contract Drawings. Blast reinforcing steel in accordance with SSPC-SP-6, Commercial Blast Cleaning, to remove all contaminants, rust and rust scale.
      a. In areas where reinforcing steel is found to be surrounded by deteriorated concrete or has at least one-half its surface area exposed or has less than 1" cover, the depth of removal shall be such as to include all deteriorated concrete but not less than 3/4" below or behind the reinforcing steel.
      b. Where the existing reinforcing steel is severely corroded or damaged, cut out reinforcing steel and replace with new reinforcing steel of the same size and spacing. Where existing steel is determined by the Engineer to have insufficient cover, either replace reinforcing or adjust as directed. Attach new steel behind existing steel with a minimum lap of 16". Remove concrete to a minimum depth of 3/4" behind the new steel.
   6. Place new reinforcing bars per drawings. Drill and grout into existing concrete using epoxy adhesive.

7. Form excavated areas on vertical surfaces of concrete members in accordance with the requirements of ACI 301-10. Design forms so that placement access will be at the top of each formwork assembly.
   a. Prior to forming up vertical surfaces, install reinforcement as indicated on the Contract Drawings or as required and directed by the Engineer.
8. Provide Bonding compound on excavated surfaces.

3.08 CLEANING:

A. Leave finished work area in clean condition without evidence of spill over onto adjacent areas.

B. Remove all repair procedure debris from the site.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 03100
FORMWORK

PART 1 GENERAL

1.1 DESCRIPTION

A. This section specifies reinforcement for concrete structures and other facilities.
B. Related Work Specified Elsewhere
   1. 03200 – Concrete Reinforcement
   2. 03010 – Maintenance of Concrete
   3. 02410 – Selective Demolition.
   4. 03100 - Formwork.
   5. 02250 - Shoring

1.2 QUALITY ASSURANCE:

A. Codes, Regulations, Reference Standards and Specifications:
   1. Comply with codes and regulations of the jurisdictional authorities.
   2. ACI: 347, Publication # 4
   3. Western Woods Producers Association: Western Lumber Grading Rules.
   4. AASHTO: M153.
   5. ASTM: D1056, D1149, D1692.
   6. APA: HDO Plywood Exterior Grade.
   7. U.S. Product Standard: PS 1
   8. Buy America Act: Except for those products which are exempt under the specific statutory waivers stipulated in 49 CFR 661, all other products supplied under this section must comply with the requirements of the Buy America Act.
B. Responsibilities:
   1. Design and construction of formwork is the responsibility of the Contractor, subject to review by the Engineer.
C. Design Criteria:
   1. Design formwork for vertical loads and lateral pressures in accordance with ACI 347.
   2. Design formwork system which is adequately braced and has adequate strength and stability to ensure finished concrete within the specified tolerances.
   3. When necessary to maintain the specified tolerances, design camber into the formwork to compensate for anticipated deflection and creep due to the weight and pressure of the fresh concrete, and construction loads.

1.3 SUBMITTALS:

A. Submit the following for approval in accordance with the General Requirements and with the additional requirements as specified for each:
   1. Working Drawings:
      a. Include details of form types, methods of form construction and erection, design computations and location of form joints and form ties, location and dimensions of blockouts and openings in structure, and embeds.
   2. Samples:
      a. Each type of premolded expansion-joint filler proposed for use, each six inches by 12 inches: Two.
      b. Snap-off form ties: Two.

3. Certification:
   a. Manufacturer's certificates.
   b. Certified test reports of specified concrete tests.
4. Documentation:
   a. Calculations: Early form removal calculations as certified by a professional engineer registered in the area where the work is to be performed. Submit in advance for obtaining approval prior to form removal.

PART 2 PRODUCTS

2.1 MATERIALS

A. General:
1. Wood forms:
   a. All framing lumber stress-graded
2. Plywood forms:
   a. APA grade-marked:
      1) B-B Plyform Exterior Grade Group I or II for unexposed finished concrete.
   b. APA High-Density Overlay (HDO) plywood;
      1) B or better face veneer Exterior Grade Group I for exposed to public view finished concrete.
   c. USPS: PS 1
3. Hardboard:
   a. For concrete not exposed to public view: tempered, smooth-one- side (S1S) panels not less than 3/16-inch thick, in accordance with AHA IS 1.
4. Form ties:
   a. Factory-fabricated, snap-off metal type, of adequate design to minimize form deflection and preclude concrete spalling upon removal.
   b. Fabricated so that set-back in concrete is such that portion of tie remaining after snap-off and removal of exterior portions is at least 1-1/2 inches below concrete surface.
5. Form release agent: Chemically reactive liquid product that will not bond with, stain, or impair concrete surfaces. Follow form panel manufacturers approved product and recommendations for application. Agents containing castor oil are prohibited.
6. Preformed expansion joint filler: AASHTO M153.
   a. Type I: Sponge rubber.
   b. Type II: Cork.
   c. Type III: Self-expanding cork.
7. Chamfer strips: Except where other sizes are shown, 3/4-inch by 3/4-inch triangular fillets milled from clear, straight-grain pine, surfaced-each-side, or extruded-vinyl tape.
8. Miscellaneous preformed strips for reveals, rustications and similar joints: Fabricated of wood, metal, plastic or other approved material formed to cross sections shown.
9. Bonding adhesive: As recommended by manufacturer of premolded elastic filler.

PART 3 EXECUTION

3.1 CONSTRUCTION AND WORKMANSHIP:

A. Concrete finishes and usage locations of various types of forms and form lining: As shown or specified.

B. Unless otherwise shown for concrete surfaces exposed to public view, use HDO Plywood in largest practicable continuous panels to produce plane, smooth surface free from grain imprint, patchmarks, and discoloration.
C. Construct adequately braced formwork so that resulting concrete surfaces conform to specified tolerances.
D. Brace forms, falsework and centering adequately to retain forms in position as shown on approved working drawings.
E. Provide mortar-tight forms of wood, plywood, fibrous-glass-reinforced plastic, steel or other approved materials which conform to shapes, lines and dimensions shown and produce smooth surface without fins and projections.
F. Where shown or directed because of lagging or form irregularity, and where concrete surfaces will not be exposed to public view, line inner form surfaces with hardboard as follows:
   1. Use widest available width of hardboard.
   2. Line areas less than four feet wide with single-width piece of hardboard.
   3. Offset lining joints from those in backing.
   4. Fasten securely to backing with galvanized or aluminum nails driven flush.
G. Forms shall be clean of any rust, molds, concrete scale, etc.

3.2 FIELD QUALITY CONTROL:

A. Allowable Tolerances:
   1. Construct elements except concrete linings of tunnels to meet allowable tolerances of dimensions, elevations and positions shown and specified in Section 03300.

3.3 COATING FORMS:

A. Lightly coat form panels with chemically reactive release agent prior to initial concrete placement and before each subsequent placement.
B. Do not allow excess coating material to stand in puddles in forms nor to come into contact with concrete against which fresh concrete is to be placed.
C. Coat with release agent bolts and rods that are to be completely removed or to be free to move.

3.4 EMBEDDED ITEMS:

A. Ensure that items to be embedded in concrete are free from oil and foreign matter that would weaken bond of concrete to such items.
B. Install in formwork inserts, anchors, sleeves and other items specified elsewhere. Close ends of conduits, piping and sleeves embedded in concrete with caps or plugs.
C. Before depositing concrete, check location and support of piping, electrical conduits and other items which are to be wholly or partially embedded.

3.5 OPENINGS AND RECESSES IN CONCRETE:

A. Provide openings and recesses; place sleeves furnished by other trades.

3.6 JOINTS:

Unless otherwise directed, make contraction, expansion and construction joints only where shown. Where concrete will be exposed to public view, use largest practical size sheets to minimize joints.

B. Form keyways as shown.
C. Continue reinforcing steel and wire fabric across joints unless they are shown as being free to move.
D. Make maximum distance between transverse contraction joints 50 feet or as shown, as measured along centerline of track on tangent alignment.
E. Install premolded joint filler at locations shown. Extend filler from bottom of concrete up flush to finish concrete surface or hold down below finish surface as shown.
F. Make splices in premolded filler in manner to preclude penetration of concrete between joint faces.
G. Where premolded joint filler is held below finish concrete face, install in the form a water-soaked wood strip of dimensions shown, to form, after removal, proper size slot to receive sealant compound specified in Section 07900.

3.7 REMOVAL OF FORMS, FALSEWORK AND CENTERING:

A. Maintain forms, falsework and centering in place until the concrete has attained minimum percentage of specified design strength in accordance with Schedule 2.

Structural Member	Minimum Percentage of	
	Schedule 1	Schedule 2
Double Tee Deck	90	75

B. Early removal of forms, falsework and centering will not be allowed for concrete strength values below Schedule 2, but will be allowed for concrete strength values between Schedule 1 and Schedule 2 only after:
   1. The Engineer has approved calculations showing anticipated concrete strengths at time of proposed early removal based on:
      a. Ratio of dead load over live load.
      b. Span, height and shape.
      c. Ratio of rise over span.
      d. Reshoring.
      e. Loads, resultant stresses and deformations to which concrete and reinforcing steel will be subjected at time of removal, subsequent to removal and until concrete has attained design strength.
      f. Prevailing site conditions.
   2. Concrete strength attained prior to form removal has been determined by analysis of quality-assurance data in accordance with Section 03300.
C. Do not remove wood board forms within 48 hours of pouring concrete.
D. Do not alter loading conditions on concrete subsequent to removal of forms if it results in exceeding permissible stresses and deformations at attained concrete strengths.
E. The Engineer may permit early removal of concrete support without submittal of calculations prior to attainment of specified design strength if he considers such submittals to be unnecessary.

END OF SECTION

SECTION 03200
REINFORCEMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. The work specified in this Section consists of furnishing and installing reinforcement for concrete structures.

1.2 1.2 RELATED SECTIONS

A. 03010 - Maintenance of Concrete
B. 03200 - Formwork

1.3 1.3 REFERENCES

A. American Concrete Institute (ACI):
   1. ACI 315: Details and Detailing of Concrete Reinforcement.
   2. ACI 318: Building Code Requirements for Structural Concrete and Commentary.
B. American Welding Society (AWS):
   1. AWS D1.4: Structural Welding Code – Reinforcing Steel.
C. ASTM International (ASTM):
   1. ASTM A615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
   2. ASTM A663: Standard Specification for Steel Bars, Carbon, Merchant Quality, Mechanical Properties.
   3. ASTM A706: Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
   4. ASTM A1064: Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
D. Concrete Reinforcing Steel Institute (CRSI):
   1. CRSI Manual of Standard Practice.

1.4 SUBMITTALS

A. Shop Drawings and Product Data:
   1. Prepare shop drawings of concrete reinforcement in accordance with ACI 315.
   2. Provide drawings showing all fabrication dimensions and locations for placing reinforcement and bar supports; indicate bending diagrams, splicing and lap of rods, shapes, dimensions and details of bar reinforcing, and accessories.
   3. Product Data: Submit manufacturer's descriptive product data and current specification for each product specified herein, include installation instructions.
B. Test Reports:
   1. Submit copies of reports showing the results of tests, conducted in accordance with ASTM Specifications.
   2. Test Requirements may be waived based upon certified copies of mill test reports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage of Materials:

1. Store reinforcing materials in a manner to prevent excessive rusting and fouling with dirt, grease, and other bond-breaking coatings.
    a. Store reinforcing materials in a manner to prevent excessive rusting and fouling with dirt, grease, and other bond-breaking coatings.
    b. Cover reinforcement and accessories.
2. Identify bundles of reinforcing steel with tags wired to steel.
3. Protect reinforcement from deforming, bending, kinking, and other injury.

1.6 PROJECT CONDITIONS

A. Protection: Protect in-place reinforcement from excessive construction traffic and other work.

PART 2 PRODUCTS

2.1 MATERIALS

A. Reinforcing Steel:
1. Reinforcement Bars: ASTM A615, Grade 60, deformed steel.
2. Epoxy-Coated Reinforcement Bars: ASTM A775
3. Weldable reinforcement bars: ASTM A706.
4. Wire: ASTM A1064.
5. Epoxy Coated Welded Wire Reinforcement: ASTM A185.
6. Metal Accessories: CRSI Manual of Standard Practice.

B. Rebar Splicing Coupler: Make splices in accordance with ACI 318 with a capacity not less than 125 percent of minimum yield strength of the rebar.
1. Internal Coupler Protector: Provide coupler manufacturer's plastic internal coupler protector where couplers are provided for anticipated future additions.
2. Use Rebar Splicing Coupler only where shown on Drawings or where approved by the Engineer.
3. Acceptable Manufacturers:
    a. Lenton Lock Shear Bolt Mechanical Coupler Coated by Erico
    b. Or approved equal.

C. Slab Joint Dowel System for Expansion and Contraction Joints:
1. Two-piece system consisting of a closed end plastic sleeve and smooth dowel bar, size as indicated on drawings.
    a. Dowel Bar:
        1) Plain round bar confirming to requirements of ASTM A663, Grade 70, 75, or 80 which is not burred, roughened, or deformed out-of-round so slippage is not hindered.
    b. Acceptable Manufacturers:
        1) Greenstreak: Speed Dowel System
        2) Or approved equal.
2. Dowel Bar with Bondless Surface:
    a. Plain round bar conforming to requirements of ASTM A663, Grade 70, 75, or 80 which is not burred, roughened, or deformed out-of-round to slippage is not hindered.
    b. Coat with curing compound to render surface bondless.
        1) Curing compound: Section 03300.

D. Deformed Bar Anchors: Deformed anchor conforming to ASTM A1064 with minimum yield strength of 70 ksi and minimum ultimate tensile strength of 80 ksi. Bar anchor shall be low carbon steel with the following properties C -0.23 max, Mn – 0.90 max, P – 0.040 max, and S – 0.050 max.
   1. Anchors shall be similar to Nelson, flux-filled deformed bar anchor, Type D2L, by Nelson Stud Welding or equal.

E. Fiber Concrete Reinforcement: First quality, 100% virgin polypropylene fibers containing no reprocessed olefin materials such as Fibermesh as manufactured by SI Concrete Systems, or equal.
   1. Fiber material shall be mixed at rate of 1.5 pounds of fiber to 1 cubic yard of concrete.
   2. Add fibrous reinforcement to concrete material at the time concrete is cast. Mix concrete in strict accordance with fiber reinforcement manufacturer's instructions in order to achieve uniform three-dimensional distribution.

F. Metal Accessories:
   1. Provide metal accessories in accordance with the requirements of the CRSI Manual of Standard Practice.

2.2 FABRICATION

A. General: Fabricate reinforcement to the dimensions indicated on the Drawings and within the tolerances given in ACI 315. Perform bending of steel reinforcement by the cold bending method.
   1. Do not use bars with kinks or bends not indicated on Drawings.
   2. Perform bar shape fabrication in a manner that will not injure the material or lessen the member strength.
   3. Use a designed bending machine, either hand- or power-operated.
   4. Do not field bend bars partially embedded in concrete unless approved by the Engineer.

2.3 SOURCE QUALITY CONTROL

A. Tests and Inspections:
   1. Materials specified in this Section require advance examination or laboratory testing according to the methods referenced herein.
   2. The Testing and Inspection Agency (Approved Agency) will perform the source testing specified in this Paragraph, unless the testing is not required as specified.
      a. The tests specified in Subparagraphs 2.03.A.3 through 2.08.A.9 may be waived if certified copies of mill test reports are submitted showing complete compliance with the specified requirements.
      b. If the certified mill test reports are not submitted the Testing and Inspection Agency must perform the specified tests.
   3. Deformed Steel Reinforcement Tests:
      a. Test Procedure:
         1) The following properties of the deformed steel bar reinforcement will be determined using the methods specified in ASTM A615:
            a) The carbon, manganese, phosphorus, and sulfur content of the dowel bar material.
            b) The tensile strength, yield strength, and percentage elongation.
         2) The bend test will be performed on the deformed steel bar reinforcement using the methods specified in ASTM A615.

b. Acceptance Criteria:
   1) Deformed steel bar reinforcement that exhibit the chemical composition, tensile strength, yield strength, percent reduction of area, and weight (mass) per unit length within the ranges specified in ASTM A615, and that pass the bend test for the bar size, as specified in ASTM A615 are acceptable.

4. Deformed Weldable Reinforcement Tests:
   a. Test Procedure:
      1) The following properties of the low-alloy steel deformed bar reinforcement will be determined using the methods specified in ASTM A706:
         a) The carbon, manganese, phosphorus, and sulfur content of the dowel bar material.
         b) The tensile strength, yield strength, and percentage elongation.
      2) The bend test will be performed on the low-alloy steel deformed bar reinforcement using the methods specified in ASTM A706.
   b. Acceptance Criteria:
      1) Low-alloy steel deformed bar reinforcement that exhibit the chemical composition, tensile strength, yield strength, percent reduction of area, and weight (mass) per unit length within the ranges specified, and that pass the bend test for the bar size, as specified in ASTM A706 are acceptable.
5. Steel Welded Wire Reinforcement Tests:
   a. Test Procedure:
      1) The tensile strength, yield strength, and percent reduction of area will be determined, and the bend test for steel welded wire reinforcement will be performed in accordance with the methods specified in ASTM A1064.
   b. Acceptance Criteria:
      1) Steel wire used to fabricate the steel welded wire reinforcement that exhibits the tensile strength, yield strength, and percent reduction of area within the ranges specified, and that passes the bend test for the wire size as specified in ASTM A1064 are acceptable.
6. Deformed Bar Anchor Tests:
   a. Test Procedure:
      1) The tensile strength and yield strength will be determined, and the bend test for steel deformed bar anchors will be performed in accordance with the methods specified in ASTM A1064.
   b. Acceptance Criteria:
      1) Deformed bar anchors exhibiting the tensile strength and yield strength within the ranges specified in Subparagraph 2.01.E are acceptable.
7. Rebar Splicing Coupler:
   a. Test Procedure:
      1) The following properties of the dowel bar used to fabricate the rebar splicer components will be determined using the methods specified in ASTM A615
         a) The carbon, manganese, phosphorus, and sulfur content of the dowel bar material.
         b) The tensile strength, yield strength, and percentage elongation.

2) The bend test will be performed on the dowel bar used to fabricate the dowel bar splicer components using the methods specified in ASTM A615.

b. Acceptance Criteria:

1) Rebar splicer components that exhibit the chemical composition, tensile strength, yield strength, percent reduction of area, and weight (mass) per unit length within the ranges specified in ASTM A615, and pass the bend test for the bar size as specified in ASTM A615 are acceptable.

8. Slab Joint Dowel Bar Tests:

a. Test Procedure:

1) The chemical composition, tensile strength, yield point, and percent elongation of slab joint dowel bars will be determined in accordance with the methods specified in ASTM A663

b. Acceptance Criteria:

1) Dowel bars exhibiting the tensile strengths, yield points, and percent elongation within the ranges as specified in ASTM A663 for the Grade of bar tested are acceptable.

9. Non-Conforming Work:

a. Do not use concrete reinforcement that fails the testing.

PART 3 EXECUTION

3.1 INSTALLATION

A. Placing Concrete Reinforcement:

1. Place metal concrete reinforcement accurately and in accordance with ACI 318.

a. Do not lay metal reinforcement on formwork.

b. Terminate reinforcement 2 inches from the face of expansion joints.

c. Continue reinforcement across or through construction joints except for keyed control joints in slab-on-grade.

d. Place additional concrete reinforcement around openings in slabs and walls as detailed on the Contract Drawings.

e. Provide reinforcing accessories to securely brace the reinforcement against displacement outside of permitted tolerances.

2. Slab Reinforcement Placement:

a. Install welded wire reinforcement (flat sheets or mats) as indicated, lapping joints eight inches with the overlap being measured between the outermost cross wires of each reinforcement sheet and securely wiring the joints together.

b. Extend welded wire reinforcement to within 2 inches of sides and ends of slabs.

c. To support slab reinforcement from the ground, place the reinforcement on concrete blocks of the correct height and having a compressive strength equal to or greater than the specified compressive strength of the concrete being placed.

1) Use concrete blocks not larger than 3 inches by 3 inches and of a height equal to required bottom steel cover.

d. To support slab reinforcement from formwork, place the reinforcement on bar chairs made of plastic or metal.

1) If the slab surface is exposed to view, provide supports with legs protected by plastic or stainless steel.

3. Field weld deformed bar anchors to slab edge steel bent plate as shown on the Contract Drawings.

B. Concrete Reinforcement Field Bends:
1. Do not field bend bars partially embedded in concrete.
2. When obstructions interfere with the placement of reinforcement, pass such obstructions by placing reinforcement around it
   a. Do not bend the reinforcement to clear the obstructions.

C. Shortening Concrete Reinforcement:
1. Shorten (trim) concrete reinforcement, if required, by shearing or sawing.
2. Shortening concrete reinforcement using an acetylene torch may be acceptable, but only if the location of the shortening is approved by the Engineer in writing in advance.

D. Welding Concrete Reinforcement:
1. Do not weld concrete reinforcement except when using ASTM A706 weldable reinforcement, and only where indicated on the Contract Documents or approved in writing by the Engineer.
2. Select proper filler materials, preheat temperatures, and performance/procedures in accordance with the requirements specified in AWS D1.4.

E. Splicing Concrete Reinforcement:
1. Splice reinforcement in accordance with ACI 318 and as indicated on the Contract Drawings.
2. Secure reinforcement at intersections with not less than 16-gauge annealed wire or appropriately sized clips.
   a. Where bar spacing is less than 12 inches, tie alternate intersections.
   b. Do not tack-weld crossing bars.

F. Slab Joint Dowel Bar Installation:
1. Install one-half the length of the coated bar dowel into the slab to be poured.

3.2 SITE QUALITY CONTROL

A. A Testing and Inspection Agency (Approved Agency) shall be engaged by Owner to perform code-required special inspections.
1. Written reports on all tests and inspections shall be provided immediately after work is performed. The reports shall state test specimens either comply with requirements or deviate from them.

B. Inspections:
1. Notify the Engineer at least 10 days prior to scheduled concrete placement operations so the placement of reinforcement can be inspected.
2. Prior to placing concrete, inspect the reinforcement size, location, spacing, clear distance between bars, and to the outside face of the concrete, and the reinforcement will not be displaced during the placement of concrete.
   a. Verify the rebar splicer system is installed at the approved locations, is the correct type, and is installed in accordance with the manufacturer’s guidelines.

3.3 CLEANING

A. Clean or otherwise protect metal reinforcement so that at the time the concrete is placed, the reinforcement is free from rust, scale, or other coatings that could destroy or reduce the concrete to steel bond.

3.4 PROTECTION

A. Provide protection for concrete reinforcement during concrete pours in accordance with ACI 318, unless indicated otherwise on the Contract Drawings.

B. Protect in-place reinforcement from excessive construction traffic and other work.

END OF SECTION

SECTION 04050

COMMON WORK RESULTS FOR MASONRY

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies furnishing mortar, grout, and accessories for masonry work, including brick masonry, concrete unit masonry, granite and other stone masonry. The installation of such material is specified in the various masonry sections.

1.02 RELATED SECTIONS

A. Section 05500 - Metal Fabrications

B. Section 07620 - Sheet Metal Flashing and Trim

1.03 SUBMITTALS

A. Submit the following for approval in accordance with the General Provisions and with the additional requirements as specified for each:
   1. Shop Drawings:
      a. Manufacturer's data: Recommendations for use of materials, preparation of substrate, limitations and special instructions for materials necessary to the work.
   2. Samples:
      a. Three of each type of the following products used in the work:
         1) Mortars: Cured samples showing color of each type.
         2) Accessories: Representative samples of each type.
         3) Certification.

1.04 QUALITY ASSURANCE

A. Codes, Regulations, Reference Standards and Specifications:
   1. Comply with codes and regulations of the jurisdictional authorities.
   2. ASTM: A36, A82, A153, A276, A666, A775, C114, C144, C150, C207, C270, C476, C665, C780, C881, C1019, D570, D638, D695, D1525, D2000, D2240, F593, F594.
   3. FS: HH-I-521.

B. Source Quality Control:
   1. Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver products to job site in their original unopened containers clearly labeled with manufacturer's name and brand designation, referenced specification number, type and class as applicable.

B. Store products so as to prevent water intrusion, dampness and deterioration. Store loose materials sand and aggregates so as to prevent intrusion of foreign materials.

C. Handle products so as to prevent breakage of containers and damage to products.

1.06 JOB CONDITIONS

A. Environmental Requirements:
   1. Do not use materials or aggregates that are covered with frost. Do not mix mortar when the temperature is below that specified for masonry work.
   2. Provide protective covering and heat as specified for masonry work.
   3. Perform work under environmental conditions consistent with manufacturer's recommendations for materials being used in the work.

PART 2 PRODUCTS

2.01 MORTAR AND GROUT MATERIALS

A. Cement:
   1. ASTM C150, Type I, Portland cement, packaged in one-cubic-foot waterproof bags.
      a. For exterior walls, use low alkali cement; maximum 0.60 percent total alkali when tested according to ASTM C114.
      b. For below grade use type II cement and lime.
   2. Cement for brick masonry:
      a. Factory-prepared, color-blended with nonstaining, inorganic coloring pigment.
      b. Pigments not to exceed 10 percent of weight of cement.
      c. Pigment blended in such quantity to produce cured mortar color matching face brick when mixed with hydrated lime and fine aggregate.

B. Hydrated Lime:
   1. ASTM C207, Type S.
   2. Uniform color for similar work.

C. Fine Aggregate: Clean, sharp, masonry sand, ASTM C144. For joints less than 1/4 inch, grade aggregate with 100 percent passing the Number 16 sieve.

D. Water: Potable.

E. Pigment: As necessary to produce colored mortar matching color of brick unless otherwise indicated.

F. Admixtures: Do not add admixtures including air-entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

G. Epoxy for Epoxy Mortar: Two-component, ASTM C881, Type 3, Grade 3, Class C, with the following additional requirements:
   1. Component A: Modified-epoxy resin of epichlorohydrin bisphenol A-type, containing suitable viscosity control agents and having epoxide equivalent of 180-200.
   2. Component B: Primarily reaction product of aromatic amine and an aliphatic amine with epoxy resin of epichlorohydrin bisphenol A-type.
   3. Ratio of Component A to Component B: By volume, 1:2.
   4. Properties of mixed components:
      a. Solids content: 100 percent by weight.
      b. Pot life: 20 to 30 minutes at 73F.
      c. Tack-free time, thin film: Two to four hours at 73F.
      d. Final cure, 75-percent ultimate strength, ASTM D695: Two days at 73F.
      e. Initial viscosity, A plus B: 250 to 350 cps at 73F.
   5. Properties of cured material:
      a. Tensile strength, ASTM D638: 5,000-psi minimum at 14 days, 73F cure.
      b. Tensile elongation, ASTM D638 modified: One to three percent at 14 days, 73F cure.
      c. Compressive strength, ASTM D695: 10,500-psi minimum at 28 days, 73F cure.
      d. Water absorption, ASTM D570: One-percent maximum.
      e. Bond strength: 2,000-psi minimum at 14 days.
      f. Hardened to hardened: 73 degrees Fahrenheit cure.
      g. Vicat softening temperature, ASTM D1525: 121F minimum.
   6. Manufacturers
      a. Sika Corporation.
         201 Polio Ave.
         Lyndhurst, NJ 07071
         Customer Service: 800-933-7452
         Internet: https://usa.sika.com
         1) Sikadur 32 Hi-Mod
      b. Or Equivalent Equal

H. Aggregate for Epoxy Mortar: Silica sand, Size 20 to Size 40, dust-free and moisture-free.

2.02 MORTAR AND GROUT MIXES

A. Mortar Mixes for Brick Masonry: ASTM C270, types as follows:

1. Type S: For exterior loadbearing masonry and for masonry in contact with earth, proportioned by volume as follows:
   a. Portland cement: One part.
   b. Hydrated lime: 1/4 to 1/2 part.
   c. Fine aggregate: Not less than 2-1/2 nor more than three times sum of volumes of cement and lime.
   d. Pigment: As necessary to produce colored mortar matching color of brick unless otherwise indicated.
2. Type N: For interior non loadbearing masonry, proportioned by volume as specified for Type S, except 1/2 to 1-1/4 parts hydrated lime.
3. Color: As shown or as selected by the AR.
4. Mortar Mixes for Concrete Unit Masonry: As specified for brick masonry, except pigment not required.

B. Grout: For setting steel lintels and similar items, grouting mortar composed of one-part Portland cement and two parts fine aggregate with sufficient lime putty added to obtain quick set.

C. Preshrunk Mortar: Dry, premixed, ready-to-use formulation.

2.03 ACCESSORIES

A. Continuous joint reinforcement:
   1. Accessories for Brick and Concrete Unit Masonry:
      a. Prefabricated continuous-reinforcing tie system fabricated of wire conforming to ASTM A82. Flush-welded cross ties, nine-gauge wire, hot-dip galvanized after fabrication in accordance with ASTM A153, Class B2, 1.50 ounces for side and cross rods.
      b. Fabricate joint reinforcement in straight lengths of not less than 10 feet of truss design with continuous diagonal cross ties spaced maximum 16 inches o.c.
         1) Make width of unit 1-1/2 inches to two inches less than thickness of wall.
         2) For multi-wythe wall, provide one side rod for each face shell of masonry more than four inches in width; plus one side rod for each wythe of masonry four inches or less in width.
         3) At cavity walls, provide integral drips on cross rods. Where horizontal joints of outer wythe does not align with back-up joints, provide adjustable two-piece tab design to engage the outer wythe by at least 1-1/2 inches.
            a) Corner reinforcement: Prefabricated, shop-welded corner-L and intersection-T units matching the continuous wall units.
            b) Spacing: See related work sections.
   2. Dovetail anchors:
      a. Flexible, adjustable or corrugated 1-inch wide dovetail anchors of 12 gauge galvanized steel. Place anchors every 16 inches in height of wall at intersections of masonry walls and concrete, and for masonry furring of concrete.

3. Wall plugs:
   a. Galvanized 26-gauge corrugated metal, approximately three inches long and of standard manufacture, where necessary for attaching other work.
4. Z-type rigid-steel anchors: Steel, ASTM A36, 1/4-inch thick by 1-1/2 inches wide by 28 inches long, galvanized; with one two-inch opposing 90-degree bend at each end.
5. Corrugated-steel anchors:
   a. 12 gauge by 2 inches by 5 inches with one 1 ½ inches 90-degree: #345 galvanized corrugated Buck Anchor by Simpson-tie or approved equal.
6. Steel framing anchors:
   a. Fabricated of 3/16-inch galvanized wire tie and galvanized flat-steel strap one-inch wide by 22 gauge or 3/4-inch wide by 12 gauge.
7. Weep-hole tubes:
   a. 3/8-inch OD, medium density, nonstaining, polyethylene tubes of lengths ensuring complete panel penetration and unobstructed flow. Fire-resistant compressible filler: Inorganic, non-asbestos mineral fiber safing insulation, with foil facing to impede smoke passage; moisture resistant, mildew-proof and vermin-proof, noncorrosive and non-deteriorating; UL-listed; meeting ASTM C665 and FS HH-I-521 Type III, except for identification marking.
8. Control joint gasket:
   a. Solid styrene-butadiene-rubber compound per ASTM D2000, 2AA-805, factory extruded into shapes for use with standard sashblock to provide stability to masonry walls at expansion and control joints; minimum shear strength 540 psi, durometer hardness 80 (plus or minus 5) per ASTM D2240. Provide T-shape and X-shape for vertical joints as appropriate, flat shape beneath load-relieving angles.
9. Cavity Drainage System:
   a. 1 inch thick by 10 inches high by 5 feet long section of high density polyethylene or nylon mesh designed to allow moisture to flow downward in cavity joint.
10. Masonry Cell Insulation:
    a. Molded polystyrene Insulation Units - Rigid, cellular thermal insulation formed by the expansion of polystyrene - resin beads or granules in a closed mold to comply with ASTM 578, Type I. Provide specially shaped units designed for installing in cores of masonry units.

B. Steel lintels: Section 05500.

C. Masonry lintels: Section 04220.

D. Flashing: Section 07620.

PART 3 EXECUTION

3.01 MIXING OF MORTAR

A. Mix mortar materials in an approved clean mechanical mixer for at least three minutes and not more than five minutes with a minimum amount of water to produce workable consistency.

B. Mortar which has stiffened because of evaporation of water may be re-tempered by adding water as needed to restore necessary consistency. Use mortar within 2-1/2 hours of initial mixing.

C. Use an approved method of measuring materials and mortar that will control and accurately maintain specified proportions throughout the work. Shovel measure is prohibited. Measure sand in damp, loose condition.

D. Apply pre-shrunk mortar in accordance with the manufacturer's instructions.

E. For alteration and restoration work, tint or modify mix to match mortar of existing masonry.

F. The AR may direct a test of the mortar in accordance with ASTM C780 and a test of the grout for compressive strength per ASTM C1019 to establish compliance with specified requirements.

END OF SECTION

SECTION 04220

CONCRETE UNIT MASONRY

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies providing concrete unit masonry and glazed concrete masonry.

1.02 RELATED SECTIONS

A. Section 04050 - Common Work Results for Masonry did not see these specifications in PW

B. Section 05500 - Metal Fabrications

C. Section 07920 - Joint Sealants

1.03 SUBMITTALS

A. Submit the following for approval in accordance with the General Requirements and with the additional requirements as specified for each:
   1. Samples for Initial Selection: Samples in small-scale form showing the full range of colors and textures available for each different exposed masonry unit required.
   2. Samples:
      a. Three sets of each type of the following products used in the work.
         1) Concrete masonry units (CMU):
            a) Lightweight.
            b) Normal weight.
            c) Special shapes.
            d) Glazed.
         2) Precast lintels.
         3) CMU lintels.do we need CMU or precast lintels anywhere?
      b. Concrete masonry panels:
         1) Construct sample panels for exposed work only. Build panels not less than four feet square by eight inches thick, incorporating reinforcement and concrete masonry units. Construct one panel of concrete glazed and unglazed masonry units.
         2) Use types of material, color variation, mortar, bond, tooling of joints, method of laying and workmanship shown or specified.
         3) Maintain panels in good condition and protect from moisture penetration until completion of masonry work and removal is directed.

4) Approval of mock ups is for color, texture and blending of masonry unit; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
5) Maintain panel in good condition and protect from moisture penetration until completion of masonry work. Panel may remain as part of finished work after approval.

3. Shop Drawings: Show fabrication and installation details for the following:
   a. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
   b. Certification.

1.04 QUALITY ASSURANCE

A. Codes, Regulations, Reference Standards and Specifications:
   1. Comply with codes and regulations of the jurisdictional authorities.
   2. NCMA: TEK Manual for Concrete Masonry Design and Construction.
   3. ASTM: A615, C33, C55, C90, C129, C150, C744, E119.
   4. ACI: 315, 530.1-99.
   5. UL: Fire Resistance Directory.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

C. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver products to jobsite in good condition.

B. Keep products clean and dry. Prevent contact with soil.

C. Handle products so as to prevent chipping and breakage.

1.06 JOB CONDITIONS

A. Environmental Requirements:
   1. The following are prohibited:
      a. Use of products that are covered with frost.
      b. Erection of masonry when the temperature is below 40F or tending to fall below 40F, unless suitable fireproof protection covering and heat are provided to maintain work and materials above 40F.

PART 2 PRODUCTS

2.01 MATERIALS

A. CMU:
   1. General:
      a. Nominal dimensions:
         1) Face size: 7-5/8 inches by 15-5/8 inches.
         2) Thickness: As shown.
      b. For exposed work, units of uniform medium texture, free from defects and of uniform dimensions. Furnish special units as necessary.
      c. Units having UL Fire Resistance Directory ratings to achieve fire ratings for walls as required by local building codes and as shown.
      d. Units free from iron and other substances that will stain plaster or paint.
   2. Lightweight CMU:why keep both light weight and normal weight CMU at the same time? Delete the light weight CMU
      a. Hollow, lightweight loadbearing concrete units: ASTM C90, Type I.
      b. Solid, lightweight loadbearing concrete units: ASTM C90, Type I.
      c. Lightweight concrete brick: ASTM C55, Type I, Grade N.
      d. Aggregate: Limited to expanded shale or slate.
      e. Hollow, light-weight non-load bearing concrete units: ASTM C129, Type 1
   3. Normal-weight CMU:
      a. Solid loadbearing units: ASTM C90, Type I.
      b. Exposed alteration and restoration work: Units of same type, grade, size, color variation, texture and appearance as existing masonry work.
   4. Concrete fill for CMU bond beams and reinforced masonry unit cores: Class 3500; maximum aggregate size, 3/4 inch, and in accordance with ACI 301-10.

B. Mortar, Grout and Masonry Accessories: Section 04050 - Common Work Results for Masonry.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean foreign substances which would affect bond of mortar from surfaces to receive CMU.

B. Built-In Work.
   1. Verify locations of chases and openings for pipes, conduits and ducts.
   2. Establish locations for walls and partitions; verify that door frames and other built-in work provided by others are or can be properly located.

3.02 ERECTION

A. Erect exposed CMU masonry work to conform to approved sample panel.

B. Use of loadbearing and non-loadbearing units shall be governed by locations and purposes to be served. Except as otherwise shown, follow these general uses:
   1. Loadbearing: Backup loadbearing masonry walls and for bearing partitions.
   2. Non-loadbearing: Furring, non-bearing partitions and backup non-loadbearing masonry walls.
   3. Solid: Where specifically required by drawings, for fireproofing structural steel and for partitions with fire ratings.

C. Erect adjoining walls simultaneously. Do not erect walls more than five feet above adjoining walls. Toothing is prohibited. Cover and protect the tops of unfinished walls.

D. Plumb piers, walls and partitions. Level courses using uniform joint thickness for interior work, build external corners with bullnose units.

E. Place reinforcement and build in openings for pipes, conduits, ducts, chases, frames and other work as shown.

F. Grout in accordance with Section 04050 and set in place miscellaneous steel lintels furnished by other trades for openings in masonry walls in accordance with Section 05500. Provide eight-inch minimum bearing on adjacent masonry unless otherwise indicated.

G. As the work progresses, keep masonry clean by stiff brushing with fiber brush. Do not wet units before laying up. Unless otherwise shown, lay units in running bond.
   1. Set cored units with cells vertical, unless manufactured with horizontal cores. Open ends not permitted.
   2. Lay out so that at jambs and internal and external angles, the headers in alternate courses are at least 2 inches long. Use “Z shapes if necessary, especially with glazed masonry units.
   3. Lay units out so that no cut piece is less than 5 inches long; not less than 2 inches high
   4. Lay concrete units up suitable for painting. See finish schedules.

H. Prevent smearing mortar on surface of exposed units. If mortar smears occur, remove while soft.

I. Carefully cut faces of units for electrical or other outlets and cut-out backs for conduit and other piping. Where possible, use full-size units. Do not use portions of units shorter than four inches. Perform cutting with power-driven masonry saws.

J. Build partitions straight, plumb, true to line and uniform in thickness unless shown otherwise. Anchor partitions at junctions with CMU exterior walls using Z-type steel

anchors, rigid or corrugated, Z-bar anchors vertically 24 inches on center maximum unless otherwise shown. Use dovetail anchors spaced not over 16 inches on vertical centers where partitions abut concrete walls or concrete columns and steel framing anchors where partitions abut steel columns. Start partitions on concrete slabs and extend to structure above, except where shown to be erected only to ceiling.

K. Use CMU or precast lintels except where steel lintels are shown. Use precast lintels for four-inch CMU partitions. For other CMU partitions and walls, use lintels fabricated at plant or at jobsite from concrete-masonry lintel units. Provide eight-inch minimum bearing on adjacent masonry unless otherwise indicated.

L. Fill cells of CMU with mortar in accordance with Section 04050, adjacent to openings and around built-in and embedded items.did not see section 04050 in PW?

M. Place prefabricated continuous joint reinforcement in alternate horizontal joints above grade and each horizontal joint below grade. Terminate each side of expansion joints. Use specially fabricated sections at corners and intersections.

N. Fill cells solid with grout in accordance with Section 04050 where vertical reinforcement is installed within CMU walls.

O. Fill heads and jambs of hollow metal frames solid with mortar in accordance with Section 04050, as laying of units progresses.

P. Tooling joints:
   1. After mortar has attained initial set, finish and compact with non-staining metal jointing tool, forcing mortar tight against masonry units and closing all hair line cracks and crevices.
   2. All interior and exterior joints tooled concave type, except as stated below or noted otherwise.
      a. At wall faces to receive other facing materials having mortar backing, strike joints flush.
      b. At concealed joints and joints on cavity side of cavity walls, strike flush.

Q. Mortar Bedding in accordance with Section 04050:
   1. Hollow units shall be laid with full mortar coverage on horizontal and vertical face shells, except that webs shall also be bedded in all courses of piers, columns, and pilasters, and in the starting course of footings and solid foundation walls, and where adjacent to cells or cavities to be reinforced and/or filled with mortar or grout.
   2. Solid units laid with full head and bed joints.
   3. Masonry units:
      a. Laid in beds of mortar of such plasticity and fullness and spread with trowel so that pressing and shoving units will obviate dashing or slushing joints after units are laid. Mortar shall not be “furrowed”.
      b. In cavity walls, mortar shall be beveled on cavity side to prevent protruding mortar fins and subsequent dropping of mortar into cavity.

c. For interior and exterior faces of walls, prior to placing units, one end of each stretcher shall be fully covered with mortar.
d. For any wall thickness, leave no voids whatever, except space in cavity walls.

R. Top of Non-Loadbearing Partitions: Build non-loadbearing interior partitions full height of story to underside of solid floor or roof structure above, unless shown otherwise. Build as follows depending on the movement requirements of floor or structure above, and as shown:
1. Install fire resistant compressible filler in joint between top of partition and underside of structure above.
2. Fill top joint with mortar in accordance with Section 04050, after dead-load deflection of structure above approaches final position.

S. Installation of Masonry Accessories:delete portions which is not applicable
1. Wall anchors:
a. Space Z-type rigid-steel anchors at intersections of loadbearing CMU walls and control joints.
b. Space corrugated-steel anchors 16 inches on centers vertically at control joints located not more than two feet from intersections of CMU walls.
2. Steel framing anchors:
a. Install anchors to attach CMU walls to structural steel building frame at 16 inches on centers horizontally and vertically. Weld anchors to structural steel so as to achieve full strength of anchor system.
3. Soldier-course anchors:
a. Install corrugated-steel anchors in horizontal mortar joints of soldier coursing, except where continuous wall reinforcement is used. Space anchors 24 inches on centers horizontally.
4. Flashing:
a. Install flashing to provide positive keying to mortar.
5. Weep holes:
a. Install at two feet on centers at terminations of through-wall flashing, base flashings, lintels, or relief angles, and as shown.
6. Control joint gasket:
a. Install in sash-type CMU and between wythes in accordance with manufacturer's instructions and as shown. Seal weather side of control joints with sealant and backup rod as specified in Section 07920.

3.03 POINTING AND CLEANING

A. Pointing:
1. When approved, point holes in joints of exposed CMU masonry surfaces by completely filling with preshrunk mortar.
2. Point exposed raked joints of CMU masonry with mortar and tool to match approved samples panels.

B. Cleaning:

1. After pointing, wet and clean exposed CMU masonry surfaces with soap-and-water solution, applied with stiff-fiber brushes leaving masonry clean, free of mortar daubs and with tight mortar joints throughout. The use of acid is prohibited.
2. Allow masonry walls to cure at least three weeks in summer and five weeks in winter before cleaning.
3. Begin cleaning at top and work down.
4. Remove as much mortar from masonry as is possible by hand with wooden paddles and nonmetallic scraper hoes or chisels or stiff bristle brushes taking care not to deface masonry units.
5. Remove specific stains by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain present on exposed surfaces.
6. Clean surfaces thoroughly and carefully with specified cleaning solution.
7. Rinse and flush with clean water immediately after cleaning.
8. Leave work in clean condition, free from mortar stain or other defacement.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 05010

MAINTENANCE OF METALS

PART 1 GENERAL

1.01 SUMMARY

A. The work shall consist of providing the necessary labor, materials, equipment and supervision for the repair of welded connections as shown in the Contract Drawings.

1.02 RELATED SECTIONS:

A. Section 01550 – Access Roads, Parking Areas and Parking Controls

B. Section 01560 – Temporary Barriers and Closures

C. Section 05500 – Metal Fabrications

D. Section 09970 – Special Coatings for Steel

1.03 SUBMITTALS

A. Mill Certificates: Signed by manufacturers certifying that products furnished comply with requirements.

B. Welding Certificates: Copies of certificates for welding procedures and personnel.

C. Qualification Data: Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in welding connections similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to perform the required work.

B. Welding Standards: Qualify procedures and personnel according to the following:
   1. AWS D1.1, “Structural Welding Code – Steel”
   2. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and holds a current certification. Provide copies of welder certifications.

1.05 DELIVERY STORAGE AND HANDLING

A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.

B. Store materials to permit easy access for inspection and identification.

C. Keep steel members off ground by using pallets, platforms, or other supports.

D. Protect steel members and packaged materials from corrosion and deterioration.

E. Store fasteners in a protected place. Clean and lubricate bolts and nuts that have become dry or rusty before use.

F. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed by the AR.

1.06 SEQUENCING

A. Field Measurements:
   1. Where connections are indicated to fit to existing and other construction, verify all dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Job Conditions:
   1. Contractor shall perform all work while maintaining vehicular parking to site and within site that are not under construction in accordance with Section 01550 and Contract Drawings.
   2. Contractor shall provide adequate signalization in accordance with Section 01560 and Contract Drawings.

PART 2 PRODUCTS

2.01 FERROUS METALS

A. Steel plates, Structural Shapes, Shim Plates and Bars. ASTM A36.

B. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy to be welded.

C. Prime / Paint: Field primer and paint shall conform to the requirements listed in Section 09970.

PART 3 EXECUTION

3.01 PREPARATION

A. Provide temporary shores, guys, braces, and other supports to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary shoring after repairs are approved by the Quality Control Engineer.

B. Clean and sand blast all surfaces to be welded. Remove loose rust, mill scale, slag, dirt, dust, and other debris.

C. Check existing connections for failed welds, corrosion, section loss of plates, or other defects and report findings to the Quality Control Engineer.

D. Utilize existing weld plates where possible. Replace plates if section loss exceeds 25% or if directed by the Quality Control Engineer. Replace weld plates in accordance with Section 05500.

E. Grind base metal surfaces to remove corrosion, coatings or debris prior to welding. Weld immediately thereafter.

3.02 FIELD WELDING

A. Comply with AWS code for procedures of manual shield metal – arc welding, appearance and quality of welds made, method used in correction welding work, and 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. Grind smooth exposed fillet welds Y2 inch and larger. Grind flush butt welds. Dress exposed welds.
   4. Remove welding flux immediately. All field welds shall be inspected and tested in accordance with AWS D1.1.
   5. Clean and prime all field welds in accordance with Section 09970.
   6. Fill all weld pockets with polyurethane sealant in accordance with Section 07920.

3.03 QUALITY ASSURANCE COMPLIANCE

A. The Contractor shall prepare a contract quality assurance program based on the requirements for work plans, submittals and other quality assurance and quality control articles contained in this Contract. The program shall consist of the plans, procedures and organization necessary to provide inspection, testing (unless otherwise specified), and verification that materials, equipment, workmanship, fabrication, construction and operations comply with the Contract requirements. The Quality Assurance Program, and the name and qualifications of the person within the Contractor's organization responsible for managing the approved Quality Assurance Program, shall be submitted to the AR. Work will not be permitted nor will progress payments made, until the Contractor's Quality Assurance Program and Quality Assurance Manager are approved for that portion of work by the AR.

B. To assure the Contractor compliance with and conformance to the approved Contractor's Quality Assurance Program, the program will be subject to quality audits. Audits will be scheduled by the AR as required.

C. Inspections: Contractor will engage an independent Certified Welding Inspector (CWI) to perform field inspections and tests and prepare tests reports. CWI will conduct and interpret tests and state in each report whether tested work complies

with or deviates from specified requirements. Deficiencies noted in inspections and test report; which do not comply with specified requirements will be corrected at the Contractor's expense. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

D. Visually inspect field-welded connections. In addition to visual inspections, field-welded connections may be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option:

E. Magnetic Particle Inspection: ASTM E 709
   1. Magnetic Particle inspection: ASTM E 709, performed on root pass and on finished weld. Cracks or zones with incomplete fusion or penetration will be accepted.
   2. 7. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T".
   3. Ultrasonic Inspection: ASTM E 164.

3.04 CLEANING

A. Remove all debris from the site.

END OF SECTION

Adjust header

SECTION 05100

STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SUMMARY

A. This work shall consist of furnishing all labor, materials, equipment and incidentals necessary for repairs to existing structural steel or installation of new structural steel as directed by the AR in the field. The work shall also include the furnishing, installing, maintaining and removing any shoring, as required, related to the work specified above.

1.02 RELATED WORK:

A. Section 09970 – Special Coatings for Steel

B. Section 02250 – Shoring

1.03 REFERENCES

A. American Institute of Steel Construction:

B. AISC 360 - Specification for Structural Steel Buildings.

C. ASTM International:delete metric callouts typ.
   1. ASTM A36- Standard Specification for Carbon Structural Steel.
   2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   3. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
   4. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   5. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   6. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
   7. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
   8. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
   9. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
   10. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.

Adjust header

11. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.
12. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
13. ASTM E164 - Standard Practice for Ultrasonic Contact Examination of Weld elements.
14. ASTM F436 - Standard Specification for Hardened Steel Washers.
15. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

D. American Welding Society:
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
2. AWS D1.1 - Structural Welding Code - Steel.

E. SSPC: The Society for Protective Coatings:
1. SSPC SP 3 - Power Tool Cleaning.
2. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

1.04 SUBMITTALS

A. Submit in accordance with General Provisions for Construction and details shown on the drawings and the specifications.

B. Shop Drawings:
1. Submit shop drawings for shoring system, if required, which clearly indicate profiles, sizes spacing and locations of shoring members, connections, attachments, anchorages, framed openings, size and type of fasteners, cambers, and clearances.
2. Indicate profiles, sizes, spacing, and location of structural members, openings, attachments, and fasteners.
3. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
4. Identify all bolted connection locations with the type, number and size of bolts and the connection type.

C. Erection Procedure: Submit description data to illustrate the installation procedure of structural steel work. Obtain field measurements where necessary for fabrication and installation of the work. Exact measurements are the Contractor's responsibility.

D. Mill Test Reports: Submit indicating structural strength, destructive and non-destructive test analysis.

E. Welders Certificates: Submit for welders employed on the Work, verifying AWS qualification within previous 12 months.

Adjust header

F. Welding Procedure: Submit written description as required to illustrate each welding procedure to be performed in the specified work.

1.05 QUALITY ASSURANCE

A. Welder Qualifications: Welding shall be done only by currently certified welding operators qualified according to AWS D1.1.

B. Testing Agency: Testing and inspection shall be made as required, by an approved testing laboratory selected and paid by the Owner. Contractor shall furnish testing agency access to work, facilities and incidental labor required for testing and inspection. Such inspections and tests will not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

C. Codes and Standards: Comply with the provisions of the following except as otherwise indicated:

1. AISC "Code of Standard Practice for Steel Building and Bridges".
2. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings".
3. AWS D1.1 "Structural Welding Code".
4. Appropriate specifications of the American Society for Testing and Materials.

D. The work in this section should comply with all applicable provisions of the state and local building and safety codes and any other codes referenced therein.

E. Any material or operation specified by reference to the published specification of a manufacturer shall comply with the requirements of the latest edition of the standards listed herein. In case of conflict between the referenced specification and the project specifications, the project specifications shall govern.

1.06 QUALIFICATIONS

A. Fabricator: Company specializing in performing Work of this section shall have minimum three years documented experience with the following current AISC Certification:
1. Standard Steel Building Structures (STD).

B. Erector: Company specializing in performing Work of this section shall have minimum three years documented experience with the following current AISC Certification:
1. Certified Steel Erector (CSE).

C. Shop Painter: Company specializing in performing Work of this section shall have minimum three years documented experience.

Adjust header

D. Welders and Welding Procedures: AWS D.1 qualified within previous 12 months.

1.07 SEQUENCING

A. Field Measurements - Verify all dimensions of other construction by field measurements before and after fabrication to ensure proper fit. Report discrepancies in existing construction to AR. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 PRODUCTS

2.01 STRUCTURAL STEEL

A. Structural W-Shapes: ASTM A992 delete metric callouts typ.

B. Structural M-Shapes: ASTM A36/A36M.

C. Structural S-Shapes: ASTM A36/A36M.

D. Structural T-Shapes: Cut from structural W-shapes, M-shapes, or S-shapes.

E. Channels and Angles: ASTM A36/A36M.

F. Round Hollow Structural Sections: ASTM A500, Grade B.

G. Square and Rectangular Hollow Structural Sections: ASTM A500, Grade B.

H. Structural Pipe: ASTM A53/A53M, Grade B.

I. Structural Plates and Bars: ASTM A36/A36M.

J. Floor Plates: ASTM A786/A786M; diamond raised pattern.

2.02 FASTENERS, CONNECTORS, AND ANCHORS

A. High Strength Bolts: ASTM A325; Type 1 or ASTM A490; Type 1.
   1. Finish: Hot dipped galvanized, unless otherwise indicated.

B. Nuts: ASTM A563 heavy hex type.
   1. Finish: Hot dipped galvanized, unless otherwise indicated.

C. Washers: ASTM F436; Type 1, circular. Furnish clipped washers where space limitations require.
   1. Finish: Hot dipped galvanized, unless otherwise indicated.

Adjust header

D. Anchor Rods: ASTM F1554; Grade 55, weldable.
   1. Shape: As indicated on Drawings.
   2. Plate Washers: ASTM A36/
   3. Stainless steel threaded rods furnished with chamfered ends so that either end will accept a nut and washer. Anchor rods shall be manufactured to meet the requirements of ASTM F593.
   4. Anchor rod epoxy: Two-component manufactured for anchoring stainless-steel anchor rods to hardened concrete conforming to ASTM C881, Type IV, Grade 3, Class A, B, or C. Get time requirements of ASTM C881 waived. Embedment depth shall be sufficient to develop the ultimate shear strength of the rod embedded based on the manufacturer's test data for an assumed existing concrete compressive strength of 4,000 psi. Embedment lengths may be interpolated between concrete compressive strengths if approved by the manufacturer.

E. Threaded Rods: ASTM A36/A36M.
   1. Finish: Hot dipped galvanized, unless otherwise indicated.

F. Forged Structural Steel Hardware:
   1. Clevises and Turnbuckles: ASTM A108; Grade 1085.
   2. Eye Nuts and Eye Bolts: ASTM A108; Grade 1030.
   3. Sleeve Nuts: ASTM A108; Grade 1018.
   4. Rod Ends, Yoke Ends and Pins, Cotter Pins, and Coupling Nuts: Carbon steel.

G. Expansion Anchors shall be Hilti Kwik Bolts as manufactured by HILTI , P.O. Box 21148, Tulsa, OK 74121 TEL. (918) 252-6000 or approved equal.

2.03 WELDING MATERIALS

A. Welding Materials: AWS D1.1; type required for materials being welded.

2.04 ACCESSORIES

A. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing minimum compressive strength of 7,000 psi at 28 days.

B. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20.

2.05 FABRICATION

A. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

B. Fabricate connections for bolt, nut, and washer connectors.

C. Develop required camber for members.

Adjust header

2.06 FINISH

A. Prepare structural component surfaces in accordance with SSPC SP 3.

B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted. Primer/Paint: Shop applied primer and field painting shall conform to the requirements listed in Section 09970.

C. Galvanizing for Structural Steel Members: ASTM A123/A123M; minimum 1.2 oz./sq. ft. coating thickness; galvanize after fabrication.

D. Galvanizing for Fasteners, Connectors, and Anchors:
   1. Hot-Dipped Galvanizing: ASTM A153/A153M.
   2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

2.07 SOURCE QUALITY CONTROL AND TESTS

A. Shop test bolted and welded connections as specified for field quality control tests.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify bearing surfaces are at correct elevation.

C. Inspection: Exact measurements of the field dimensions for proper shop-fabrications are the Contractor's responsibility. Wherever the repair details shown on the drawings are not applicable, the Contractor shall identify the locations on the shop drawings and submit proposed details for an approval by the Consultant. Any changes of fabrication and/or installation of the support assembly from the approved details on the shop drawings submitted due to the Contractor's negligence of the detail inspection specified herein shall be the Contractor's responsibility. The cost of the above mentioned changes shall be borne by the Contractor with no extra cost to the Owner at all.

D. Provide temporary shoring in accordance with Section 02250.

E. Clean all surfaces where new connections are to be installed. Areas shall be free of all dirt dust and other debris.

F. Test fit pre-fabricated connection at the center of each double tee along the sliding side of the expansion joint prior to installation. Report any discrepancy to the Quality Control Engineer

Adjust header

3.02 FABRICATION

A. No work shall be fabricated or delivered prior to approval of the shop drawings.

B. Fabricate structural steel in compliance with the governing Building Code and the AISC "Code of Standard Practice", with modifications and additional requirements specified in this section. Where a conflict occurs between the standards specified above and the Building Code, the Building Code shall apply.

C. Fabricate and assemble structural assemblies as required in the shop to the greatest extent possible.

D. Properly mark and match-mark materials for field assembly.

3.03 SHOP WELDING

A. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

B. Obtain fusion without undercut or overlap.

C. Grind smooth exposed fillet welds 1/2 inch and larger. Grind flush butt welds. Dress exposed welds.

D. Remove welding flux immediately. All welds shall be inspected and tested in accordance with AWS D1.1.

3.04 ERECTION

A. Do not proceed with the work specified in this section until the shop drawings have been approved and any unsatisfactory conditions, if any, have been corrected in a manner acceptable to the Installation Contractor.

B. Furnish and install temporary shoring and bracing system as required and approved by the Consultant. Remove them as soon as the work specified in this Section has been finished.

C. Field connections: Bolted connections or other connections are indicated. Welded Construction shall comply with AWS Code.

D. High-Strength bolted construction shall be in accordance with AISC "Specifications for structural Joints using ASTM A-325 or A-490 Bolts."

3.05 FIELD QUALITY CONTROL

Adjust header

A. Materials and fabrication procedures are subject to inspection and tests, as required, in the mill, shop and field, conducted by the qualified and approved Testing Laboratory. Such inspections and tests will not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

B. Correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with specified requirements. The cost of retests shall be borne by the Contractor.

C. All bolted connections that fail shall be corrected and retested. The cost of retesting of the connections shall be borne by the Contractor.
   1. Visually inspect epoxy adhesion of threaded rods into concrete. Do not remove existing connections until new connections are found acceptable and approved by the Quality Control Engineer.

D. All welds that fail shall be re-welded and retested until passing. The cost of all retesting shall be borne by the Contractor.
   1. Inspections: Contractor will engage an Independent Certified Welding Inspector (CWI) to perform weld inspections and tests and prepare test reports. CWI will conduct and interpret tests and state in each report whether tested work complies with or deviates from specified requirements. Deficiencies noted in inspections and test reports which do not comply with specified requirements will be corrected at the Contractor's expense. Additional testing, at Contractor's expense will be performed to determine compliance of corrected work with specified requirements.
   2. Visually inspect welded connections. In addition to visual inspection, welds may be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.
      a. Liquid Penetrant Inspection: ASTM E 165.
      b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
      c. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T".
      d. Ultrasonic Inspection: ASTM E 164.

3.06 CLEANING

A. Remove all debris and waste materials from the site

END OF SECTION

SECTION 05500
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel and/or metal items including but not limited to: bollards, brackets, hangers, pre-fabricated frames, anchors, outriggers, stair nosings, fasteners and touch up paint

1.02 RELATED SECTIONS

A. Section 08110 – Hollow Metal Doors and Frames

B. Section 08120 – Aluminum Doors and Frames

C. Section 09900 - Painting and Coating

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels ; 2005.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel ; 2008.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products ; 2009.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware ; 2009.

E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates ; 2003 (Reapproved 2007).

F. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength ; 2009a.

G. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric) ; 2009.

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process ; 2010.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength ; 2010

J. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings ; 2002 (Ed. 2004).

K. K. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings ; 1982 (Ed. 2004).

1.04 SUBMITTALS

A. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections, profiles and miscellaneous shapes: ASTM A36/A36M.

B. Plates: ASTM A283.

C. Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1 , galvanized to ASTM A153/A153M where connecting galvanized components.

D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

E. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by intermittent welds and plastic filler.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FINISHES – STEEL

A. Prime paint all steel items.
   1. Exceptions: Galvanize items to be imbedded in masonry.
   2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.04 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Perform field welding in accordance with AWS D1.1/D1.1M.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

D. After erection, prime welds, abrasions , and surfaces not shop primed or galvanized , except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 07180

TRAFFIC COATINGS

PART 1 GENERAL

1.01 SUMMARY

A. The work shall consist of providing the necessary labor, materials, equipment, and supervision for installation of a new traffic bearing topping on concrete surfaces as indicated in Contract Drawings.

B. This specification describes the application of a seamless waterproofing membrane resistant to specified traffic wear exposures. The specified products shall meet or exceed requirements of ASTM C957, High-Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with Integral Wearing Surface.

C. Description of System
   1. The traffic bearing topping will be a complete system of compatible materials from one manufacturer to create a seamless waterproof coating.
   2. The traffic bearing topping will be applied to the structural deck on the top level (roof level) and the ramps leading to the roof that are exposed as indicated in the Contract Drawings. In addition, the ramps leading to the roof shall receive a traffic bearing topping of at least 30 feet into areas that are not exposed. The traffic bearing topping will also be installed within stairwells, stairs and intermediate landings. Turn-ups and terminations shall be installed as shown on Contract Drawings.

1.02 RELATED SECTIONS

A. Section 01550 – Access Roads, Parking Areas and Parking Controls

B. Section 01560 – Temporary Barriers and Closures

C. Section 03010 – Maintenance of Concrete

D. Section 07190 – Water Repellents

E. Section 07920 – Joint Sealants

F. Section 09910 – Traffic Stripping and Painting

1.03 QUALITY ASSURANCE

A. Manufacturing qualifications:

1. The manufacturer of the specified product shall be ISO9001/002 certified and have in existence a recognized ongoing quality assurance program independently audited on a regular basis.
2. The manufacturer shall have in existence for a minimum of ten (10) years a program of training, certifying and technically supporting a nationally organized Licensed Applicator Program.
3. Manufacturer shall provide evidence showing that specified materials have been manufactured by the same source and successfully installed on a yearly basis for a minimum of ten (10) years.

B. Contractor qualifications:
1. Contractor shall be qualified in the field of concrete repair and protection with a successful track record of 5 years or more. Contractor shall maintain qualified personnel who have received product training by a manufacturer's representative. Contractor will provide a certification of product training at the time of bid.
2. Applicator will be a Licensed Applicator of the manufacturer of the specified product who has completed a formal program of instruction in the use of the specified vehicular traffic topping system. Applicator shall have been a Licensed Applicator of the specified product for a minimum of three (3) years. Applicator will provide a certification attesting to their Licensed Applicator status at the time of bid.

C. Install materials in accordance with all safety and weather conditions required by manufacturer or as modified by applicable rules and regulations of local, state and federal authorities having jurisdiction. Consult Material Safety Data Sheets for complete handling recommendations.

1.04 REQUIREMENTS OF REGULATORY AGENCIES

A. The traffic bearing topping system shall be rated Class A by Underwriters Laboratories (ASTM E108/UL 790).

B. Materials used in the traffic bearing topping system shall meet existing solvent emission regulations (i.e. California Rule 66).

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's product literature, standard color samples and installation instructions and details, Product Data Sheet, and appropriate Material Safety Data Sheets (MSDS).

B. Submit three 2' x 2' samples of specified traffic bearing topping system. Samples shall be constructed as examples of finished color and texture of traffic bearing topping system only.

C. License Certificate: Submit a currently dated Applicators Certificate issued by the manufacturer. The certificate shall verify the applicator's qualifications to properly install the traffic bearing topping system and shall commit the manufacturer as a co-

signer under the joint responsibility provisions of the guarantee required by these specifications.

D. Guarantee: Upon completion of installation of the traffic bearing topping system, submit a joint manufacturer/applicator Guarantee certificate.
   1. Guarantee requirements: The materials and workmanship involved in this application shall be guaranteed on a single document signed by the manufacturer and Licensed Applicator for a period of five (5) years. In accordance with the provisions of the guarantee, ruptures caused by cracking of the substrate up to 1/16” in width are covered; otherwise no liability is assumed for defects in the substrate.

1.06 DELIVERY, STORAGE AND HANDLING

A. All materials must be delivered in original, unopened containers with the manufacturer’s name, labels, product identification, and batch number. Containers shall bear UL labels.

B. Damaged material must be removed from the site immediately.

C. Store all materials off the ground and protect from rain, freezing or excessive heat until ready for use. Do not store for long periods of time in direct sunlight.

D. Handle products to avoid damage to container.

E. Product shall be stored in conditions as recommended by the manufacturer.

1.07 JOB CONDITIONS

A. Environmental Conditions:
   1. Do not apply material if it is raining or snowing or if such conditions appear to be imminent. Minimum application temperature is 40 ºF (5 ºC) and rising.
   2. Do not apply materials unless surface to receive topping is clean and dry or if precipitation is imminent.
   3. Avoid dew point conditions during application, relative humidity must be no more than 95%and substrate temperature must be at least 5 ºF (3 ºC) above measured dew point temperature.
   4. Maximum moisture content of substrate: 4% by weight.

B. Protection:
   1. Warn personnel against breathing vapors and contact of materials with skin or eyes.
   2. In confined areas workmen shall wear approved chemical-cartridge type masks.
   3. Wear protective clothing.
   4. Keep products away from heat, sparks and flames. Do not allow use of spark producing equipment during application and until vapors are gone. Post "No Smoking" signs.

5. After completion of application do not allow traffic on coated surfaces for a period of at least 48 hours at 75 degrees F and 50% relative humidity or until completely cured.
6. Protect plants, vegetation and animals which might be affected by coating. Use drop cloths or masking as required.
7. Precautions should be taken to avoid damage to any surface near the work zone due to mixing and handling of the specified coating.

C. Construction:
1. Contractor shall perform all work while maintaining vehicular parking to site and within site that are not under construction in accordance with Section 01550 and Contract Drawings.
2. Contractor shall provide adequate signalization in accordance with Section 01560 and Contract Drawings.

1.08 PRECONSTRUCTION CONFERENCE

A. Prior to starting work under this section, the Contractor, any subcontractors, manufacturer's representative, Quality Control Engineer and AR shall meet to review substrate preparation, application procedures, testing procedures and special project requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sikalastic 720 and 745 Traffic System, as manufactured by Sika Corporation, 201 Polito Ave., Lyndhurst, NJ 07071, is considered to conform to the requirements of this specification or approved equal.

B. Any materials required for repair prior to installation shall be manufactured by the same supplier of the proposed traffic bearing topping system.

C. Specifications and drawings are based on manufacturer’s proprietary literature from Sika Corporation. Products from other manufacturers shall comply with minimum levels of materials and detailing indicated in Specifications Section 07180 and Contract Drawings. AR will be the sole judge of equivalency.

2.02 MATERIALS

A. Traffic Bearing Topping Material:
1. Primer: Two-part epoxy primer designed for concrete and metal flashings.
2. Liquid flashing: Manufacturer’s recommended elastomeric liquid flashing.
3. Aggregate: shall be clean, rounded, oven sized quartz with a minimum uniformly gradation of 16-30 mesh for vehicular traffic, and a minimum hardness of 6.5+ on Moh’s scale or approved by manufacturer. Aggregate shall be supplied in pre-packaged bags and free of metallic or other impurities.
4. Elastomeric Coating Material: Coating shall comply with ASTM C957 and be a

single component, moisture cured, low odor polyurethane coating system

(Heavy Duty) with integral wearing surface. Color selected from manufacturer's standard color by the Authority.

5. Sealant: Sealant shall be a polyurethane material as specified in Section 07920 and as approved by the Vehicular Traffic Bearing Topping Material manufacturer.

B. Approved product: Sikalastic 720 Base and Sikalastic 745 AL

C. Total dry film thickness exclusive of aggregate shall be 33 mils for pedestrian traffic, 43 mils for heavy pedestrian and light vehicular traffic, and 55 mils for heavy vehicular traffic. See data sheet System Guide for coverage rates and application methods.

2.03 PERFORMANCE CRITERIA

A. Properties of standard Sikalastic base and top coats:

	720 Base	745 Top
Total Volume Solids (ASTM D2697)	100%	100%
VOC Content (ASTM D2369-81)	< 15 g/l	73.6 g/l
Tensile Strength (ASTM D412)	2500 +/- 100 psi	3200 +/- 300 psi
Elongation at Break (ASTM D412)	800 +/- 50%	450 +/- 45%
Tear Resistance (Die C, ASTM D624)	300 +/- 25 pli	300 +/- 30 pli
Hardness (ASTM D2240)	80 +/- 5 Shore A	85 +/- 5 Shore A
UV Resistance and Recovery from Elongation (ASTM C-957)		PASS

PART 3 EXECUTION

3.01 DEMOLITION AND INSPECTION

A. Concrete: Verify that the work done under these sections meets the following requirements:
   1. Perform all required demolition and removal of existing construction required to permit installation of the coating system.
   2. Verify that the concrete deck surface is free of ridges and sharp projections. Grind concrete surfaces as required to remove ridges and sharp projections.
   3. Verify that the concrete has cured for a minimum of 28 days. The use of concrete curing agents, if any, shall require written approval by the manufacturer. Curing agents used shall be removed prior to installation of the coating, if required by the manufacturer.

3.02 SURFACE PREPARATION

A. The substrate must be clean, dry, sound and free of surface contaminants. Remove all traces of dust, laitance, grease, oils, curing compounds, form release agents and foreign particles by mechanical means, i.e. – milling, scarifying, shot blasting, etc., as approved by the AR. Blow surface free of dust using compressed air line equipped with an oil trap Surface Preparation. Surface must be clean, dry and sound with an open texture. Remove dust, laitance, grease, curing. All projections, rough spots, etc. should be dressed off to achieve a level surface prior to the application. Installer shall use a moisture meter to verify moisture levels in substrate at time of preparation and application of traffic bearing topping.

B. Concrete should be cleaned and prepared to achieve a laitance contaminant free, open textured surface by blast cleaning or equivalent mechanical means (CSP 3-4 per ICRI guidelines).

C. Plywood should be clean and smooth, APA and exterior grade, not less than ½" thick, and spaced and supported according to APA guidelines. Seams should be sealed with Sikaflex 2c or 1a and detailed and may need embedded fabric reinforcement.

D. Metal should be thoroughly cleaned by grinding or blast cleaning

E. Cracks and cold joints: Visible hairline cracks in concrete and cold joints shall be cleaned, primed and treated with polyurethane deck coating material as recommended by bearing traffic topping manufacturer. Cracks 1/16 inch wide and larger shall be routed and sealed with polyurethane sealant in accordance with the procedures of Section 03010. The polyurethane sealant material shall be as specified in this Section. Sealant shall be applied to inside crack only, not applied to deck surface. Detail sealed crack with polyurethane deck coating material as recommended by traffic bearing topping manufacturer.

F. Control joints: Rout and seal control joints with polyurethane sealant in accordance with the procedures of Section 03010. The polyurethane sealant material shall be as specified in this Section.

G. Elevation Tolerances: Grind and dress edges of concrete double tee flanges and beam edges to within 1/16" in elevation at the following locations:
   1. Concrete double tee flange-to-flange interfaces.
   2. Concrete double tee flange to concrete inverted tee interfaces.
   3. Concrete double tee flange to concrete "L" beam interfaces.

H. Wall Terminations and Expansion Joints: Install saw cuts and sealant cants as detailed in the Contract Drawings. The coating system primer, base coat and top coat shall be installed as detailed in the Contract Drawings.

I. Surface condition: Surface shall be clean and dry prior to coating.

3.03 APPLICATION AT HORIZONTAL DECK SURFACES

A. Coordinate application of urethane membrane coating with application of water repellent coating (Section 07190).

B. Coordinate application of urethane membrane coating with traffic striping and pavement markings as per Section 09910.

C. Apply system in accordance with the manufacturer's specifications, if different from the following requirements. The system shall be applied to obtain the following minimum system thickness.

D. Traffic Bearing Urethane Topping: An average of 52 dry mils nominal thickness, exclusive of aggregate.

E. At drains, clean and prime the throat of the drain. Extend the coating system into the drain throat.

F. Coating system shall be turned up at parapet walls and ramp walls.

3.04 PRIMING

A. Concrete and plywood – Apply Sikafloor FTP primer at 300 sf./gal. with a flat squeegee or roller and work well into the substrate to insure adequate penetration and sealing and puddles are avoided. Refer to data sheet for detailed information, or consult Sika for other primer options.

B. Premix both components. Apply and cure primer according to manufacturer's instructions.

C. Metal – Consult Sika regarding primer.

3.05 DETAILING

A. Non-structural cracks up to 1/16 inch - Detail according to manufacturer's instructions.

B. Cracks and joints over 1/16 inch up to 1 inch – Detail according to manufacturer's instructions.

C. Joints over 1 inch – Detail according to manufacturer's instructions.

3.05 BASE COAT

A. Premix Sikalastic 720 Part A and Part B in accordance with manufacturer's instructions. Apply and allow to cure according to manufacturer's instructions

3.06 TOP COATS

A. Premix Sikalastic 745 Part A and Part B in accordance with manufacturer's instructions. Apply and allow to cure according to manufacturer's instructions.

3.07 MOCK-UP

A. A 4 ft. by 4 ft. job site mock-up at each site is required prior to the installation of the traffic bearing topping to confirm acceptability of workmanship, material coverage rates and aesthetics. Mock-up will be tested for proper adhesion. Do not start membrane installation until mock-up has been accepted.

3.08 QUALITY CONTROL

A. The Quality Control Engineer shall verify surface preparation, crack preparation, detail coat application, wet mil application thickness and aggregate application rates.

3.09 CLEANING

A. Uncured materials can be removed from tools or other surfaces with an approved solvent. Cured materials can only be removed by mechanical means.

B. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

C. Remove debris resulting from completion of coating operation from the project site.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 07190 WATER REPELLENTS

WATER & OIL STAIN REPELLENTS

PART 1 GENERAL

1.01 SUMMARY

A. The work to be performed includes furnishing all labor, materials, and equipment necessary to apply the specified surface treatment to horizontal concrete surfaces of elevated concrete decks, with the exception of those on the top level.

B. The coating will be applied to the ramps leading to the elevated concrete decks with the exception of the top level.

C. Section Includes:
   1. Alkylalkoxysilane penetrating water repellent sealer for exterior above grade horizontal or vertical surfaces as scheduled.

1.02 RELATED SECTIONS:

A. Section 01400 – Quality Control and Assurance Requirements

B. Section 01550 – Access Roads, Parking Areas and Parking Controls

C. Section 01560 – Temporary Barriers and Closures

D. Section 07180 – Traffic Coatings

E. Section 09910 – Traffic Stripping and Painting

1.03 SUBMITTALS

A. Contractor shall submit the following items to the AR prior to construction:
   1. A copy of the applicator’s certification issued by the manufacturer.
   2. Product Data: Submit the sealer manufacturer's technical data sheets and LEED product information for each product. Include generic description, surface preparation and application instructions.
   3. MSDS Sheets indicating safety precautions.
   4. Manufacturer’s Quality Assurance: Submit manufacturer’s certification that coatings comply with specified requirements and are suitable for intended application.
   5. Warranty: Submit manufacturer’s standard warranty form with authorized signatures and endorsements.
   6. Submit list of project references as documented in this Specification under Quality Assurance Article. Include contact name and phone number of person charged with oversight of each project.
   7. Quality Control Submittals:
      a. Provide protection plan of surrounding areas and non-work surfaces.

1.04 QUALITY ASSURANCE

A. Comply with Section 01400.

B. Qualifications:
   1. Manufacturer Qualifications: Company with minimum 15 years of experience in manufacturing of specified products.
   2. Manufacturer Qualifications: Company shall be ISO 9001:2000 Certified.
   3. Manufacturer shall be able to demonstrate successful performance on comparable projects.
   4. Applicator Qualifications: Company with minimum of 5 years experience in application of specified products on projects of similar size and scope, and is acceptable to product manufacturer.
      a. Successful completion of a minimum of 5 projects of similar size and complexity to specified Work.
      b. Applicator will be a licensed Applicator of the manufacturer of the specified product who has completed a formal program of instruction in the use of the specified water repellant coating system.
      c. Applicator will provide certification attesting to their Licensed Applicator status at time of bid.

C. Pre-application Meeting: Convene a pre-application meeting two (2) weeks before start of application of coating systems. Require attendance of parties directly affecting work of this section, including Contractor, Quality Control Engineer, applicator, and manufacturer's representative. Review the following:
   1. Environmental requirements.
   2. Protection of surfaces not scheduled to be coated.
   3. Surface preparation.
   4. Application.
   5. Repair.
   6. Field quality control.
   7. Cleaning.
   8. Protection of coating systems.
   9. Coordination with other work.

D. Field Sample:
   1. Install at Project site or pre-selected area of building an area for field sample (mock-up), as directed by Quality Control Engineer or AR.
      a. Provide mockup of at least Five (5) by Five (5) feet minimum to include surface preparation, sealant joint, and juncture details and allow for evaluation of repellent performance and finish.
      b. Mock-up Substrate: Horizontal concrete surfaces.
      c. Maintain mock-up during construction for workmanship standard.
      d. Mock-up may be incorporated into final construction upon Quality Control Engineer/AR approval.
      e. Field sample will be standard for judging workmanship on remainder of Project.

f. Obtain Quality Control Engineer or AR written approval of field sample before start of material application, including approval of aesthetics, color, texture, and appearance.
g. Conduct absorption test on cured field sample. Adjust application until required repellent performance is achieved.
h. Apply material in accordance with manufacturer's written application instructions.

2. Manufacturer's representative or designated representative will review technical aspects; surface preparation, application, and workmanship.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle and protect all products in accordance with the manufacturer's recommendations.

B. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

C. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Store in unopened containers in clean, dry area between 35 degrees F (2 degrees C) and 110 degrees F (43 degrees C).

1.06 PROJECT CONDITIONS

A. Environmental Requirements:
1. Follow all Material Safety Data Sheet instructions as they pertain to Environmental Conditions and Personal Protection.
2. Compliance: Follow manufacturer's instructions with regard to safety, health, and other related environmental precautions. Comply with all applicable Federal, State, and Local Environmental Regulations.

B. Protection:
1. Warn personnel against breathing vapors and contact of materials with skin or eyes.
2. In confined areas workmen shall wear approved chemical-cartridge type masks.
3. Wear protective clothing.

4. Keep products away from heat, sparks and flames. Do not allow use of spark producing equipment during application and until vapors are gone. Post "No Smoking" signs.

C. Construction:
1. Contractor shall perform all work while maintaining vehicular parking to site and within site that are not under construction in accordance with Section 01550 and Contract Drawings.
2. Contractor shall provide adequate signalization in accordance with Section 01560 and Contract Drawings.

1.07 REFERENCE STANDARDS

A. ICRI Guideline No. 03732 – "Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays", January 1997.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, provide products from the following manufacturers:
   1. BASF Building Systems:
      889 Valley Park Drive
      Shakopee, MN 55379
      Customer Service: 800-433-9517
      Technical Service: 800-243-6739
      Direct Phone: 952-496-6000
      Internet: www.BASFbuildingsystems.com

   2. Vexcon Chemicals Inc.
      7240 State Road
      Philadelphia, PA 19135
      Customer Service: 888-839-2661
      Internet: www.vexcon.com

   3. Sika Corporation.
      201 Polio Ave.
      Lyndhurst, NJ 07071
      Customer Service: 800-933-7452
      Internet: https://usa.sika.com

   4. Or Approved Equal

B. Specifications and Drawings are based on manufacturer's proprietary literature from BASF Building Systems. Other manufacturers shall comply with minimum levels of material and detailing indicated in Specifications or on Drawings. AR will be sole judge of appropriateness of substitutions.

2.02 MATERIALS

A. Clear, breathable, 100 percent alkylalkoxysilane penetrating sealer. Penetrates deeply and chemically reacts with concrete to form long-lasting water-repellent surface.
   1. Acceptable Product: Hydrozo 100 by BASF Building Systems.
   2. Sikaguard – 705 OWR
   3. Or approved equal.

2.03 PERFORMANCE REQUIREMENTS

A. Sealer shall have the following minimum performance:
   1. Active Alkylalkoxysilane Content by Weight: 100 percent.
   2. Penetration, average depth, depending upon substrate: 0.20 inch (5 mm).
   3. Surface Appearance After Application: Unchanged.
   4. Flash Point, SETA, IPA: 53 degrees F (12 degrees C).
   5. Waterproofing After Abrasion, Alberta Transportation and Utilities Type 1B, 225 sf. per gal. (5.6 m2/L): 88.4 percent.
   6. Resistance to Chloride:
      a. Criteria of 1.5 at 1/2 inch: Less than 0.2 lb. per cy.
      b. Criteria of 0.75 at 1 inch: 0.00 lb. per cy.
   7. Water Weight Gain, NCHRP 244 Series II Cube Test, 200 sf. per gal (5 m2/L): 86 percent, exceeds criteria.
   8. Absorbed Chloride, NCHRP 244 Series II Cube Test, 200 sf. per gal (5 m2/L): 92 percent, exceeds criteria.
   9. Absorbed Chloride, NCHRP 244 Series IV Southern Climate, 200 sf. per gal (5 m2/L): 99 percent, exceeds criteria.
   10. Moisture-Vapor Transmission Rate, OHD-L-35: 102 percent.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's most recently published technical bulletins including installation instructions, substrate testing, and surface preparation and cleaning, and post installation testing.

3.02 EXAMINATION

A. Verify substrate conditions are acceptable for water repellent system installation accordance with manufacturer's instructions.
   1. General: Determine acceptable removal techniques for contaminants harmful to water repellent performance, such as dust, dirt, grease, oils, curing compounds, form release agents, laitance, efflorescence, existing films and other water repellent coatings.
   2. Concrete: Verify concrete substrates have cured to full load bearing capacity (14-28 days).

3.03 SURFACE PREPARATION

A. A. Surfaces to be treated will be cleaned of dust, dirt, oil, grease, coatings, debris and other contaminants in accordance with procedures outlined in Section 3.03 D

B. Perimeter of areas to be coated shall be masked, to avoid coating adjacent surfaces. Protect adjacent work areas and finish surfaces from damage during water repellent system installation.

C. All caulking, patching, and joint sealing shall be completed prior to application of the penetrating concrete sealer.

D. Prior to installation, clean substrates that could impair penetration or reaction of water repellent system. Coordinate cleaning and application to avoid contamination of newly treated surfaces. Prepare surfaces in accordance with manufacturer's instructions and as follows:
   1. The slab surface shall be broom swept to remove heavy dust and/or debris. Soiled or grease stained surfaces to be sealed shall be cleaned with SureKlean degreaser and etch, as follows:
      a. Wet the area to be cleaned.
      b. Dilute degreaser and etch per the manufacturer's specifications and apply to the stained areas by brush or spray.
      c. Allow solution to stand, then apply a second coat and scrub the area with a stiff bristle brush.
      d. Rinse the area with fresh water using low pressure water cleaning equipment.
      e. Repeat the applications as required to remove heavily oil and grease stains.
   2. Concrete surfaces to be sealed shall receive a light abrasive blasting to remove surface contaminants. Surface profile shall be CSP3 or CSP4 as defined by ICRI Guideline No. 03732.

E. Test and clean substrates in accordance with manufacturer's printed recommendations and the following National standards:
   1. ASTM 0 4258, Surface Cleaning Concrete for Coating.
   2. ASTM 0 4262, Test Method for pH of Chemically Cleaned Concrete.
   3. ASTM 0 4259, Abrading Concrete.

F. Substrates shall be clean, dry, sound, and free of contaminants detrimental to water repellent system performance.
   1. Remove contaminants by approved methods demonstrated at mock-up.
   2. Allow cleaned, damp, or water soaked surfaces to become totally dry before installation.
   3. Efflorescence, mold, and mildew shall be treated, neutralized and removed prior to water repellent installation.
   4. Do not apply sealer if standing water is visible on surface to be treated.

G. Protection: Protect plant life and surfaces to remain uncoated during application. Use drop cloths or masking as required.

3.04 APPLICATION

A. Coordinate application of water repellent with traffic striping and pavement markings as per Section 09910.

B. The coating shall be applied as packaged. Do not dilute or alter the material.

C. Apply transparent water repellent to properly prepared surfaces indicated. Apply water repellent within time restrictions after mixing and surface preparation as recommended by manufacturer.

D. Apply water repellent by low pressure spray techniques recommended by manufacturer. Spray equipment shall be equipped with solvent-resistant gaskets and hoses. Maintain the appropriate coverage rates as specified by the product manufacturer.

E. Caulking, patching, and expansion joint sealants shall be installed prior to application. Allow 6-12 hours for caulking and sealant materials to cure (or until they are set).

F. Surface, air, and materials temperatures should be maintained between 40 degrees F and 100 degrees F during the application process, or as specified by the manufacturer, whichever is more stringent. Do not perform coating if temperature is expected to fall below 40 degrees F and within 12 hours after completion of application.

G. Surfaces to be treated must be dry. Do not apply if frost, ice, or standing water are visible on the surface to be treated.

H. Apply sealer in accordance with manufacturer's instructions.

I. Apply sealer, water-based products from the bottom up (on vertical surfaces) with total saturation providing an 8-12 inch controlled run down. For horizontal application, apply flood coat to saturation working to a wet edge. The product may be poured down followed by brooming with a medium, stiff bristle push broom or equivalent.

J. Apply water repellent material as demonstrated and approved at mock-up and not less than manufacturer's minimum recommended coverage rate. Coverage of approximately 100-200 square feet per gallon can be attained depending on substrate porosity, texture and profile.

K. Excess coating on the treated surfaces must be broomed out thoroughly until they completely penetrate.

L. Stir material thoroughly before and during application.

M. Apply even distribution of sealer.

N. Match approved samples for warrantable performance, appearance, and coverage. Remove, reapply or re-coat work not in compliance with Contract Documents or Manufacturer's Warranty Requirements.

O. Treated surfaces must be protected from rain and other water for a period of not less than eight (8) hours after application.

P. Treated surfaces must be protected from excessive foot and/or vehicular traffic for a period of not less than eight (8) hours after application, or until dry. Check for slip hazards before pedestrian and/or vehicular traffic is permitted on the surface.

3.05 FIELD QUALITY CONTROL

A. The Quality Control Engineer shall inspect surface preparation for compliance with this Section. Material application rates and the total quantity of material used on the work area shall be recorded. Average application rates per square foot of surface area shall be calculated and compared to that required. Additional coats shall be applied where the application rates are 5 percent or more less than the specified application rates.

B. Post Installation Testing: Owner reserves the right to complete recommended testing required by the manufacturer at completion of work to assure warranty requirements, and contract compliance are met.

3.06 CLEANING AND PROTECTION

A. Remove temporary coverings and protection of adjacent work areas. Remove over-spray from windows or areas not intended to be coated with hot soap-water solution.

B. Remove construction debris resulting from work.

C. Protect sealer from damage during construction.

END OF SECTION

SECTION 07620

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SUMMARY

A. This section includes all sheet metal flashing related to the water proofing of the roof parking decks at parapet walls as shown on the contract drawings.

1.02 RELATED SECTIONS

A. Section 07920 – Joint Sealants

1.03 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing.

B. Fabricate and install flashings at roof edges to comply with recommendations of FM Loss Prevention Data Sheet 1-49 for the following wind zone:
   1. Wind Zone 3: Wind pressures of 46 to 104 psf.

1.04 SUBMITTALS

A. Submit the following for approval in accordance with the General Requirements and with the additional requirements as specified for each:
   1. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.
   2. Shop Drawings:
      a. Show both shop-fabricated and site-fabricated work, indicating where each item is fabricated. Include complete details of joints, supports and fasteners, in accordance with SMACNA Architectural Sheet Metal Manual standard details where applicable.
      b. Show dimensions and locations of wood nailing strips, miscellaneous wood supports and details of installation.
      c. Fabricated Masonry Flashing: Detail corner units, end-dam units, and other special applications.
   3. Samples: Three of each type of the following materials used in the work:
      a. Stainless steel: 6 inches in length of each flashing/counter-flashing profile used.
   4. Certifications.

1.05 QUALITY ASSURANCE

A. Codes, Regulations, Reference Standards and Specifications:
   1. Comply with codes and regulations of the jurisdictional authorities.
   2. SMACNA: Architectural Sheet Metal Manual.
   3. FS: QQ-L-201, UU-B-790.
   4. AAMA: 606.1.
   5. NRCA: Roofing and Waterproofing Manual.
   6. ASTM: A167, A755, B32, B101, B209, B221, B370.
   7. UL: 580 for Class 90 wind-uplift resistance.
   8. FM: Loss Prevention Data Sheet 1-49.

B. Installer Qualifications: Engage an experienced Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

C. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver products to jobsite in original unopened containers clearly marked with manufacturer's name and brand designation, reference specification number, type and class as applicable.

B. Store products in approved dry area and protect from contact with soil and exposure to the elements. Keep products dry.

C. Handle products so as to prevent breakage of containers and damage to products.

PART 2 PRODUCTS

2.01 MATERIALS

A. Stainless Steel:
   Exposed trims, base flashings, counter flashings, flashing receivers, drip edges, and roof penetration flashings: ASTM A167, Type 304, hard tempered, minimum thickness 0.0187 inch, unless otherwise shown or indicated.

B. Miscellaneous Items:
   1. Vinyl tape: As recommended by the metal product manufacturer as a dissimilar metal separator.
   2. Bituminous Paint: As recommended by the manufacturer as a dissimilar metal separator.

3. Solder: ASTM B32, with flux-core; of the following solder alloys. Use another alloy if it is demonstrated to the AR that better results, including visual as applicable, can be achieved on the particular metals being joined.
   a. For stainless steel: Tin/silver solder, Alloy Grade Sn96, with acid flux of type recommended by stainless steel manufacturer.
   b. For copper: 50-50 tin/lead solder, Alloy Grade Sn50, with rosin flux. For lead-coated copper: 60-40 tin/lead solder, Alloy Grade Sn60, with rosin flux.
4. Sealant:
   a. Elastomeric: Section 07920.
   b. Epoxy Seam Sealer: Two-part, non-corrosive, aluminum seam-cementing compound as recommended by aluminum manufacturer for exterior and interior non-moving joints including riveted joints.
   c. Mastic Sealant: Polyisobutylene, non-hardening, non-skinning, nondrying, non-migrating sealant.
5. Metal Accessories and Fasteners: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching, matching finish of exposed heads, or compatible with material being installed as approved; noncorrosive; size and thickness required for performance per approved samples.
6. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.

2.02 FABRICATION, GENERAL

A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.

B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.

D. Expansion Provisions: Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in the Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints or intermeshing hooked flanges, not less than one-inch deep, filled with mastic sealant (concealed within the joints).

E. Fabricate nonmoving joints with flat-lock seams. For tin edges to be seamed, form seams and solder. For aluminum to be seamed, form seams and seal with epoxy seam sealer and rivet joints for additional strength as approved.

F. Sealed joints: Form movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

G. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

H. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
   1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean dirt, debris, grease, oil and other foreign substances from surfaces that are to receive metalwork.

B. Existing sealant and backer rod are to be removed all sheet metal flashing/counter flashing locations and replaced with a joint protection assembly (sealant and backer rod) as specified in specification section 07920.

3.02 INSTALLATION

A. Coordinate flashing and sheet metal with the work of other trades. Shop-fabricate the work whenever possible. Provide for expansion and contraction of sheet metal.

B. Install the work of this Section in accordance with the NRCA Roofing and Waterproofing Manual, performance requirements, manufacturers' instructions and SMACNA's Architectural Sheet Metal Manual. Anchor units securely in place by methods indicated and conceal fasteners where possible. Set units true to line and level with exposed edges folded back to form hems. Install exposed sheet metal without excessive oil canning, buckling and tool marks. Verify shapes and dimensions of surfaces to be covered prior to fabrication and trim to fit substrates. Install work with laps, joints and seams that will be permanently watertight and weatherproof. Provide for thermal expansion of metal units. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges not less than one-inch deep and fill with mastic sealant concealed within joints. Form non-expansion joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant. Use joint adhesive for non-moving joints specified not to be soldered. Fabricate non-moving seams in sheet metal with flat-lock seams, except fabricate non-moving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints as approved for additional strength. Tin edges to be seamed, form seams and solder.

C. Perform cutting, drilling and other operations in connection with sheet metal work to accommodate work of other trades. Provide accessories as recommended by SMACNA Architectural Sheet Metal Manual.

D. Where sheet metal abuts or interfaces with adjacent materials, join as shown on approved shop drawings. Isolate dissimilar metals by use of compatible coatings or other approved methods. Apply red-rosin paper backing for sheet metal applied to any surface to permit movement caused by expansion or to prevent galvanic action.

E. Soldering:
   1. Clean surfaces to be soldered to remove oils and foreign matter. Brush liberal amount of flux on seams, solder immediately, neutralize acid and clean.
   2. Solder slowly, thoroughly heating seam and completely sweating solder through full width of seam. Use ample solder for full width along seams.
   3. Do not solder aluminum and coil-coated galvanized steel sheet. Pre-tinning is not required for lead and lead-coated copper. Do not use torches for soldering, heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

F. Seams:
   1. Flat lock: 3/4-inch wide, minimum.
   2. Solder lap: One-inch wide, minimum
   3. Unsoldered plain lap: Three-inch wide, minimum.
   4. Seams: Corresponding to direction of flow.

G. Form flashings from material shown or specified made up from sheets eight to 10 feet long with locked and soldered seams into units of not more than 16 feet. Join units together with three-inch wide loose-locked seams filled with sealant before units are joined. Runs of flashing shorter than 16 feet will not require loose-seam joints. Miter corners and join by locked and soldered joints.

H. Where cants do not occur at intersections of roof decks and vertical surfaces of walls and other construction, provide flashings. Extend base flashings up vertical surfaces eight inches unless otherwise shown, behind metal cap flashing and out onto roof or horizontal surface not less than eight inches. Coat back sides of base flashing with bituminous paint and set into angle formed by roof and vertical surfaces after three plies of roofing-felt reinforcement have been laid. Nail flange with nails spaced three inches on centers and 3/4-inch from edge into wooden nailer provided in roof slab. Secure metal flashing at roof edges according to FM Loss Prevention Data Sheet 1-49 for specified wind zone.

I. Counter flashings: Coordinate installation of counter flashings with installation of assemblies to be protected by counter flashing. Install counter flashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counter flashing joints a minimum of 2 inches and bed with sealant.

J. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Weld or seal flashing to equipment support member.

K. Install sealant in accordance with Sections 07920.

3.03 CLEAN-UP

A. Clean up rubbish and debris caused by this work and remove from site.

B. Promptly remove drippings and stains of materials from exposed surfaces.

C. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION

SECTION 07840
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

1.02 REFERENCE STANDARDS

A. FM 4991 - Approval of Firestop Contractors; Factory Mutual Research Corporation; 2001.

1.03 SUBMITTALS

A. Product Data: Provide data on product characteristics, performance ratings, and limitations.

C. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Certificate from authority having jurisdiction indicating approval of materials used.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Approved by Factory Mutual Research under FM Standard 4991, Approval of Firestop Contractors , or meeting any two of the following requirements:.
   2. With minimum 3 years documented experience installing work of this type.
   3. Able to show at least 5 satisfactorily completed projects of comparable size and type.
   4. Licensed by authority having jurisdiction.

PART 2 PRODUCTS

2.01 FIRESTOPPING - GENERAL REQUIREMENTS

A. Manufacturers:
   1. A/D Fire Protection Systems Inc: www.adfire.com.
   2. 3M Fire Protection Products: www.3m.com/firestop.
   3. Hilti, Inc: www.us.hilti.com.

4. Specified Technologies, Inc: www.stifirestop.com.

B. Firestopping: Any material meeting requirements.

C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

2.02 FIRESTOPPING PENETRATIONS THROUGH CONCRETE AND CONCRETE MASONRY CONSTRUCTION

A. Blank Openings:
   1. In Floors or Walls:
      a. 2 Hour Construction: UL System C-AJ-0090; Hilti FS-ONE Intumescent Firestop Sealant.

B. Penetrations Through Floors or Walls By:
   1. Multiple Penetrations in Large Openings:
      a. 3 Hour Construction: UL System C-AJ-1140; Hilti CP 637 Firestop Mortar.
      b. 3 Hour Construction: UL System C-AJ-8110; Hilti FS 657 Fire Block.
   2. Insulated Pipes:
      a. 3 Hour Construction: UL System C-AJ-5090; Hilti FS-ONE Intumescent Firestop Sealant.
      b. 2 Hour Construction: UL System C-AJ-5091; Hilti FS-ONE Intumescent Firestop Sealant.
      c. 2 Hour Construction: UL System C-AJ-5048; Hilti FS-ONE Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CP 601S Elastomeric Firestop Sealant, or CP 604 Self-Leveling Firestop Sealant.
   3. HVAC Ducts, Uninsulated:
      a. 2 Hour Construction: UL System C-AJ-7111; Hilti FS-ONE Intumescent Firestop Sealant.

C. Penetrations Through Floors By:
   1. Multiple Penetrations in Large Openings:
      a. 3 Hour Construction: UL System F-A-1023; Hilti CP 680-P/M Cast-In Device.
      b. 2 Hour Construction: UL System F-A-8012; Hilti CP 604 Self-Leveling Firestop Sealant.
   2. Uninsulated Metallic Pipe, Conduit, and Tubing:
      a. 2 Hour Construction: UL System F-A-1016; Hilti CP 680-P/M Cast-In Device.
   3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
      a. 2 Hour Construction: UL System F-A-2015; Hilti CP 643N Firestop Collar.
      b. 2 Hour Construction: UL System F-A-2053; Hilti CP 680-P Cast-In Device.
      c. 2 Hour Construction: UL System F-A-2058; HIlti FS-ONE Intumescent Firestop Sealant.
   4. Insulated Pipes:
      a. 2 Hour Construction: UL System F-A-5015; Hilti CP 680-P/M Cast-In Device.
      b. 2 Hour Construction: UL System F-A-5017; Hilti CP 680-P/M Cast-In Device.

D. Penetrations Through Walls By:
   1. Uninsulated Metallic Pipe, Conduit, and Tubing:

2. HVAC Ducts, Uninsulated:
   a. 2 Hour Construction: UL System W-J-7109; Hilti FS-ONE Intumescent Firestop Sealant or CP 606 Flexible Firestop Sealant.
3. HVAC Ducts, Insulated:
   a. 2 Hour Construction: UL System W-J-7112; Hilti FS-ONE Intumescent Firestop Sealant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authority having jurisdiction, as determined by the AR or the Project Engineer.

C. Install labeling required by code.

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 07920

JOINT SEALANTS

PART 1 GENERAL

1.01 SUMMARY

A. The work shall consist of providing the necessary labor, materials, equipment and supervision for placement of elastomeric sealant joints and joint backers installed as part of the work.

1.02 RELATED SECTIONS

A. Section 01400 – Quality Control and Assurance Requirements

B. Section 01550 – Access Roads, Parking Areas and Parking Controls

C. Section 01560 – Temporary Barriers and Closures

1.03 SUBMITTALS

A. Product Data: Provide data indicating sealant chemical characteristics.

B. Samples: Submit two samples, 6 inches in size illustrating sealant colors for selection.

1.04 QUALITY CONTROL INSPECTIONS

A. All quality control inspections and testing shall be performed by the Quality Control Engineer in accordance with this Section and Section 01400.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each referenced document covering installation requirements on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.06 JOB CONDITIONS

A. Contractor shall perform all work while maintaining vehicular parking to site and within site that are not under construction in accordance with Section 01550 and Contract Drawings.

B. Contractor shall provide adequate signalization in accordance with Section 01560 and Contract Drawings for all overhead and work areas below.

C. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.07 WARRANTY

A. Correct defective work within a period of five years after Date of Substantial Completion.

B. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MATERIALS

A. Elastomeric Sealant for Concrete to Concrete and Concrete to Metal: Two-part polyurethane with minimum ±50 percent movement capacity in conformance with ASTM C-920, Type M, Grade NS, Class 50 with compatible backer rod and primer. Submit color samples. Color to be selected by the Authority.

B. Sealants and Primers - General: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

C. General Purpose Exterior Sealant: Polyurethane; ASTM C920, Grade NS, Class 25, Uses M, G, and A; single component.

D. Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, non-shrinking, non-curing.

E. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.

2.02 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

2.03 MANUFACTURERS

A. For level joints: Sikaflex 2C SL, two-component, self-leveling, polyurethane elastomeric sealant, as manufacturer by Sika Corporation, 201 Polito Ave., Lyndhurst, NJ 07071, is considered to conform to the requirements of this specification or approved equal.

B. For uneven joints: Sikaflex 2C NS, two-component, non-sag, polyurethane elastomeric sealant, as manufacturer by Sika Corporation, 201 Polito Ave., Lyndhurst, NJ 07071, is considered to conform to the requirements of this specification or approved equal.

C. Any materials required for repair prior to installation shall be manufactured by the same supplier of the proposed, or approved equal.

PART 3 EXECUTION

3.01 WORK TO BE PERFORMED

A. Verify that substrate surfaces are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

C. Sealants to be replaced/installed at the following locations:
   1. Joints between dissimilar materials.
   2. Joints between door/window frames and walls.
   3. Joints between flashing and trim work.
   4. Connection pockets as shown in Contract Drawings.
   5. At all other areas where sealant joint exists.

D. Approximately 2 weeks before but no sooner than one week before installation, arrange a pre-installation conference with the sealant manufacturer’s representative, Quality Control Engineer and the AR to review site conditions, work procedures and to select primers.

E. Install samples of sealant material colors for review and selection by the AR. Do not purchase materials until approval of color is received from the AR.

3.02 SURFACE PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Protect elements surrounding the work of this section from damage or disfigurement.

E. Cut existing sealant material from joints and connection block-outs. Remove any existing backer rod or backer board. If Hydro is used to remove loose sealant then contractor is required to not damage the surrounding area. Contractor to arrange water supply if WMATA water is not available.

F. Remove all debris.

G. Clean the sides of the joint as necessary to remove all remnants of the existing sealant material that will inhibit bonding of the new sealant Follow the sealant manufacturer's recommendations for joint preparation and priming. Grind and dress concrete edges. Grind high side of concrete flush in elevation with opposite side.

H. Repair spalled areas in accordance with Contract Drawings.

3.03 SEALANT APPLICATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
   1. Width/depth ratio of 2:1.
   2. Neck dimension no greater than 1/3 of the joint width.
   3. Surface bond area on each side not less than 75 percent of joint width.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Tool joints concave.

G. Install an open cell backer rod system compatible with the sealant as recommended by the sealant manufacturer. Install bond breaker where joint backing is not used.

H. If a primer is required, sealant shall not be installed until the primer has cured.

I. The joints shall be dry when the sealant is installed.

J. The sealant shall be applied into the joint mechanically, with pressure to expel all air and provide complete filling of the joint to the backer rod. Surface pointing of flaws in the joint with a skin bead shall not be accepted. The joint surface shall be uniform and free of wrinkles.

K. All joints shall be neatly tooled to provide a concave surface profile.

L. No sealant shall be applied during adverse weather conditions or when temperatures are outside of the range of those recommended by the manufacturer.

M. Do not paint over sealant joints.

3.04 QUALITY CONTROL INSPECTIONS

A. The Quality Control Engineer shall inspect surface preparation, backer rod installation and primer application prior to sealant installation for compliance with this Section and the manufacturer's specifications.

B. The Quality Control Engineer shall inspect the completed joints for compliance with this Section, the manufacturer's specification and workmanship.

3.05 CLEANING

A. Surfaces or components adjacent to the sealed joints shall be cleaned free of smears or other soiling due to sealing operations as the work progresses.

3.06 PROTECTION

A. Protect sealants until cured.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 08110
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire-rated and Non-Fire Rated steel doors and frames.

1.02 RELATED SECTIONS

A. Section 08710 - Door Hardware.

1.03 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.

B. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.

C. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998 (R2004).

D. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2006.

E. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2007.

F. NAAM HMMA 862 – Guide Specification for Commercial Security Hollow Metal Doors and Frames.

G. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2010.

H. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc; current edition.

I. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Manufacturer's catalog sheets, specifications, and installation instructions.

B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any. Show details of each frame type, elevation and construction for each door type, conditions at openings, location for each door type, location and installation requirements for finish hardware (including cutouts and reinforcements), details of connections, and anchorage and accessory items.

C. Certificates: Provide certification that glazing meets safety impact requirements of CPSC 16 CFR 1201.

D. Warranties: Provide manufacturer/installer warranty.

1.05 QUALITY ASSURANCE

A. Provide doors and frames complying with ANSI/SDI A250.8 and as herein specified.

B. Fire Rated Assemblies: Wherever fire resistance classification is shown or scheduled for steel doors and frames, provide fire rated units that have been tested as fire door assemblies and comply with National Fire Protection Association (NFPA) Standard No. 80, are tested in accordance with NFPA 252 or UL 10B/UL 10C and UL 1784 as required by the NYC Building Code and comply with these Specifications. Identify each door and frame with metal UL, or Warnock Hersey labels indicating applicable fire class of the unit. Rivet or weld labels on the hinge edge of door and jamb rabbet of frame.

1.06 WARRANTY

A. Submit warranty signed by manufacturer and installer, agreeing to replace assemblies which fail in materials, performance or workmanship within the specified warranty period.

1. Warranty Period: 1 year from date of Substantial Completion.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in accordance with NAAMM HMMA 840.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

1.08 FIELD EXAMINATION

A. At the Site, before door installation, the Authority reserves the right to select at random one or more doors for examination by cutting a portion of such size to reveal the construction of a particular door.

1. If the examination finds that the doors examined do not comply with requirements of the Specifications, all doors shall be removed from the Site and new doors shall be provided. Costs of examination and replacement of rejected doors shall be borne by Contractor.

2. If the examination finds that the doors do comply with the requirements of the Specifications, the cost of the examination and the cost of the replacement of the examined doors will be borne by the Authority.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Doors and Frames:

1. Assa Abloy Ceco, Curries, or Fleming: www.assaabloydss.com.

2. Republic Doors: www.republicdoor.com.
3. Steelcraft: www.steelcraft.com.
4. Approved equal.

2.02 DOORS AND FRAMES

A. All hollow metal doors and frames shall comply with NAAMM, HMMA 862, Requirements for All Doors and Frames shall include the following:
   1. Accessibility: Comply with ANSI/ICC A117.1.
   2. Door Top Closures: Flush with top of faces and edges.
   3. Door Edge Profile: Beveled on both edges.
   4. Door Texture: Smooth faces.
   5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
   6. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
   7. Galvanizing for all doors and frames: Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A526, G60 zinc coating, mill phosphatized.
   8. Shop Painting:
      a. Clean, treat and paint exposed surfaces of steel door and frame units, including galvanized surfaces.
      b. Chemically clean steel surfaces of mill scale, rust, oil, grease, dirt and other foreign materials before application of paint.
      c. Apply phosphate conversion pretreatment coating.
      d. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint. Apply primer immediately after surface preparation and pretreatment.

B. Combined Requirements: If a door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 DOORS

A. Fire Rated Doors:
   1. Where fire-rated door and frame assemblies are required for code compliance, or are otherwise indicated, provide door, frame and hardware assemblies in compliance with NFPA 80, which are labeled and listed by UL.
   2. Fabrication and assembly requirements necessary to obtain labels will take precedence over requirements shown or specified, except where requirements shown or specified exceed sizes or gauges required for labeling.

3. Where oversized fire doors are required, furnish manufacturer's certification that assembly has been constructed with materials and methods equivalent to labeled construction.
4. Louvers: Equip louvers in fire-rated doors with UL-listed self-closing fire dampers with fusible links.
5. Identify each fire door and frame with permanent UL labels, indicating the applicable fire rating of both the door and the frame. Secure labels to vertical edge of doors and frames where readily visible. Protect labels from painting operations.

B. Exterior Doors
1. Fabricate exterior doors with two (2) outer stretcher-leveled, galvanized steel sheets of 14 gauge unless indicated otherwise on the Drawings. Construct doors with smooth, flush surfaces without visible joints or seams on exposed faces and stile edges, except around glass and louver panels. On mortise face of door, vertical joints shall be continuously welded and ground smooth and coated with zinc-rich primer.
2. Provide reinforcement for surface sheet, edge, hardware, stops, and other provisions, of size and gage as detailed on Drawings.
3. Provide 14 GA bottom channel and top channel and closure, as detailed on Drawings.

2.04 STEEL FRAMES

A. Exterior Door Frames, Fire-Rated: Knock-down type.
1. Fire Rating: Same as door, labeled.
2. Finish: Factory primed, for field finishing.
3. Fabricate door frames in cold-rolled 14 gauge sheet steel.

2.05 ACCESSORY MATERIALS

A. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.

B. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

C. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

2.06 FINISH MATERIALS

A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.

B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.01 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.02 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.

B. In addition, install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

E. Coordinate installation of hardware.

3.03 TOLERANCES

A. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.04 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Adjust sound control doors so that seals are fully engaged when door is closed.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 08120
ALUMINUM DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tubular aluminum doors.

B. Aluminum door frames.

C. Accessories, including louvers, fasteners, and brackets.

1.02 RELATED SECTIONS

A. Section 07920 - Joint Sealants.

B. Section 08710 - Door Hardware.

C. Section 08800 - Glazing.

1.03 REFERENCE STANDARDS

A. AAMA 609 - Voluntary Guide Specification for Cleaning and Maintenance of Architectural Anodized Aluminum; American Architectural Manufacturers Association; 2009.

B. AAMA 701/702 - Voluntary Specifications for Pile Weatherstripping and Replaceable Fenestration Weatherseals; American Architectural Manufacturers Association; 2004.

C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; American Architectural Manufacturers Association; 2005

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2009.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2008.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2007.

1.04 SUBMITTALS

A. Product Data: Manufacturer's descriptive literature for each type of door; include information on fabrication methods.

B. Shop Drawings: Include elevations of each opening type.

C. Selection Samples: Complete set of color and finish options, using actual materials, for Architect's selection.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Not less than 5 years of experience in manufacturing components of the types specified.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide products complying with specified requirements and manufactured by one of the following:
   1. Cline Aluminum Doors, Inc: www.clinedoors.com .
   2. Wilson Partitions: www.wilsonpart.com .
   3. Kawneer, www.kawneer.com.
   4. Or approved equal.

2.02 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), alloy 6063-T5 or alloy 6463-T5.

2.03 COMPONENTS

A. Tubular Aluminum Doors: Provide 1-3/4 in thick glazed doors using materials as follows:
   1. Framing: Extruded aluminum tubing, 0.125 in minimum thickness, with heavy-duty plated steel through bolts in rails.
      a. Stile Width: Nominal 5 inches.
   2. Glazing: As specified in Section 08800 - Glazing.

B. Aluminum Door Frames: Provide frames sized to fit wall thicknesses indicated on the drawings, in profiles indicated, and constructed from materials as follows:
   1. Frame Members: Extruded aluminum shapes, not less than 0.062 inch thick, reinforced at hinge and strike locations.
   2. Corner Brackets: Extruded aluminum, fastened with stainless steel screws.
   3. Trim: Extruded aluminum, not less than 0.062 inch thick, removable snap-in type without exposed fasteners.
   4. Replaceable Weatherstripping: AAMA 701/702 wool pile.

2.04 FINISHES

A. Finish: High Performance Organic Coating: Kynar/Polyvinylidene Fluoride (PVDF) complying with requirements of AAMA 2604; color as selected from manufacturer's full range by AR.

2.05 FABRICATION

A. Door sizes shown are nominal; provide standard clearances as follows:
   1. Hinge and Lock Stiles: 0.125 inch.
   2. Between Meeting Stiles: 0.250 inch.

3. At Top Rail and Bottom Rail: 0.125 inch.

B. Aluminum frames: Sizes and contours as indicated on drawings.

2.06 ACCESSORIES

A. Fasteners: Aluminum, non-magnetic stainless steel, or other material warranted by manufacturer as non-corrosive and compatible with aluminum components.

B. Brackets and Reinforcements: Manufacturer's high-strength aluminum units where feasible, otherwise, non-magnetic stainless steel or steel hot-dip galvanized in compliance with ASTM A123/A123M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall surfaces and openings are ready to receive frames and are within tolerances specified in manufacturer's instructions.

B. Verify that frames installed by other trades for installation of doors of this section are in strict accordance with recommendations and approved shop drawings and within tolerances specified in manufacturer's instructions.

3.02 PREPARATION

A. Perform cutting, fitting, forming, drilling, and grinding of frames as required for project conditions.

B. Replace components with damage to exposed finishes.

C. Separate dissimilar metals to prevent electrolytic action between metals.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and approved shop drawings.

B. Set frames plumb, square, level, and aligned to receive doors. Anchor frames to adjacent construction in strict accordance with manufacturer's recommendations and within specified tolerances.

C. Where aluminum surfaces contact metals other than stainless steel, zinc, or small areas of white bronze, protect from direct contact by painting dissimilar metal with heavy coating of bituminous paint.

D. Hang doors and adjust hardware to achieve specified clearances and proper door operation.

3.04 CLEANING

A. Upon completion of installation, thoroughly clean door and frame surfaces in accordance with AAMA 609.

B. Do not use abrasive, caustic, or acid cleaning agents.

3.05 PROTECTION

A. Protect products of this section from damage caused by subsequent construction until substantial completion.

B. Replace damaged or defective components that cannot be repaired to a condition indistinguishable from undamaged components.

END OF SECTION

SECTION 08710
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for hollow steel and aluminum doors.

B. Hardware for fire-rated doors.

C. Lock cylinders for doors for which hardware is specified in other sections.

D. Thresholds.

E. Weather-stripping, seals and door gaskets.

1.02 RELATED SECTIONS

A. Section 08110 - Hollow Metal Doors and Frames.

B. Section 08120 - Aluminum Doors and Frames

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; 2010; (ADA Standards for Accessible Design).

B. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.

C. BHMA A156.3 - American National Standard for Exit Devices; Builders Hardware Manufacturers Association; 2001 (ANSI/BHMA A156.3).

D. BHMA A156.4 - American National Standard for Door Controls - Closers; Builders Hardware Manufacturers Association, Inc. ; 2000 (ANSI/BHMA A156.4).

E. BHMA A156.6 - American National Standard for Architectural Door Trim; Builders Hardware Manufacturers Association; 2005 (ANSI/BHMA A156.6).

F. BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders; Builders Hardware Manufacturers Association, Inc.; 2005 (ANSI/BHMA A156.8).

G. BHMA A156.13 - American National Standard for Mortise Locks & Latches; Builders Hardware Manufacturers Association ; 2005 (ANSI/BHMA A156.13).

H. BHMA A156.18 - American National Standard for Materials and Finishes; Builders Hardware Manufacturers Association, Inc.; 2006 (ANSI/BHMA A156.18).

I. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association; 2005 (ANSI/BHMA A156.22).

J. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2010.

K. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association; 2012.

L. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products onto which door hardware will be installed.

B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

C. Convey Owner's keying requirements to manufacturers.

1.05 SUBMITTALS

A. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project.

B. Hardware Schedule: Detailed listing of each item of hardware to be installed on each door. Use door numbering scheme as included in the Contract Documents.

C. Keying Schedule: Submit for approval of Owner.

D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

E. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

F. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

G. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

H. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

I. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.

1.06 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.08 WARRANTY

A. Provide a five year warranty for all hardware.

PART 2 PRODUCTS

2.01 DOOR HARDWARE - GENERAL

A. Provide all hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated. All hardware

B. Provide all items of a single type of the same model by the same manufacturer.

C. Provide products that comply with the following:
   1. Applicable provisions of federal, state, and local codes.
   2. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
   3. Applicable provisions of NFPA 101, Life Safety Code.
   4. Fire-Rated Doors: NFPA 80.
   5. All Hardware on Fire-Rated Doors: Listed and classified by UL as suitable for the purpose specified and indicated.
   6. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide hardware that enables door assembly to comply with air leakage requirements of the applicable code.

D. Finishes: All door hardware the same finish unless otherwise indicated.
   1. Primary Finish: Shall match existing or be Satin chrome plated over nickel on brass or bronze, 630.
   2. Finish Definitions: BHMA A156.18.

2.02 HINGES

A. Hinges: Provide hinges on every swinging door.
   1. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
   2. Provide ANSI/BHMA A156.1, Type A156.1, finish 630, full mortise butt hinges, anti-friction bearings, button tips.
   3. Provide hinges in the quantities indicated.
   4. Provide non-removable pins on exterior outswinging doors.

B. Quantity of Hinges Per Door:
   1. Doors From 60 inches High up to 90 inches High: Three hinges.

C. Manufacturers - Hinges:
   1. Assa Abloy McKinney: www.assaabloydss.com.
   2. Bommer Industries, Inc: www.bommer.com.
   3. C. R. Laurence Co., www.crlaurence.com.
   4. Hager Companies: www.hagerco.com.
   5. Stanley Black & Decker: www.stanleyblackanddecker.com.
   6. Or approved equal.

2.03 PUSH/PULLS

A. Push/Pulls: Comply with BHMA A156.6.
   1. Provide push and pull on doors not specified to have lockset, latchset, exit device, or auxiliary lock.
   2. Push/Pull hardware shall match existing hardware finish and size.

B. Manufacturers - Push/Pulls:
   1. Assa Abloy McKinney: www.assaabloydss.com .
   2. C. R. Laurence Co., Inc: www.crlaurence.com .
   3. Hager Companies: www.hagerco.com.
   4. Or approved equal.

2.04 LOCKS AND LATCHES

A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.
   1. Hardware Sets indicate locking functions required for each door.
   2. If no hardware set is indicated for a swinging door provide an office lockset.
   3. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.
   4. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.

B. Lock Cylinders: Manufacturer's standard tumbler type, six-pin standard core.
   1. Provide cams and/or tailpieces as required for locking devices required.

C. Keying: Grand master keyed.
   1. Key to existing keying system.

D. Latches: Provide a latch for every door that is not required to lock, unless specifically indicated "push/pull" or "not required to latch".

2.05 MORTISE LOCKSETS

A. Locking Functions: As defined in BHMA A156.13.

B. Manufacturers - Mortise Locksets:
   1. Assa Abloy Corbin Russwin, Sargent, or Yale: www.assaabloydss.com.
   2. Corbin Russwin, www.corbinrusswin.com,
   3. Best Access Systems, division of Stanley Security Solutions: www.bestlock.com.
   4. Hager Companies: www.hagerco.com.
   5. Schlage: www.schlage.com.
   6. Or approved equal.

2.06 EXIT DEVICES

A. Locking Functions: Functions as defined in BHMA A156.3, and as follows:
   1. Entry/Exit, Always-Unlocked: Outside lever unlocked, no outside key access, no latch holdback.

B. Manufacturers:
   1. Assa Abloy Corbin Russwin, Sargent, or Yale: www.assaabloydss.com .
   2. C. R. Laurence Co., Inc : www.crlaurence.com.
   3. Detex Corporation: ADVANTEX Series: www.detex.com.
   4. DORMA Group North America: www.dorma-usa.com/usa.
   5. Hager Companies: www.hagerco.com.
   6. Or approved equal.

2.07 CLOSERS

A. Closers: Complying with BHMA A156.4.
   1. Provide surface-mounted, door-mounted closers unless otherwise indicated.
   2. Provide a door closer on every exterior door.
   3. Provide a door closer on every fire- and smoke-rated door. Spring hinges are not an acceptable self-closing device unless specifically so indicated.
   4. On pairs of swinging doors, if an overlapping astragal is present, provide coordinator to ensure the leaves close in proper order.

B. Manufacturers - Closers:
   1. Assa Abloy Corbin Russwin, Norton, Rixson, Sargent, or Yale: www.assaabloydss.com.
   2. C. R. Laurence Co., www.crlaurence.com.
   3. DORMA Group North America: www.dorma-usa.com/usa.
   4. Or approved equal.

2.08 STOPS AND HOLDERS

A. Stops: Complying with BHMA A156.8; provide a stop for every swinging door, unless otherwise indicated.
   1. Provide wall stops, unless otherwise indicated.
   2. If wall stops are not practical, due to configuration of room or furnishings, provide overhead stop.
   3. Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop unless specifically so stated.

B. Floor Stops:

C. Manufacturers - Wall and Floor Stops/Holders:
   1. Assa Abloy McKinney: www.assaabloydss.com.
   2. C. R. Laurence Co., www.crlaurence.com.
   3. Hager Companies: www.hagerco.com.
   4. Hiawatha, Inc: www.hiawathainc.com.
   5. Triangle Brass Manufacturing Co., Inc: www.trimcobbw.com.
   6. Or approved equal.

2.09 GASKETING AND THRESHOLDS

A. Gaskets: Complying with BHMA A156.22.
   1. On each door in smoke partition, provide smoke gaskets; top, sides, and meeting stile of pairs. If fire/smoke partitions are not indicated on drawings, provide smoke gaskets on each door identified as a "smoke door" and 20-minute rated fire doors.
   2. On each exterior door, provide weatherstripping gaskets, unless otherwise indicated; top, sides, and meeting stiles of pairs.
      a. Where exterior door is also required to have fire or smoke rating, provide gaskets functioning as both smoke and weather seals.
   3. On each exterior door, provide door bottom sweep, unless otherwise indicated.

B. Thresholds:

1. At each exterior door, provide a threshold unless otherwise indicated.

C. Manufacturers - Gasketing and Thresholds:
1. Assa Abloy McKinney: www.assaabloydss.com.
2. Hager Companies: www.hagerco.com.
3. National Guard Products, Inc: www.ngpinc.com.
4. Pemko Manufacturing Co: www.pemko.com.
5. Zero International, Inc: www.zerointernational.com.
6. Or approved equal.

2.10 KEY CONTROLS

A. Key Management System: For each keyed lock on project, provide one set of consecutively numbered duplicate key tags with hanging hole and snap catch.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.

D. Mounting heights for hardware from finished floor to center line of hardware item: As listed in Schedule, unless otherwise noted.

3.03 ADJUSTING

A. Adjust hardware for smooth operation.

3.04 PROTECTION

A. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

SECTION 08800
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass.

B. Glazing compounds and accessories.

1.02 RELATED SECTIONS

A. Section 08110 - Hollow Metal Doors and Frames.

B. Section 08120 - Aluminum Doors and Frames

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2011.

E. ASTM C1036 - Standard Specification for Flat Glass; 2006.

F. ASTM C1048 - Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass; 2004.

G. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Building; 2009a.

H. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.

I. GANA (GM) - GANA Glazing Manual; Glass Association of North America; 2009.

J. GANA (SM) - FGMA Sealant Manual; Glass Association of North America; 2008.

1.04 SUBMITTALS

A. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

B. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

C. Samples: Submit two samples 6x6 inch in size of glass units.

D. Manufacturer's Certificate: Certify that glass meets or exceeds specified requirements.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.

1.06 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

A. Sealed Insulating Glass Units: Provide a five (5) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

PART 2 PRODUCTS

2.01 GLAZING TYPES

A. Type E-1 – Single exterior vision glazing:

1. Application(s): Vision glazing at aluminum storefront and doors.
2. Type: Tempered glass
3. Tint: Clear or to match existing.
4. Total Thickness: ¼: inch.

2.02 EXTERIOR GLAZING ASSEMBLIES

A. Structural Design Criteria: Select type and thickness to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with ASCE 7.

1. Use the procedure specified in ASTM E1300 to determine glass type and thickness.
2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
3. Thicknesses listed are minimum.

2.03 GLASS MATERIALS

A. Float Glass Manufacturers:

1. Guardian Industries Corp: www.sunguardglass.com.
2. Pilkington North America Inc: www.pilkington.com/na.
3. PPG Industries, Inc: www.ppgideascapes.com.
4. TPG Fire Glass, www.fireglass.com
5. Or approved equal.

B. Float Glass: All glazing is to be float glass unless otherwise indicated.

1. Annealed Type: ASTM C1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
2. Heat-Strengthened and Fully Tempered Types: ASTM C1048.
3. Tinted Types: Color and performance characteristics as indicated.
4. Thicknesses: As indicated; for exterior glazing comply with specified requirements for wind load design regardless of specified thickness.

C. Laminated Fire Rated Ceramic Glass: UL- or WH-listed as fire-protection-rated glazing and complying with 16 CFR 1201 test requirements for Category II with or without the use of a surface-applied film.

2.04 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inches x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, ASTM C 864 Option I. Minimum 3 inches long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper. Size to match existing Glazing System.

D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option I; color to match existing.

E. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

3.03 GLAZING METHODS

3.04 INSTALLATION - EXTERIOR/INTERIOR DRY METHOD (GASKET GLAZING)

A. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

B. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

C. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

3.06 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; does not mark heat absorbing or reflective glass units.

END OF SECTION

SECTION 09205

FURRING AND LATHING

PART 1 - GENERAL

1.01 DESCRIPTION:

A. This section specifies providing furring, lathing and accessories.

1.02 PERFORMANCE REQUIREMENTS:

A. Structural Performance of Ceiling Support Systems: Limit deflection of ceiling to less than 1/360 of span.

1.03 SUBMITTALS:

A. Submit the following for approval in accordance with the General Requirements and with the additional requirements as specified for each:
   1. Product Data for each product specified.
   2. Shop Drawings: Furring layouts; locations of access panels, mechanical openings, light fixtures and electrical openings; and construction details.
   3. Samples:
      a. Four of each of the following products used in the work:
         1) Furring Channels: 12 inches long
         2) Metal lath: 12 inches square.
         3) Studs, runner and caps: 12 inches long.
         4) Tie wire: 12 inches long.
         5) Fasteners, hangers and accessories.

1.04 QUALITY ASSURANCE:

A. Codes, Regulations, Reference Standards and Specifications:
   1. Comply with codes and regulations of the jurisdictional authorities.
   2. ASTM: A36, A641, A653, B69, C645, C847, C1063, E488.
   3. ML/SFA: Guide Specifications for Metal Lathing and Furring.

B. Mockups: At the start of installation, construct panels for each type of finish and application required to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. The mockups shall be a part of the Work. The work must be approved by the Engineer before installation can continue.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Deliver products in the original unopened packages, containers or bundles each bearing name of manufacturer, brand designation, referenced number, type and class as applicable.

B. Store materials inside, under cover, and dry, protected from weather, direct sunlight, surface contamination, aging, corrosion, and damage from construction traffic and other causes. Use platforms or other means to protect products and materials from contact with the soil. Do not store materials on finished floors.

C. Handle materials so as to preclude breakage of packages or containers and damage to materials.

PART 2 - PRODUCTS

2.01 METAL SUPPORTS FOR SUSPENDED AND FURRED CEILINGS:

A. General: Size metal ceiling supports to comply with ASTM C1063, unless otherwise indicated.

B. Cast-in-Place and Post-installed Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials, with holes or loops for attaching hanger wires; and with capability to sustain, without failure, a load equal to 5 times that imposed by ceiling construction, as determined by testing according to ASTM E488 conducted by a qualified independent testing agency.
   1. Expansion anchor.

C. Wire for Hangers: ASTM A641, Galvanized carbon-steel wire, eight-gauge minimum, medium-temper, Class 3 coating.

D. Wire for Ties: ASTM A641, Galvanized carbon-steel wire, 16-gauge minimum for securing metal furring, 18-gauge minimum for securing metal lathe, medium-temper, Class 1 coating.

E. Resilient Furring Channels: Galvanized steel, minimum 0.0209-inch-thick base (uncoated) metal, approved type, standard with the manufacturer, similar to RC-1, U.S. Gypsum Company.

F. Channels: Cold-rolled steel, minimum 0.0598-inch-thick base (uncoated) metal and 7/16-inch-wide flanges, and as follows:
   1. Carrying Channels: 1-1/2 inches deep, 475 lb/1000 feet.
   2. Furring Channels: 3/4 inch deep, 300 lb/1000 feet.
   3. Finish: ASTM A653, G60 hot-dip galvanized coating for framing.

G. Steel Studs for Furring Channels: ASTM C645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch-wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
   1. Thickness: 0.0478 inch, unless otherwise indicated.
   2. Depth: As indicated.
   3. Protective Coating: ASTM A653, G40 galvanized coating.

2.02 STEEL STUDS AND RUNNERS:

A. General: Provide steel studs and runners complying with the following requirements:
   1. Protective Coating: ASTM A653, G40 hot-dip galvanized coating.

B. Non-Load-Bearing Studs and Runners: ASTM C645 and complying with the following requirements for minimum thickness of base (uncoated) metal and other characteristics:
   1. Thickness: 0.0478 inch.
   2. Depth: As indicated.

2.03 VERTICAL METAL FURRING:

A. General: Provide vertical furring complying with the following requirements:
   1. Protective Coating: ASTM A653, G40 hot-dip galvanized coating.

B. Channel Furring and Braces: Cold-rolled steel, minimum 0.0598-inch-thick base (uncoated) metal and 3/4-inch-deep-by-7/16-inch-wide flanges, 300 lb/1000 feet.

C. Hat Channels: Hat-shaped screwable furring channels, 7/8 inch deep, formed from zinc-coated (galvanized) steel sheet, minimum 0.0179-inch-thick, Grade 33.

D. Furring Brackets: Serrated-arm type, minimum 0.0329-inch-thick base (uncoated) metal, adjustable from 1/4- to 2-1/4-inch wall clearance for channel furring.

2.04 LATH:

A. Expanded-Metal Lath: Comply with ASTM C847 for material, type, configuration, and other characteristics indicated below.
   1. Material: Fabricate expanded-metal lath from sheet metal conforming to the following:
      a. Galvanized Steel: Structural-quality, zinc-coated (galvanized) steel sheet complying with ASTM A653, G60 minimum coating designation, unless otherwise indicated.
   2. Diamond-Mesh Lath: Comply with the following requirements:
      a. For applications directly to masonry or concrete:
         1) Configuration: Self-furring.
         2) Weight: 2.5-lb/sq. Yd.
      b. For reinforcing at corners of opening or at internal corners:
         1) Configuration: Flat.
         2) Weight: 2.5-lb/sq. Yd.
      c. For all other applications:
         1) Configuration: Flat.
         2) Weight: 3.4-lb/sq. Yd.

2.05 ACCESSORIES:

A. General: Comply with material provisions of ASTM C1063 and the requirements indicated below; coordinate depth of accessories with thicknesses and number of plaster coats required.

1. Galvanized Steel Components: Fabricated from zinc-coated (galvanized) steel sheet complying with ASTM A653, G40 minimum coating designation.
2. Zinc-Alloy Components: ASTM B69, 99 percent pure zinc.

B. Metal Corner Reinforcement: Expanded, large-mesh, diamond-metal lath fabricated from zinc-alloy or welded-wire mesh fabricated from 0.0475-inch-diameter, zinc-coated (galvanized) wire and specially formed to reinforce external corners of portland cement plaster on exterior exposures while allowing full plaster encasement.

C. Cornerbeads: Small nose cornerbeads fabricated from the following metal, with expanded flanges of large-mesh diamond-metal lath allowing full plaster encasement.
1. Zinc Alloy: Minimum 0.0207-inch-thick.
2. Galvanized Steel: Minimum 0.0179-inch-thick.

D. Casing Beads: Square-edged style, with expanded flanges of the following material:Retain 1 of first 4 below or retain last with 2 or more of first 4.
1. Zinc Alloy: Minimum 0.0207-inch-thick.
2. Galvanized Steel: Minimum 0.0179-inch-thick.

E. Curved Casing Beads: Square-edged style, fabricated from aluminum coated with clear plastic, preformed into curve of radius indicated.

F. Control Joints: Prefabricated, of material and type indicated below:
1. Zinc Alloy: Minimum 0.0207-inch-thick.
2. Galvanized Steel: Minimum 0.0179-inch-thick.
3. One-Piece Type: Folded pair of nonperforated screeds in M-shaped configuration, with expanded or perforated flanges.
4. Two-Piece Type: Pair of casing beads with back flanges formed to provide slip-joint action, adjustable for joint widths from 1/8 to 5/8 inch.
   a. Provide removable protective tape on plaster face of control joints.

G. Lath Attachment Devices: Material and type required by ASTM C1063 for installations indicated.

H. Fasteners: Clips and nails, standard with furring and lathing manufacturer.

I. Anchors: Stainless steel, Alloy 303 or 304, with the following additional requirements:
1. Type: Through bolt in steel; expansion bolt in concrete; toggle bolt in CMU.
2. Pull-out strength: 1,200 pounds minimum
3. Shear strength: 1,500 pounds minimum.

PART 3 - EXECUTION

3.01 INSTALLATION OF LATH AND FURRING, GENERAL:

A. Standards: Comply with ML/SFA 920, "Guide Specifications for Metal Lathing and Furring," and with the requirements of ASTM C841 and ASTM C1063.

B. Install supplementary framing, blocking, and bracing at terminations in work and for support of fixtures, equipment services, heavy trim, grab bars, handrails, furnishings, and similar work to comply with details indicated or, if not otherwise indicated, to comply with applicable written instructions of lath and furring manufacturer.

C. Isolation: Where lathing and metal support system abuts building structure horizontally and where partition or wall abuts overhead structure, sufficiently isolate from structural movement to prevent transfer of loading from building structure. Install slip- or cushion-type joints to absorb deflections but maintain lateral support.
   1. Frame both sides of control joints independently and do not bridge joints with furring and lathing or accessories.

D. Install additional framing, furring, runners, lath, and beads, as required to form openings and frames for other work as indicated. Coordinate support system for proper support of framed work that is not indicated to be supported independently of metal furring and lathing system.

3.02 INSTALLATION OF CEILING SYSTEMS:

A. Preparation and Coordination:
   1. Do not install furring until pipe, conduits and other equipment are in place and inspected.
   2. Coordinate installation of ceiling suspension system with installation of overhead structural systems to ensure inserts and other structural anchorage provisions have been installed to receive ceiling hangers in a manner that will develop their full strength and at spacings required to support ceiling.
      a. Furnish concrete inserts, and other anchorage devices indicated, to other trades for installations well in advance of time needed for coordination with other work.
      b. Perform cutting of construction necessary to install furring and lathing around ducts, conduits, pipes and equipment.

B. Hanger Installation: Attach hangers to structure above ceiling to comply with ML/SFA 920, "Guide Specifications for Metal Lathing and Furring," and with referenced standards.
   1. Do not attach hangers to metal deck tabs.

C. Install ceiling suspension system components of sizes and spacings indicated, but not in smaller sizes or greater spacings than those required by referenced lathing and furring installation standards.
   1. Wire Hangers: Suspend hangers from overhead construction. Coordinate work with construction work from which it is suspended. Space wire hangers not over 42 inches o.c., parallel with and not over 36 inches perpendicular to direction of carrying channels, unless otherwise indicated, and within 6 inches of carrying channel ends. Wrap wire hanger around carrying channel so as to develop full strength of hangers.

2. Carrying Channels: Space carrying channels not over 42 inches o.c. with 36-inch o.c. hanger spacing. Use shims or other methods, if necessary, to level channels before securing in place.
3. Furring Channels to Receive Metal Lath: Space furring channels not over 12 inches o.c. Secure furring channels to carrying channels, saddle-tied with tie wire or fastened with approved clips.

D. Where masonry partitions are erected to ceiling height only, continue suspended ceilings across partition tops without bearing on partitions. Place carrying channels, which are adjacent to and parallel to partitions, not more than six inches from face of partition.

E. Where furred ceilings are shown or specified, attach furring channels directly to the overhead construction.

F. Where shown or specified provide resilient furring channels in lieu of conventional furring channels.

G. Provide additional rods, clips and other accessories as necessary to achieve complete furring and lathing job.

3.03 INSTALLATION OF STEEL STUD WALL AND PARTITION SUPPORT SYSTEMS:

A. General: Install components of systems to comply with written instructions of steel stud manufacturer for applications indicated and as follows:
1. For non-load-bearing stud systems, comply with ASTM C754.

B. Steel Stud Systems to Receive Metal Lath: Comply with requirements of ML/SFA 920, "Guide Specifications for Metal Lathing and Furring," applicable to each installation condition and type of metal stud system indicated.
1. Extend and attach partition support systems to structure above suspended ceilings, unless otherwise indicated.

3.04 INSTALLATION OF VERTICAL METAL FURRING:

A. Install vertical metal furring components of sizes and spacings indicated, but not in smaller sizes or greater spacings than those required by referenced ML/SFA standard.

B. For furring on interior side of exterior walls, provide furring brackets, unless otherwise indicated

C. Metal Furring to Receive Metal Lath: Comply with requirements of ML/SFA 920, "Guide Specifications for Metal Lathing and Furring," applicable to each installation condition indicated.

3.05 INSTALLATION OF LATHING:

A. Install metal lath for the following applications where plaster base coats are required. Provide appropriate type, configuration, and weight of metal lath

selected from materials indicated that comply with referenced ML/SFA specifications and ASTM lathing installation standards.

1. For applications directly to masonry or concrete use 2.5-lb/sq. Yd. minimum weight, self-furring, diamond-mesh lath.
2. For reinforcing at corners of opening or at internal corners 2..5-lb/sq. Yd. minimum weight, diamond-mesh lath.
3. For all other applications use 3.4-lb/sq. Yd. minimum weight, diamond-mesh lath.

B. Lathing on Ceilings:

1. Apply metal lath with long dimension of sheet at right angle to furring channels.
2. Securely tie metal lath to supporting framing with tie wire.
3. Tie each sheet of lath at least four times in width to each support. Lap ends and sides of sheet not less than ½-inch and lace together at approximately six inches on center. Stagger ends of sheets.

C. Lathing on Stud Partitions and Furred Walls:

1. Provide metal lath where shown.
2. Attach metal lath to furring channels and studs with tie wire.

3.06 CLEANING:

A. Remove from site rubbish and debris caused by this work..

B. Leave rooms and areas in broom-clean condition.

END OF SECTION

SECTION 09320

TILE

PART 1 - GENERAL

1.01 DESCRIPTION:

A. This section specifies providing ceramic tile, ceramic mosaic tile, quarry tile and marble thresholds, typically in restricted areas as shown.

1.02 PERFORMANCE REQUIREMENTS:

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C1028:
   1. Level Surfaces: Minimum 0.6.
   2. Ramp Surfaces (slope grater than 1:20): Minimum 0.8.

1.03 SUBMITTALS:

A. Submit the following for approval in accordance with the General Requirements and with the additional requirements as specified for each:
   1. Product Data: For each type of tile, mortar, grout, and other products specified. Include recommendations for product application and use.
   2. Shop Drawings: For the following:
      a. Tile patterns and locations.
      b. Widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
   3. Tile Samples for Initial Selection: Manufacturer's color charts consisting of actual tiles or sections of tiles showing the full range of colors, textures, and patterns available for each type and composition of tile indicated. Include Samples of accessories involving color selection.
   4. Grout Samples for Initial Selection: Manufacturer's color charts consisting of actual sections of grout showing the full range of colors available for each type of grout indicated.
   5. Samples for Verification: Of each item listed below, prepared on Samples of size and construction indicated. Where products involve normal color and texture variations, include Sample sets showing the full range of variations expected.
      a. Ceramic and Ceramic Mosaic Tile: Three panels of each type and composition of tile and for each color and texture required, 12 inches square, mounted on 16 inches square by 1/4-inch thick hardboard with grouted joints using product complying with specified requirements and approved for completed work in color or colors selected by the Engineer.
      b. Full-size units of each type of trim and accessory for each color required.

c. Quarry Tile: Four standard size units mounted on 16 inches square by 1/4-inch thick hardboard with grouted joints using product complying with specified requirements and approved for completed work in color or colors selected by the Engineer.
d. Marble Threshold: Three 12-inch lengths showing range of color, veining and finish.

6. Master Grade Certificates: For each shipment, type, and composition of tile, per ANSI A137.1, bearing TCA-Certification Mark, signed by tile manufacturer and Installer stating type and quality of material. Submit at time of shipment..
7. Product Certificates: Signed by manufacturers certifying that the products furnished comply with requirements.
8. Tile Test Reports: Certified test reports in accordance with ANSI A118.1 through A118.4.

1.04 QUALITY ASSURANCE:

A. Codes Regulations, Reference Standards and Specifications:
1. Comply with the codes and regulations of the jurisdictional authorities.
2. ADA: Americans with Disabilities Act.
3. ANSI: A108.1C, A108.5, A108.6, A108.10, A118.1, A118.2, A118.3, A118.4, A118.6, A137.1.
4. ASTM: A82, A185, C144, C150, C206, C207, C241, C503, C920, C1028, D4397.
5. FS: UU-B-790.
6. TCA: Handbook for Ceramic Tile Installation.

B. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

C. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.

D. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.Mockups: Before installing floor and wall tile, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for completed Work.
1. Mockups shall be minimum four feet square and in the location as directed by the Engineer.
2. Notify the Engineer seven days in advance of the dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.

4. Obtain the Engineer's approval of mockups before proceeding with final unit of Work.
5. Approved mockups may become part of the completed Work.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials to the site in original unopened containers, clearly labeled with the manufacturer's name, brand designation, type, grade and color. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

B. Store materials so as to prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

C. Handle materials so as to prevent breakage of containers and damage to materials.

1.06 PROJECT CONDITIONS:

A. Environmental Limitations: Do not start tile work unless ambient temperature of area in which work occurs is at least 50 deg. F and rising and is maintained at not less than 50 deg. F without interruption while work is being done and for at least 72 hours after completion.

B. Substrate Conditions: Do not start tile work unless surfaces to receive tile are in satisfactory condition. Commencement of tile work constitutes Contractor's acceptance of the subfloor condition in accordance with ANSI A108-AN-2, General Requirements for Subsurfaces.

1.07 EXTRA MATERIALS:

A. Deliver extra materials to Owner. Furnish and store extra materials in locations as directed on pallets and in original containers with protective covering for storage, and are clearly identified with labels describing contents and area of placement.
1. Tile and Trim Units: Furnish quantity of full-size units equal to 5 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.01 PRODUCTS, GENERAL:

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" article.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
   1. Provide Engineer's selections from manufacturer's full range of colors, textures, and patterns for products of type indicated.
   2. Provide tile trim and accessories that match color and finish of adjoining flat tile.

D. Factory Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.

2.02 TILE PRODUCTS:

A. Unglazed Ceramic Mosaic Floor Tile: Provide factory-mounted flat tile complying with the following requirements:
   1. Composition: Porcelain or porcelain with abrasive admixture, as indicated.
   2. Module Size: 2 by 2 inches (nominal).
   3. Nominal Thickness: 1/4 inch.
   4. Face: Plain with cushion edges.

B. Unglazed Quarry Tile: Provide square-edged flat tile complying with the following requirements:
   1. Wearing Surface: Nonabrasive or abrasive aggregate embedded in surface, as indicated.
   2. Facial Dimensions: 6 by 6 inches (nominal).
   3. Thickness: 1/2 inch.
   4. Face: Plain.

C. Glazed Wall Tile: Provide flat tile complying with the following requirements:
   1. Module Size: 4-1/4 by 4-1/4 inches.
   2. Thickness: 5/16 inch.
   3. Face: Plain with cushion edges.
   4. Color: White.

D. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with the following requirements:
   1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
   2. Shapes: As follows, selected from manufacturer's standard shapes:
      a. Base for Thin-Set Mortar Installations: Straight.
      b. External Corners for Thin-Set Mortar Installations: Surface bullnose.
      c. Internal Corners: Field-butted square corners, except with coved base and cap angle pieces designed to member with stretcher shapes.

2.03 STONE THRESHOLDS:

A. General: Provide stone thresholds that are uniform in color and finish, fabricated to sizes and profiles indicated to provide transition between tile surfaces and adjoining finished floor surfaces.
   1. Fabricate thresholds to heights indicated, but not more than ½-inch above adjoining finished floor surfaces, with transition edges beveled on a slope of no greater than 1:2.

B. Marble Thresholds: Provide marble thresholds complying with ASTM C503 requirements for exterior use and with a minimum abrasive-hardness value (Ha) of 10 per ASTM C241.
   1. Provide white, honed marble complying with the Marble Institute of America's Group A requirements for soundness.

2.04 SETTING AND GROUTING MATERIALS:

A. Portland Cement: ASTMC150, Type I.

B. Sand: ASTM C144.

C. Hydrated Lime: ASTM C206 or ASTM C207, Type S.

D. Water: Potable.

E. Portland Cement Mortar Installation Materials: Provide materials complying with ANSI A108.1A and as specified below:
   1. Cleavage Membrane: Polyethylene sheeting ASTM D4397, 4.0 mils thick.
   2. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A185 and ASTM A82, except for minimum wire size.

F. Dry-Set Portland Cement Mortar: ANSI A118.1.

G. Chemical-Resistant, Water-Cleanable, Ceramic Tile-Setting and -Grouting Epoxy: ANSI A118.3.
   1. Provide product capable of resisting continuous and intermittent exposure to temperatures of up to 140 deg F and 212 deg F, respectively, as certified by mortar manufacturer for intended use.

H. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated.

I. Dry-Set Grout: ANSI A118.6, color as indicated.

J. Chemical-Resistant Epoxy Grout: ANSI A118.3, color as indicated.
   1. Provide product capable of resisting continuous and intermittent exposure to temperatures of up to 140 deg F and 212 deg F, respectively, as certified by mortar manufacturer for intended use.

2.05 ELASTOMERIC SEALANTS AND BACKUP JOINT FILLER:

A. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

B. One-Part, Mildew-Resistant Silicone Sealant: ASTM C920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes.

C. Multipart, Pourable Urethane Sealant for Use T: ASTM C920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.

D. Prime and Joint Cleaner: Use products as recommended by sealant manufacturer.

2.06 MISCELLANEOUS MATERIALS:

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Building Paper: FS UU-B-790, red-rosin-sized building, Type I, Style 1B.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.07 MIXING MORTARS AND GROUT:

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.

2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with the Engineer.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION:

A. Remove coatings, including curing compounds, and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

B. Provide concrete substrates for tile floors installed with dry-set or latex-portland cement mortars that comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.
1. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Provide leveling course for masonry or concrete-wall when variation exceeds 1/4-inch in eight feet. Leveling course shall consist of dry-set mortar to which an equal volume of a mixture of one-part portland cement and 1-1/2 parts sand has been added. Apply leveling course to maximum thickness of 1/4-inch.

D. Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.03 INSTALLATION, GENERAL:

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

C. Coordinate tile work with work of other trades.

D. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate

work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

E. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

F. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
   1. For tile mounted in sheets, use plastic spacers to make joints between tile sheets the same width as joints within tile sheets so joints between sheets are not apparent in finished work.

3.04 FLOOR TILE INSTALLATION:

A. General: Install floor tile by the portland cement mortar method in accordance with ANSI A108.1C.

B. Tile Type: Unglazed ceramic mosaic tile and quarry tile.

C. Setting Bed and Grout: ANSI A108.1C with the following mortar and grout:
   1. Dry-set portland cement mortar.
   2. Dry-set grout.

D. Joint Widths: Install tile on floors joint widths as recommended by the tile manufacturer.

E. Grout: Dry-set grout in accordance with ANSI A108.10.

F. Where depression is not provided for mortar setting bed, install floor tile by the epoxy method in accordance with ANSI A108.6.

3.05 WALL TILE INSTALLATION:

A. General: Install wall tile by the dry-set mortar method in accordance with ANSI A108.5.

B. Tile Type: Glazed wall tile.

C. Setting Bed and Grout: ANSI A108.5 with the following mortar and grout:
   1. Dry-set portland cement mortar.
   2. Dry-set grout.

D. Joint Widths: Install tile on floors joint widths as recommended by the tile manufacturer.

E. Grout: Dry-set grout in accordance with ANSI A108.10.

F. Where inside corners are shown as flat tiles, make corner joint a sealant joint as specified for expansion joints below.

3.06 STONE THRESHOLD INSTALLATION:

A. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.
   1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

3.07 EXPANSION AND CONTROL JOINT INSTALLATION:

A. Provide expansion and control joints around floor perimeters, at interior corners of tiled walls, in tile surfaces directly above joints in concrete substrates and where recommended by the TCA Handbook for Ceramic Tile Installation.

B. Do not saw-cut joints after installing tiles.

C. Install removable divider strips of the same depth as the finished tile system, including setting bed, to keep sealant joints free of setting bed, mortar and grout. Remove strips after grouting and curing operations in order to install sealant.

D. Install and cure sealant in accordance with manufacturer's instructions. Use primer unless sealant manufacturer recommends against priming.

3.08 CLEANING AND PROTECTING:

A. Cleaning: On completion of placement and grouting, clean tile surfaces with warm water and washing compound in accordance with recommendations of tile manufacturer. Sponge and wash tile thoroughly and polish with clean dry cloths.
   1. The use of acid or acid cleaners on tile is prohibited.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure tile is without damage or deterioration at the time of Substantial Completion.
   1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with building paper taped to tile to prevent staining, damage, and wear. Lay board walkways on floors to be used as passageways.
   2. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION

SECTION 09511

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.01 DESCRIPTION:

A. This section specifies providing lay-in acoustical panels and exposed suspension systems.

B. Related Work Specified Elsewhere:
   1. Acoustical Snap-In Metal Pan Ceilings: Section 09513.

1.02 DEFINITIONS:

A. CAC: Ceiling Attenuation Class.

B. LR: Light Reflectance coefficient.

C. NRC: Noise Reduction Coefficient.

1.03 SUBMITTALS:

A. Submit the following for approval in accordance with the General Requirements and with the additional requirements as specified for each:
   1. Product Data: For each type of product specified provide manufacturer's printed product information including maintenance information.
   2. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
      a. Ceiling suspension system members.
      b. Method of attaching suspension system hangers to building structure.
      c. Ceiling-mounted items including light fixtures; air outlets and inlets; speakers; sprinklers; and special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.
      d. Minimum Drawing Scale: 1/8 inch = 1 foot.
   3. Samples for Initial Selection: Manufacturer's color charts consisting of actual acoustical panels or sections of acoustical panels, suspension systems, and moldings showing the full range of colors, textures, and patterns available for each type of ceiling assembly indicated.
   4. Samples for Verification: Full-size units of each type of ceiling assembly indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics. Provide three of each type.
      a. Full-size samples of each acoustical panel type, pattern, and color.
      b. Set of 12-inch-long samples of exposed suspension system members, including moldings, for each color and system type required.
      c. Fasteners: Each type.

d. Accessories.

5. Product Test Reports: Indicate compliance of acoustical panel ceilings and components with requirements based on comprehensive testing of current products.
6. Certification or qualification statement of the testing and inspecting agency selected to perform fire-response-tests.

1.04 QUALITY ASSURANCE:

A. Codes, Regulations, Reference Standards and Specifications:
1. Codes and regulations of the jurisdictional authorities.
2. ASTM: A635, A641, B633, C635, CC636, 834, E84, E90, E488, E795, E1190, E1264.
3. CISCA: Ceiling Systems Handbook.
4. NAAMM: Metal Finishes Manual for Architectural and Metal Products.

B. Installer Qualifications: Engage an experienced installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

C. Source Limitations for Ceiling Units: Obtain each acoustical ceiling panel from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

D. Source Limitations for Suspension System: Obtain each suspension system from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

E. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
1. Fire-response tests were performed by UL, ITS/Warnock Hersey, or another independent testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
2. Surface-burning characteristics of acoustical panels comply with ASTM E1264 for Class A materials as determined by testing identical products per ASTM E84.
3. Products are identified with appropriate markings of applicable testing and inspecting agency.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages, clearly labeled with the manufacturer's name, brand designation, specification number, type, class and ratings as applicable.

B. Store acoustical panels and suspensions system components in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

C. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

D. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.06 PROJECT CONDITIONS:

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, and work above ceilings is complete. Maintain temperature of 70 deg F minimum and relative humidity of 55-percent maximum in spaces in which acoustical panel work is being done.

1.07 COORDINATION:

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.08 EXTRA MATERIALS:

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
   1. Acoustical Ceiling Units: Full-size units equal to 5.0 percent of amount installed.
   2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS:

2.01 ACOUSTICAL PANELS, GENERAL:

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
   1. Mounting Method for Measuring Noise Reduction Coefficient: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E795.

2.02 METAL SUSPENSION SYSTEMS, GENERAL:

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C635 requirements.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times design load indicated in ASTM C635, Table 1, Direct Hung, unless otherwise indicated.
   1. Cast-in-Place and Post-installed Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E488, conducted by a qualified testing and inspecting agency.
      a. Type: Cast-in-place anchors.
      b. Type: Post-installed expansion anchors.
      c. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B633, Class Fe/Zn 5 (0.005 mm) for Class SC service condition (mild).
   2. Post-installed Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E1190, conducted by a qualified testing and inspecting agency.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
   1. Zinc-Coated Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
   2. Size: Select wire diameter so its stress at five times hanger design load (ASTM C635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 12 gauge.

E. Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners. Provide moldings with exposed flange of the same width as exposed runner.

F. Metal Finish: Baked-Enamel Finish. Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat, with not less than 1.0-mil dry film thickness for topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2.0 mils.
   1. Color and Gloss: Matte white or as selected by the Engineer from manufacturer's full range of colors and glosses.

2.03 ACOUSTICAL SEALANT:

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C834 and the following requirements:
   1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical panel ceilings.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION:

A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
   1. If indicated, furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.

B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.03 INSTALLATION:

A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
   1. Standard for Ceiling Suspension System Installations: Comply with ASTM C636.

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support

ceiling loads within performance limits established by referenced standards and publications.

4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, powder-actuated fasteners, or drilled-in anchors that extend through forms into concrete.
6. Do not attach hangers to steel deck tabs.
7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
8. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 6 inches from ends of each member.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter inside and outside corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
2. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated or required.

3.04 FIELD QUALITY CONTROL OF POWER-ACTUATED FASTENERS AND POST-INSTALLED ANCHORS:

A. Testing Agency: Contractor will engage a qualified independent testing agency to perform field quality-control testing.

B. Extent and Testing Frequency: Testing will take place in successive stages in areas described below. Proceed with installation of acoustical panel ceilings only after test results for previously installed hangers comply with requirements.

1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.
2. Within each test area, testing agency will select one of every 10 powder-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
3. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 consecutively pass and then will resume initial testing frequency.

C. Testing agency will report test results promptly and in writing to Contractor and Engineer.

D. Remove and replace those fasteners and anchors that test results indicate do not comply with specified requirements

E. Additional Testing: Where fasteners and anchors are removed and replaced, additional testing will be performed to determine compliance with specified requirements.

3.05 CLEANING:

A. Replace damaged and broken acoustical panels.

B. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

C. Clean up rubbish and debris and remove from site.

D. Leave work areas in a broom clean condition.

END OF SECTION

SECTION 09650

RESILIENT FLOORING

PART 1 - GENERAL

1.01 DESCRIPTION:

A. This section specifies providing rubber floor covering, vinyl composition floor tile, vinyl wall base, rubber stair treads and accessories.

1.02 SUBMITTALS:

A. Submit the following for approval in accordance with the General Requirements and with the additional requirements as specified for each:
   1. Product Data: For each type of product specified provide manufacturer's printed product information.
   2. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors and patterns available for each type of product indicated.
   3. Samples for Verification: Four of each type, color and pattern of the following materials used in the Work, showing the full range of variations expected:
      a. Floor Tile: 12 inches square.
      b. Wall Base: 12 inches long.
      c. Edge Strips: 12 inches long.
      d. Adhesive: Pint container.Product Certificates: Signed by manufacturers of resilient products certifying that each product furnished complies with requirements.
   5. Maintenance Data: For each type of product specified.

1.03 QUALITY ASSURANCE:

A. Codes, Regulations, Reference Standards and Specifications:
   1. Comply with codes and regulations of the jurisdictional authorities.
   2. ASTM: D2240, E648, E662, F710, F1066, F1344.
   3. FS: RR-T-650, SS-T-312, SS-W-40, UU-B-790.

B. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing resilient products similar to those required for this Project and with a record of successful in-service performance.

C. Source Limitations: Obtain each type, color, and pattern of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

D. Fire-Test-Response Characteristics: Provide products with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Critical Radiant Flux: 0.45 W/sq. cm or greater when tested per ASTM E648.
2. Smoke Density: Maximum specific optical density of 450 or less when tested per ASTM E662.

1.04 DELIVERY, STORAGE, AND HANDLING:

A. Deliver products to Project site in manufacturer's original, unopened cartons and containers, clearly labeled with manufacturer's name and brand designation, referenced specification number, type and color, and shipping and handling instructions.

B. Store products in dry spaces protected from the weather, with ambient temperatures maintained between 50 and 90 deg F.

C. Store tiles on flat surfaces.

D. Handle products to prevent breakage of containers and damage to products.

E. Move products into spaces where they will be installed at least 48 hours before installation, unless longer conditioning period is recommended in writing by manufacturer.

1.05 PROJECT CONDITIONS:

A. Maintain a temperature of not less than 70 deg F or more than 90 deg F in spaces to receive products for at least 48 hours before installation, during installation, and for at least 48 hours after installation, unless manufacturer's written recommendations specify longer time periods. After post-installation period, maintain a temperature of not less than 55 deg F or more than 95 deg F.

B. Do not install products until they are at the temperature recommended according to manufacturer's instructions.

C. Do not install base until plaster or other backing material has thoroughly dried.

D. Close spaces to traffic during flooring installation and for time period after installation recommended in writing by manufacturer.

E. Install tiles and accessories after other finishing operations, including painting, have been completed. Where demountable partitions and other items are indicated for installation on top of resilient tile flooring, install tile before these items are installed.

F. Do not install flooring over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive, as determined by flooring manufacturer's recommended bond and moisture test.

1.06 EXTRA MATERIALS:

A. Furnish and store where directed extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
   1. Furnish not less than one percent of the total quantity of each type, color, pattern, class, wearing surface, and size of resilient tile flooring installed, but not less than one full unopened container.
   2. Furnish not less than one percent of the total quantity of each type, color, and size of base material installed, but not less than one full unopened container.

PART 2 - PRODUCTS

2.01 RESILIENT FLOORING:

A. Rubber Floor Covering: Products complying with ASTM F1344 and with requirements specified.
   1. Manufacturers: including but not limited to:
      a. R.C.A. Rubber Company.
      b. Or equal.
   2. Color and Pattern: Terra Cotta.
   3. Class: I-A.
   4. Hardness: Durometer hardness not less than 85 Shore, Type A per ASTM D2240 as required according to ASTM F1344.
   5. Wearing Surface: Textured.
   6. Thickness: 3/16 inch.
   7. Fabrication: Fabricate heavy duty rubber mat with interlocking joints in five pieces to fit area shown, with edges square and true, without overlap.

B. Vinyl Composition Floor Tile: Products complying with ASTM F1066 and with requirements specified:
   1. Manufacturers: including but not limited to
      a. Armstrong.
      b. Azrock.
      c. GAF.
      d. Kentile.
      e. Or equal.
   2. Color and Pattern: As selected by the Engineer from manufacturer's full range of colors and patterns produced for tile complying with requirements indicated.
   3. Class: Class 2 (through-pattern tile).
   4. Wearing Surface: Smooth unless otherwise indicated.
   5. Thickness: 1/8 inch.
   6. Size: 12 by 12 inches.

2.02 RESILIENT ACCESSORIES:

A. Vinyl Wall Base: Products complying with FS SS-W-40, Type II and with requirements specified:

1. Color and Pattern: As selected by the Engineer from manufacturer's full range of colors and patterns produced for vinyl wall base complying with requirements indicated
2. Style: Cove with top-set toe unless otherwise indicated.
3. Minimum Thickness: 1/8 inch.
4. Height: 4 inches.
5. Lengths: Cut lengths longest practicable or coils in lengths standard with manufacturer, but not less than 96 feet.
6. Outside Corners: Job formed.
7. Inside Corners: Job formed.
8. Surface: Smooth.

B. Rubber Stair Treads: Products of style suitable for use indicated and complying with FS RR-T-650, Composition A and with requirements specified:
1. Manufacturers: including but not limited to:
   a. R.C.A. Rubber Company.
   b. Or equal.
2. Color and Pattern: Terra Cotta.
3. Design: Type 1 (smooth).
4. Abrasive Strips: Provide abrasive strips as specified by the product designation indicated above in color selected by the Engineer from manufacturer’s full range of colors.
5. Nosing Style: Round.
6. Nosing Height: ½ inch light color.
7. Thickness: 5/16-inch tapering to 3/16-inch at back edge.
8. Size: Lengths and depths to fit each stair tread in one piece.
9. Fabrication: Fabricate nosing of stair tread to wrap around curved ends of step, to provide a uniform elevation appearance on three sides of step. Abrade at least 80 percent of the back of tread and nosing to assure adhesion to substrate. Fabricate nosing so that it will not delaminate or otherwise separate from the stair tread material.

2.03 INSTALLATION ACCESSORIES:

A. Tile Reducer Edge Strip: Products complying with FS SS-T-312, beveled, one-inch wide, 1/8-inch thick. Color to match vinyl wall base.

B. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by flooring manufacturer for applications indicated.

C. Tile Adhesive: Waterproof asphalt cut-back cement recommended by manufacturer to suit resilient products and substrate conditions indicated.

D. Stair Tread Adhesive: Permanent, as recommended by tread manufacturer for adhesion to galvanized steel substrate.

E. Stair Tread Nose Filler: Two-part epoxy compound recommended by tread manufacturer to fill nosing substrates that do not conform to tread contours.

F. Primer: As recommended by adhesive manufacturer.

G. Base Cement: Water-resistant, type recommended by manufacturer of vinyl wall base.

H. Building Paper: FS UU-B-790.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine substrates, areas, and conditions where installation of resilient products will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for resilient product installation and comply with requirements specified

B. Concrete Sub-floors: Verify that concrete slabs comply with ASTM F710 and the following:
   1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by flooring manufacturer.

C. Kiosk Equipment: Verify configuration of equipment in kiosk to ensure fit of flooring within 1/16-inch tolerance.

3.02 PREPARATION:

A. General: Comply with resilient product manufacturer's written installation instructions for preparing substrates indicated to receive resilient products.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.

C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

D. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Do not proceed with installation until unsatisfactory conditions have been corrected as determined by AR.

3.03 RESILIENT FLOORING INSTALLATION:

A. General: Comply with flooring manufacturer's written installation instructions.

B. Leveling Floor: Level floor by grinding high spots and filling low spots with leveling and patching compound following manufacturer’s recommendations to ensure plane surface free of imperfections.

C. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half of a tile at perimeter.
   1. Lay tiles square with room axis, unless otherwise indicated.

D. Uniformity of Color: Use tiles alternately from at least two cartons so that pattern will be uniform and not spotty due to variation that may be found in different cartons. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.

E. Application of Primer: Unless adhesive manufacturer recommends against priming, apply primer at rate and by method recommended.

F. Application of Adhesive: Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to comply with tile manufacturer's written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.
   1. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

G. Laying of Tile:
   1. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures, including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
   2. Extend tiles into toe spaces, door reveals, closets, and similar openings.
   3. Provide joints cut straight and true. Seal tile joints at pipes with waterproof cement.
   4. Embed tiles level, flush with surface and with tightly butted joints against adjoining tiles.
   5. Hand roll tiles according to tile manufacturer’s written instructions.

H. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent, nonstaining marking device.

3.04 RESILIENT ACCESSORY INSTALLATION:

A. General: Install resilient accessories according to manufacturer's written installation instructions.

B. Vinyl Wall Base: Apply resilient wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required. Extend wall base into closets and offsets adjoining areas to receive wall base.
   1. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
   2. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

3. Do not stretch base during installation.
4. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
5. Form outside corners on job from straight pieces of maximum lengths possible, without whitening at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
6. Form inside corners on job, from straight pieces of maximum lengths possible, by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

C. Rubber Stair Tread: Adhere nosing so that it will not delaminate or otherwise separate from the stair tread material.

D. Tile Reducer Edge Strip: Install edge strips at edges of flooring that would otherwise be exposed.
1. Where tile stops at doorways without saddles or thresholds, set edge strips directly under doors.

E. Place resilient accessories so they are butted to adjacent materials and bond to substrates with adhesive.

3.05 CLEANING AND PROTECTING:

A. Perform the following operations immediately after installing resilient products:
1. Remove adhesive and other surface blemishes using cleaner recommended by resilient product manufacturers.

B. After flooring is laid and adhesive thoroughly cured, clean and finish resilient floors as recommended by the resilient product manufacturer with approved compatible products.

C. Keep traffic off finished floors during the remainder of construction period.

D. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by flooring manufacturer.
1. Cover products installed on floor surfaces with reinforced kraft building paper and tape joints. Maintain such cover and otherwise protect floor until final acceptance.
2. Do not move heavy and sharp objects directly over floor surfaces. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

3.06 MAINTENANCE MATERIALS:

A. After completion of the work, furnish and store where directed at least one percent of the total quantity of tile and one percent of base material, but not less than one full unopened container of each, for future maintenance.

B. Include proportional quantities of each type and color in original containers clearly marked to show contents and area of placement of each type and color.

END OF SECTION

SECTION 09900

PAINTING AND COATING

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies furnishing and applying paint at the site.
   1. Specific surfaces and areas which require field painting and required paint systems are listed in the schedule of painting.
   2. Unless an item is shown not to be field painted or specified otherwise paint it in accordance with these specifications and Section 05500.

B. Definitions:
   1. Paint: Includes primers and undercoaters, sealers, paint, epoxy and special coatings.

C. Items Not Included In Field Painting:
   1. Stainless steel, ornamental metals, glass, resilient tile, ceramic tile, paving, acoustical tile, plastic laminate and similar items which are prefinished.
   2. Corrosion-resistant structural steel, ASTM A242.
   3. High-strength structural corrosion-resistant steel shapes, plates and bars, ASTM A588.
   4. Galvanized-metal surfaces except fire stand pipes.
   5. UL labels on fire-rated doors and frames.

1.02 RELATED SECTIONS

A. Section 05500 – Metal Fabrications

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency ; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2011.

C. GreenSeal GS-11 - Paints 1993.

1.04 SUBMITTALS

A. Product Data: Provide complete list of all products to be used, with the following

information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
2. MPI product number (e.g. MPI #47).
3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

B. Submit the following for approval in accordance with the General Requirements and with the additional requirements as specified for each:

4. Samples:
   a. Three each of each color and texture, with identification of materials keyed to those specified and application methods.
   b. Samples of paint scheduled for application to smooth finishes applied to 12-inch square hardboard or metal panels.
   c. Samples of paint scheduled for application to concrete masonry units applied to 16-inch square by two-inch thick panel of concrete masonry units, including one tooled masonry joint. Subdivide panel to define prime or filler, intermediate and finish coats.

1.05 QUALITY ASSURANCE

A. Codes, Regulations, Reference Standards and Specifications:

1. ASME: A13.1.
2. ANSI: Z535.1.
3. ASTM: A242, A588, B117, C476, C920.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum five years documented experience.

C. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years experience.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver products to the jobsite in their original unopened containers clearly labeled with the manufacturer's name and brand designation, referenced specification number and type, as applicable.

B. Store products in an approved ventilated dry area, protect from contact with soil and from exposure to the elements. Always keep products dry. Do not allow paint to freeze.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions, whichever is more stringent.

D. Handle products in a manner that will prevent breakage of containers and damage to

products.

1.07 JOB CONDITIONS

A. Environmental Requirements:
   1. Do not apply paint to non-protected surfaces in wet weather or to surfaces on which ice, frost, water or dampness is visible.
   2. Do not apply exterior paint when the temperature is below 40F or expected to fall below this temperature. Do not apply interior paint when the temperature is lower than 60F or expected to fall below this temperature.
   3. Avoid painting steel which is at a temperature which can cause blistering, porosity, or otherwise be detrimental to the life of the paint. When paint is applied in hot weather or thinned in cold weather ensure that the specified thickness of paint coating is obtained.
   4. Do not apply paint in rain, wind, snow, fog or mist or when the steel surface temperature is below the dew point, resulting in condensation of moisture.
   5. Do not apply interior paint when, in the AR's opinion, satisfactory results cannot be obtained due to high humidity and excessive temperature; however, failure of the AR to notify the Contractor of the conditions will not relieve the Contractor of responsibility to produce satisfactory results.
   6. Provide lighting level of 80 ft. candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 GENERAL

A. To the maximum extent practicable, use the materials of one manufacturer throughout the project. No claims as to the suitability of a material specified, or of inability to produce first-class work with these materials, will be considered unless such claims are made in writing and submitted with the Contractor’s Bid Proposal.

B. Provide a primer suitable for each substrate type and which is manufactured or recommended by the paint manufacturer as part of a complete painting system.

C. Previously Primed Surfaces:
   1. If surfaces have been primed off-site at the mill, factory or shop, omit specified primer, but only if the off-site primer is acceptable to the paint system manufacturer for best performance of the specified paint system.
   2. For touch-up of off-site primer, use primer of the same composition as the mill, factory or shop primer.
   3. VOC Requirements: Provide products in compliance with local volatile organic compound regulations. If the listed product of a manufacturer does not comply, provide an accepted equivalent product which does comply.

D. Listed materials are a guide to quality intended. Substitute materials and paint systems acceptable to the AR, as an equal or of superior quality for each intended use, may be used in the work at no additional cost to the Authority.

E. Accessory Materials:
   1. General: Provide miscellaneous materials and accessories, whether listed or not, as necessary to complete the work in an approved manner.
   2. Caulk: Single-component, chemically curing, synthetic rubber, non-sag, ASTM C920, Type S, NS, Class 25.
   3. Spackling compound: Ready-mixed type, U.S. Gypsum Ready-Mixed Joint Compound - Topping, ASTM C476 or equal.
   4. Thinner: As recommended by the paint manufacturer.

2.02 MANUFACTURERS

A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.

B. Provide all paint and coating products from the same manufacturer to the greatest extent possible.

C. Paints:
   1. Glidden Professional: www.gliddenprofessional.com.
   2. Benjamin Moore & Co: www.benjaminmoore.com.
   3. Parker Paint Mfg. Co Inc., a Comex Group company: www.parkerpaint.com.
   4. PPG Architectural Finishes, Inc.: www.ppgaf.com.
   5. Pratt & Lambert Paints: www.prattandlambert.com.
   6. Sherwin-Williams Company: www.sherwin-williams.com.
   7. Or approved equal.

2.02 PAINTS AND COATINGS - GENERAL

A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
   1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each coating material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Volatile Organic Compound (VOC) Content:
   1. Provide coatings that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

D. Chemical Content: The following compounds are prohibited:
   1. Aromatic Compounds: In excess of 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
   2. Acrolein, acrylonitrile, antimony, benzene, butyl benzyl phthalate, cadmium, di (2-ethylhexyl) phthalate, di-n-butyl phthalate, di-n-octyl phthalate, 1,2-dichlorobenzene, diethyl phthalate, dimethyl phthalate, ethylbenzene, formaldehyde, hexavalent chromium, isophorone, lead, mercury, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, naphthalene, toluene (methylbenzene), 1,1,1-trichloroethane, vinyl chloride.

E. Flammability: Comply with applicable code for surface burning characteristics.

F. Colors: To be selected from manufacturer's full range of available colors.
   1. Selection to be made by Architect after award of contract.

2.03 PAINT SYSTEMS – EXTERIOR

A. New and Existing Ferrous Metals.
   1. 1st Coat - Touch up with epoxy Polyamide Paint.
   2. 2nd Coat - Polyamide Epoxy Paint applied at the rate of 4.0 to 6.0 Mils DFT.
   3. SSPC-PS Guide 13.01
      3rd Coat (Top Coat) - Acrylic Aliphatic
      Polyurethane applied at rate of 1.5 to 2.0 Mils DFT. SSPC-PS Guide 17.00 Type 5.

B. Zinc Coated Metal Exposed to Public View.

   Provide for all galvanized surfaces (Zinc metallizing) exposed to public view (not just on the exposed face), except chain link fences**:**
   1. 1st Coat - Epoxy polyamide -- 4.0 Mils DFT.
   2. 2nd Coat - Exterior Aliphatic polyurethane semi-gloss enamel -- 4.0 Mils DFT.

C. Existing steel members embedded in masonry or concrete.

1. 1st Coat - Epoxy polyamide equal to Tnemec Series 135 Chembuild (capable of painting on an SSPC-SP3 surface prep. -- 7 to 9 Mils DFT

D. Existing steel members exposed to view or the elements.

1. Provide the epoxy coat system, except the first coat shall be an Epoxy polyamide equal to Tnemec Series 135 Chembuild (capable of painting on an SSPC-SP3 surface prep.

E. Epoxy Coat System.

1. 1st Coat - (Primer) – Epoxy organic zinc rich Primer with 85% zinc applied at rate of -- 2.0 to 4.0 Mils. DFT. SSPC-PS Guide 12.00 (Organic Zinc Rich)
2. 2nd Coat - Polyamide Epoxy Paint applied at the rate of 4.0 to 6.0 Mils DFT. SSPC-PS Guide 13.01
3. 3rd Coat (Top Coat) - Acrylic Aliphatic Polyurethane applied at rate of 1.5 to 2.0 Mils DFT. SSPC-PS Guide 17.00 Type 5.

   For factory painted items, Manufacturer/Fabricator shall provide touch-up paint in sufficient amount for Project. -- 5.0 Mils DFT

F. Zinc Rich Coating (ZRC)

1. Type – Two-component liquid inorganic zinc compound.
   a. Finish -Flat light gray.
   b. Theoretical coverage -300 square feet per gallon at 1.5 mil dry film thickness.
   c. Metallic zinc content -93% by weight in dry film.
   d. Flash point – None.
   e. Weight per gallon -25 lbs.
   f. Solids content – 43.5% by volume (ASTM D-2832).
   g. VOC content - 0 g/l (0 lbs/gal) (ASTM D-1475).
   h. Viscosity -525 cps. - Brookfield spindle #5 at 100 RPM at 25 degrees C (ASTM D-2196).
   i. Maximum service temp. - 1700 degrees F (ASTM D-2485).
   j. Specific gravity –3.02 (ASTM D-1963)
   k. Electrical conductivity -73 million ohms per 3 mil dry.(Resistivity).
   l. Pot life -At least 8 hours.
   m. Shelf life - 2 years minimum.
   n. Dry time -(Set to touch) When ambient air dried, 15-20 minutes (ASTM D-1640).
2. Recoat time -(Second coat) After 24 hrs. The maximum total DFT is recommended to be 6.0 mils. Under certain conditions, recoat time can be reduced.

Summary Table for Paint Items and Applicable Paint System

ITEM	PAINT SYSTEM
Bollard	2.03 C
Lightwall Bar	2.03 A
Pipe Guard	2.03 B
Railing	2.03 A
Sign Post	2.03 C
Electrical Equipment Enclosures	2.03. E
Painted Electrical Raceway Components	2.03. E
Piping	2.03. D
Door	2.03.C
Stair Nosing	2.03.F
Exposed steel plates	2.03.F
Exposed Rebars	2.03.F

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Plaster and Stucco: 12 percent.
   3. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
   4. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATORY WORK

A. Inspect surfaces for their suitability to receive a finish. When imperfections occur due to materials or workmanship appear on surfaces, make the appropriate corrections at no additional cost to the Authority. Correct damage to painted or decorated finishes due to carelessness or negligence of other trades.

B. Protect hardware, hardware accessories, plates, lighting fixtures and similar items installed prior to painting; remove protection upon completion of each space. Where necessary to remove installed products to ensure their protection, arrange for removal and reinstallation by mechanics of the trade involved. Disconnect equipment adjacent to

walls; where necessary, move to permit painting of wall surfaces, and following completion of painting, replace and reconnect.

C. Clean surfaces to be painted as necessary to remove dust and dirt. Sand as necessary to properly prepare surfaces to receive paint or varnish.

D. Wash metal surfaces with benzine or mineral spirits to remove dirt, oil or grease before applying paint. Where rust or scale is present, wire brush or sandpaper clean before painting, in accordance with paint manufacturer's recommendation and to the satisfaction of AR.

E. Prepare masonry surfaces to be painted by removing dirt, dust, oil and grease stains and efflorescence. The method of surface preparation is at the discretion of the Contractor provided that the results are approved. Clean masonry and plaster surfaces to be painted until they are free from alkali and thoroughly dry before applying paint. Test masonry and plaster surfaces for alkali, using red litmus paper, prior to painting, in accordance with paint manufacturer's recommendation and to the satisfaction of AR.

F. Clean concrete surfaces free from dirt, or film left from form oil or concrete curing compounds, or loose or excess mortar. Steam clean or wash the surfaces with water. Use cleaning additive with discretion, in accordance with paint manufacturer's recommendation and to the satisfaction of AR.

G. Cut out cracks, scratches and other imperfections in plaster surfaces as required, fill with spackling compound and sand flush with adjacent surface. Fill voids in concrete with cement grout before painting.

H. Fill nail holes and cracks after first coat with non-shrinking putty of a color to match that of the finish.

I. Sand, dust and touch up scratches, abrasions or other disfigurements and remove foreign matter from prime coats before proceeding with the following coat. Featheredge spot priming or spot coating into adjacent coatings to produce a smooth and level surface.

J. Test concrete and plaster surfaces for moisture, using moisture meter, prior to painting. Do not apply paint to surfaces having meter reading above 15.

K. Caulk joints between door and window frames and walls, and other joints as necessary.

L. Coordinate the work of this section with the work of other trades.

3.03 APPLICATION:

A. Touch-up painting of structural steel, miscellaneous metal, hollow-metal doors and frames, and other materials which have been prime coated as may be required where the shop coat has been damaged by welding or abrasion during the handling and erection operations; also rivets, bolts and welds which are unpainted after assembly and erection.

B. Apply paint by spray in accordance with the manufacturer's directions to achieve required dry film thickness (DFT). Where specifically approved by the AR, use rollers or brushes as best suited for material being applied. For covers on rollers use carpet with velvet back and high-pile sheep's wool or use short-hair covers, as best suited for material and texture specified. Except where otherwise noted, apply paint to a minimum dry-film thickness (DFT) of five mils, excluding filler coats, using no less than the number of coats specified in Part 2 – Products.\

C. Apply material evenly and smoothly without runs, sags or other defects with edges of paint adjoining other materials or color sharp and clean, without overlapping.

D. Do not paint and finish while surfaces are damp. Allow sufficient time between coats, in accordance with manufacturer's directions to produce an evenly smooth finish.

E. Do not apply final coats until after other trades, whose operations would be detrimental to finish painting, have finished their work in the areas to be painted and the areas have been approved by the AR for painting.

F. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

G. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

H. Seal surfaces that might cause bleed through or staining of topcoat.

I. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

J. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry. In accordance with paint manufacturer’s criteria, the AR will determine satisfactory preparation.

K. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.

L. Plaster Surfaces to be Painted: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

M. Concrete Floors and Traffic Surfaces to be Painted: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

N. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-PC 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1

(solvent cleaning).

O. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand or power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.

P. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

3.04 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance.

D. Sand wood and metal surfaces lightly between coats to achieve required finish.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.05 FIELD QUALITY CONTROL

A. Quality Control Engineer to provide field inspection.

3.06 PROTECTION:

A. Dispose of soiled cleaning rags and waste at the close of each day's work or store such soiled rags and waste in metal containers with tight-fitting covers. Provide buckets of sand during painting operations for use in the event of fire. Post NO SMOKING signs as necessary and as directed.

B. Protect the work of other trades against damage or injury by use of suitable covering during the progress of the painting and finishing work. Repair damage to the satisfaction of the AR.

3.07 CLEANING:

A. Upon completion of work, remove staging, scaffolding and containers from the site. Remove paint spots, oil or stains from glass, floors and other surfaces not to be painted, and leave job clean and acceptable to the AR.

END OF SECTION

SECTION 09910

TRAFFIC STRIPING AND PAINTING

PART 1 GENERAL

1.01 SUMMARY

A. Work Included: The work includes the furnishing of all labor materials, tools, equipment, and supervision necessary incidental to install traffic striping and other pavement markings as indicated in the Contract Drawings.

1.02 RELATED SECTIONS

A. Section 01550 – Access Roads, Parking Areas and Parking Controls

B. Section 01560 – Temporary Barriers and Closures

C. Section 07180 – Traffic Coatings

D. Section 07190 – Water Repellents

1.03 REFERENCE STANDARDS

A. ICRI Guideline No. 03732, “Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays”, January 1997 and latest edition.

B. ASTM D3359-95a, “Standard Test Methods for Measuring Adhesion by Tape Test”.

1.04 DEFINITIONS

A. Definitions of Painting Terms: ASTM D 16, unless otherwise specified.

B. Dry Film Thickness (DFT): Thickness of a coat of paint in fully cured state measured in mils (1/1000 inch).

1.05 SUBMITTALS

A. Product Data: Submit manufacturer’s product data for each coating, including generic description, complete technical data, surface preparation, and application instructions.

B. Color Samples: Submit manufacturer’s color samples showing full range of standard colors.

C. Contractor shall submit shop drawings for all levels of each parking garage, the striping layout, pavement marking layout, and description of equipment to be used for removing and installing the new striping and markings.

D. Manufacturer's Quality Assurance: Submit manufacturer's certification that coatings comply with specified requirements and are suitable for intended application.

E. Warranty: Submit manufacturer's standard warranty.

1.06 QUALITY ASSURANCE

A. Field Samples:
   1. Provide a full coating system to the required sheen, color, texture, and recommended coverage rates. Simulate finished lighting conditions for reviewing in-place work.
   2. The AR or Quality Control Engineer will select two areas, or combinations of areas and surfaces and conditions for traffic striping. At least one (1} area shall be on Level 2 or 3 (representing the water repellant coating) and at least one (1) area shall be on Roof (representing the urethane traffic bearing coating). Apply traffic striping in these areas, combinations of areas and surfaces according to the schedule, or as specified. After finishes are accepted, these areas or combinations of areas and surfaces will serve as the standard of quality and for evaluation of traffic striping of similar nature.
   3. A manufacturer's representative shall be available upon request by the General Contractor or Painting subcontractor, to advise applicator on proper application technique and procedures.

B. Contractor Qualifications:
   1. Contractor shall be qualified to install vehicular striping and markings in accordance with Contract Drawings, with a successful track record of 5 years or more. Contractor shall maintain qualified personnel who have received product training by a manufacturer's representative.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying:

   1. Material name.
   2. Manufacturer.
   3. Color name and number.
   4. Batch or lot number.
   5. Date of manufacture.
   6. Mixing and thinning instructions.

B. Storage:
   1. Store materials in a clean dry area and within temperature range in accordance with manufacturer's instruction.
   2. Keep containers sealed until ready for use.
   3. Do not use materials beyond manufacturer's shelf life limits.

C. Handling: Protect materials during handling and application to prevent damage or contamination.

1.08 SEQUENCING

A. Job Conditions:
   1. Contractor shall perform all work while maintaining vehicular parking to site and within site that are not under construction in accordance with Section 01550 and Contract Drawings.
   2. Contractor shall provide adequate signalization in accordance with Section 01560 and Contract Drawings.

PART 2 PRODUCTS

2.01 MATERIALS

A. Contractor shall select traffic striping manufacturer whose product is compatible with the concrete water repellent coating (Specification Section 07190) and the traffic bearing urethane topping (Specification Section 07180). Colors shall comply with VDOT and MDOT Standards: White pavement marking material shall be equal to Federal Standard Color No. 595 – 17886 and yellow pavement marking material shall be equal to Federal Standard Color No. 595 – 13538. The following guidelines must be adhered to:
   1. Paint shall be Type A, solvent base traffic paint, conforming to the requirements of Section 704 of the VDOT Road and Bridge Specifications and Federal Specification TT-P-1952.
   2. Curb painting color along fire lanes and cross walks shall be yellow, unless otherwise indicated.

2.02 MATERIAL PREPARATION

A. Mix and thin materials according to manufacturer's latest printed instructions.

B. Do not use materials beyond manufacturer's recommended shelf life.

C. Do not use mixed materials beyond manufacturer's recommended pot life.

2.03 CURING

A. All concrete surface painting shall be applied after proper application and curing of the urethane traffic bearing coating specified in Section 07180 (at Roof) or the water repellant coating specified in Section 07190. Follow manufacturer’s recommendation for time provided for the urethane traffic bearing coating and water repellant coating to cure prior striping and painting.

2.04 EQUIPMENT

A. Contractor shall provide:
   1. For removal of existing striping and markings:
   2. For installation of new striping and markings:

a. Commercial compressed air spray striping machine capable of applying an even coating at the manufacturer's recommended thickness in an even width across the stripe.
b. Or commercial airless spray striping machine capable of applying an even coating at the manufacturer's recommended thickness in an even width across the stripe.

3. The equipment used for application of the paint shall be approved by the AR prior to start of work, and shall be capable of applying waterborne traffic paint that has been approved by the Authority.
4. The Contractor shall provide access to the paint application equipment for inspection by the AR or the Quality Control Engineer.
5. The footage counters used to measure pavement markings shall be calibrated, and a notarized, certification shall be submitted to the AR as part of the Quality Control Plan.
6. The applicator shall provide a method for cleanly cutting off stripe ends and shall be capable of applying all longitudinal pavement markings.
7. The equipment shall provide continuous uniform stripe dimensions of widths in accordance with the Contract Drawings and the AR.
8. The equipment shall be mobile and maneuverable to the extent that straight lines can be followed and all standard curves can be made in true arcs.
9. All parts of the equipment shall be thoroughly cleaned of foreign material or different colored material prior to the introduction of a new batch of material.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to be coated and report conditions that would be adversely affect the appearance or performance of coating systems, and which cannot be put into an acceptable condition by preparatory work specified.

B. Do not proceed with surface preparation and application until surface is acceptable.

3.02 SURFACE PREPARATION

A. General:
1. Dislodge dirt, rust, mortar spatter and other dry material by scrapping or brushing. Remove dust and loose material by brushing, sweeping, vacuuming or blowing with high pressure air.
2. Remove oil, wax and grease by scrapping off heavy deposits and cleaning with mineral spirits or a hot trisodium phosphate solution followed by a water rinse.
3. Verify that surfaces to be coated are dry, clean and free of dust, dirt, oil, wax, grease or other contaminants, as determined to be satisfactory by the AR.
4. Allow coatings to cure and minimum of 48 hours, or as specified by the coating manufacturer, whichever is longer.

3.03 ADHESION TESTING – CONCRETE SURFACES

A. At the first work area, a sample area will be prepared for traffic striping application. The concrete water repellant coating shall be applied in accordance with Specification Section 07190 Water Repellents at elevated levels. The urethane traffic bearing coating shall be applied in accordance with Specification Section 07180 Traffic Toppings. Traffic striping samples shall be installed and allowed to cure for a minimum period of seven (7) calendar days.

B. Adhesion testing shall be performed using the procedures of ASTM D3359-95a, Test Method A. Adhesion rating shall not be less than 4A. Two adhesion tests shall be performed at each level of the parking garage.

C. A representative of the Contractor and Coating manufacturer shall be present during the adhesion testing.

D. If acceptable adhesion ratings are not achieved in the sample, the Contractor shall prepare additional sample areas with the use of different spray tip and pressure combinations to better prepare the surface. Adhesion testing of the additional samples shall be performed and the least aggressive combination accepted that produces acceptable adhesion test results.

3.04 PAINT APPLICATION

A. After surface preparation, fill all bug holes, small spalls and surface imperfections with a surface patching compound. Allow to cure.

B. Apply coating by brush or roller. Apply coating to produce an even uniform appearance. Each coat shall be applied at the rate required by the manufacturer. Apply additional coats as required at repaired areas to blend with the surrounding surfaces.

C. Allow the manufacturer's minimum curing time between coats.

3.05 CLEANING AND TOUCH- UP

A. Remove coating splatters from glass and adjacent surfaces.

B. Repair and touch-up all work that is damaged, scratched or marred.

C. Remove all debris from the work area.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 09970

SPECIAL COATINGS FOR STEEL

PART 1 GENERAL

1.01 SUMMARY

A. The work included: The work includes the furnishing of all labor materials, tools, equipment and supervision necessary to prepare, prime and paint interior steel.

1.02 RELATED SECTIONS

A. Section 05100 – Structural Metal Framing

B. Section 05500 – Metal Fabrications

1.03 REFERENCE STANDARDS

A. American Society of Testing Materials:
1. ASTM B117 – “Test Method for Salt Spray (fog) Testing”.
2. ASTM D16 – “Terminology Relating to Paint, Varnish, Lacquer, and Related Product”.
3. ASTM D522 – “Test Methods for Mandrel Bend Test of Attached Organic Coatings”.
4. ASTM D870 – “Practice for Testing Water Resistance of Coatings Using Water Immersion”.
5. ASTM D1014 – “Practice for Conducting Exterior Exposure Tests of Paints on Steel”.
6. ASTM D1653 – “Test Methods for Water Vapor Transmission of Organic Coating Films”.
7. ASTM D2794 – “Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)”.
8. ASTM D3273- “Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber”.
9. ASTM D3359 – “Standard Test Methods for Measuring Adhesion by Tape Test”.
10. ASTM D3363 – “Test for Film Hardness by Pencil Test”.
11. ASTM D4060 – “Test Method for Abrasion of Organic Coatings by the Taber Abraser”.
12. ASTM D4141 – “Practice for Conducting Accelerated Outdoor Exposure Tests of Coatings”.
13. ASTM D4263 – “Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method”.
14. ASTM D4541 – “Test Method for Pull-Out Strength of Coatings Using Portable Adhesion – Testers”.
15. ASTM D4585 – “Practice for Testing the Water Resistance of Coatings Using Controlled Condensation”.
16. ASTM E84 – “Test Methods for Surface Burning Characteristics of Building Materials”.

17. ASTM G53 – “Practice for Operating Light-and-Water-Exposure Apparatus (Fluorescent UV-Condensation Type) For Exposure of Nonmetallic Materials”.

B. Steel Structures Painting Council:
   1. SSPC – SP 1 – Solvent Cleaning.
   2. SSPC – SP 2 – Hand Tool Cleaning.
   3. SSPC – SP 3 - Power Tool Cleaning.
   4. SSPC – SP 6/NACE 3 – Commercial Blast Cleaning.
   5. SSPC – PA-1 – Painting Application Specification.

1.04 DEFINITIONS

A. Definitions of Painting Terms: ASTM D 16, unless otherwise specified.

B. Dry Film Thickness (OFT): Thickness of a coat of paint in fully cured state measured in mils (1/1000 inch).

1.05 SUBMITTALS

A. Product Data: Submit manufacturer’s product data for each coating, including generic description, complete technical data, surface preparation, and application instructions.

B. Color Samples: Submit manufacturer’s color samples showing full range of standard colors.

C. Manufacturer’s Quality Assurance: Submit manufacturer’s certification that coatings comply with specified requirements and are suitable for intended application.

D. Warranty: Submit manufacturer’s standard warranty.

1.06 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: The manufacturer shall provide evidence showing that specified materials have been manufactured and successfully installed with a minimum of ten (10) years of experience. The manufacturer shall be able to demonstrate successful performance on comparable projects. Coatings and coating application accessories shall be products of a single manufacturer.

B. Applicator’s Qualifications: Applicators will be a Licensed Applicator of the manufacturer of the specified product who has completed a formal program of instruction in the use of the specified metal coating system. Applicator shall have been a Licensed Applicator of the specified product for a minimum of three (3) years. Applicator will provide certification attesting to their Licensed Applicator status at time of bid.

C. Pre-application Meeting: Convene a pre-application meeting two (2) weeks before start of application of coating systems. Require attendance of parties directly

affecting work of this section, including Contractor, AR, applicator, and manufacturer's representative. Review the following:
1. Environmental requirements.
2. Protection of surfaces not scheduled to be coated.
3. Surface preparation.
4. Application.
5. Repair.
6. Field quality control.
7. Cleaning.
8. Protection of coating systems.
9. Coordination with other work.

D. Field Samples:
1. Provide a full coating system to the required sheen, color, texture, and recommended coverage rates. Simulate finished lighting conditions for reviewing in-place work.
2. The AR or Quality Control Engineer will select one area, or combinations of areas and surfaces and conditions for each type of coating and substrate to be coated. Apply coatings in this area, combination of areas and surfaces according to the schedule, or as specified. After finishes are accepted, this area or combination of areas and surfaces will serve as the standard of quality and for evaluation of coating systems of similar nature.
3. A manufacturer's representative shall be available upon request by the General Contractor or Painting subcontractor, to advise applicator on proper application technique and procedures.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying:
1. Material name.
2. Manufacturer.
3. Color name and number.
4. Batch or lot number.
5. Date of manufacture.
6. Mixing and thinning instruction.

B. Storage:
1. Store materials in a clean dry area and within temperature arrange in accordance with manufacturer's instructions.
2. Keep containers sealed until ready for use.
3. Do not use materials beyond manufacturer's shelf life limits.

C. Handling: Protect materials during handling and application to prevent damage or contamination.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Weather:
   1. Air and Surface Temperatures: Prepare surfaces and apply and cure coatings within air and surface temperature range in accordance with manufacturer's instructions.
   2. Surface Temperature: Minimum of 5 degrees F (3 degrees C) above dew point.
   3. Relative Humidity: Prepare surfaces and apply and cure coatings within relative humidity range in accordance with manufacturer's instructions.
   4. Precipitation: Do not prepare surfaces or apply coatings in rain, snow, fog, or mist.
   5. Wind: Do not spray coatings if wind velocity is above manufacturer's limit.
   6. Ventilation: Provide ventilation during coating evaporation stage in confined or enclosed areas in accordance with manufacturer's instructions.

B. Dust and Contaminants:
   1. Schedule coating work to avoid excessive dust and airborne contaminants.
   2. Protect work areas from excessive dust and airborne contaminants during coating application and curing.

PART 2 PRODUCTS

2.01 MATERIALS

A. Primer Performance Requirement: Products require the following performance standards be met or exceed:
   1. Ferrous Metals
      a. Type: Aromatic Urethane Zinc-Rich
      b. Properties:
         1) Solids by Volume: Greater than 60%
         2) VOC:
            a) Unthined: 2.67 lbs./gallon (320 grams/litre)
            b) Thinned 2.5%: 2.78 lbs./gallon (333 grams/litre)
            c) Thinned 10%: 3.09 lbs./gallon (370 grams/litre)
      c. Curing Time: At 75 degrees F (24 degrees C) (curing time varies with surface temperature, air movement, humidity and film thickness.)
         1) To Handle: ¼ to 1 hour (use Urethane Accelerator for faster re-coat times).
         2) To Re-Coat: 2 to 5 hours (use Urethane Accelerator for faster re-coat times).
      d. Performance Criteria:
         1) Adhesion: ASTM D4541 (Elcometer): Not less than 800 psi (5.5 MPa) pull.
         2) Adhesion, ASTM 03359, (Method B, 5 mm Crosshatch): No less than a rating of 5.
         3) Exterior Exposure; Saltwater, splash and spray (Atlantic seacoast): No blistering, cracking, rusting or delamination of film after one year exposure.

4) Humidity; ASTM 04585: No blistering, cracking, rusting or delamination of film after 1,000 hours exposure.
5) Salt Spray (Fog); ASTM 8117: No blistering, cracking, rusting or delamination of film. No more than 1/64" (0.4 mm) rust creepage at scribe after 10,000 hours exposure.
6) Static Fatigue (Slip Coefficient & Tension Creep): Method: Perform tests in compliance with AISC specifications using equipment as described in Research Council on Structural Connections Specifications Appendix A, Section 4.1 Results: Class B surface with a mean slip coefficient not less than 0.50 and a tension creep not in excess of .005" (0.13 mm).

2. Galvanized Steel
   a. Type: Polyamide Epoxy
   b. Properties:
      1) Solids by Volume: Greater than 55%
      2) VOC:
         a) Unthinned: 2.88 to 3.18 lbs./gallon (345 to 381 grams/litre).
         b) Thinned 5%: 3.07 to 3.36 lbs./gallon (367 to 402 grams/litre).
         c) Thinned 10%: 3.25 to 3.52 lbs./gallon (389 to 421 grams/litre).
   c. Curing Time: At 75 degrees F (24 degrees C) (Curing time varies with surface temperature, air movement, humidity and film thickness.)
      1) To Touch: 1 hour,
      2) To Handle: 2 to 3 hours.
      3) To Re-Coat: 3 to 4 hours.
   d. Performance Criteria:
      1) Abrasion: ASTM D4060, (CS-17 Wheel, 1,000 grams load): No more than 115 mg. loss after 1,000 cycles.
      2) Adhesion: ASTM D3359, (Method B, 5 mm Crosshatch): No less than a rating of 5; average of three tests.
      3) Adhesion: ASTM D4541 (Elcometer): No less than 1,000 psi (6.89 MPa) pull; average of five tests.
      4) Exterior Exposure: exposed at 45 degrees facing south (light industrial area): No blistering, cracking or delamination of film. No rust creepage at scribe or no rusting at edges after 72 months of exposure.
      5) Fresh Water: Continuous immersion in tap water at 75 degrees F (24 degrees C): No blistering, cracking, rusting or delamination of film after four years.
      6) Hardness; ASTM 03363 (Pencil): Pass 3H (Gouge).
      7) Humidity; ASTM 04585: No blistering, cracking, rusting or delamination of film after 4,500 hours exposure.
      8) Salt Spray (Fog); ASTM B117: No blistering, cracking, rusting, or delamination of film. No more than 1/32" (0.8 mm) rust creepage at scribe after 1,500 hours exposure.
      9) Surface Burning Characteristics; ASTM E84: Class A.

B. Intermediate Coat Performance Requirements: Products require the following performance standards be met or exceeded:
   1. Ferrous Metals

a. Type: Polyamide Epoxy
b. Properties:
   1) vi. Solids by Volume: Greater than 55%
   2) vii. VOC:
      a) Unthinned: 2.88 to 3.18 lbs./gallon (345 to 381 grams/litre)
      b) Thinned 5%: 3.07 to 3.36 lbs./gallon (367 to 402 grams/litre)
      c) Thinned 10%: 3.25 to 3.52 lbs./gallon (389 to 421 grams/litre)
c. Curing Time: At 75 degrees F (24 degrees C) (curing time varies with surface temperature, air movement, humidity and film thickness.)
   1) To Touch: 1 hour
   1) To Handle: 2 to 3 hours
   2) To Re-coat: 3 to 4 hours
d. Performance Criteria:
e. Abrasion: ASTM D4060, (CS-17 Wheel, 1,000 grams load): No more than 115 mg. loss after 1,000 cycles.
f. Adhesion: ASTM D3359, (Method B, 5 mm Crosshatch): No less than a rating of 5; average of three tests.
g. Adhesion: ASTM D4541 (Elcometer): No less than 1,000 psi (6.89 MPa) pull; average of five tests.
h. Exterior Exposure: exposed at 45 degrees facing south (light industrial area): No blistering, cracking or delamination film. No rust creepage at scribe or no rusting at edges after 72 months exposure.
i. Fresh Water: Continuous immersion in tap water at 75 degrees F (24 degrees C: No blistering, cracking, rusting or delamination of film after four years.
j. Hardness: ASTM D3363 (Pencil): Pass 3H (Gouge).
k. Humidity: ASTM D4585: No blistering, cracking, rusting or delamination of film after 4,500 hours exposure.
l. Salt Spray (Fog): ASTM B117: No blistering, cracking, rusting or delamination of film. No more than 1/32” (0.8 mm) rust creepage at scribe after 1,500 hours exposure.
m. Surface Burning Characteristics: ASTM E84: Class A.

C. Finish Coat Performance Requirements: Products require the following performance standards be met or exceeded.
   1. Type: Aliphatic Acrylic Polyurethane.
   2. Finishes: gloss, semi-gloss, or satin.
   3. Properties:
      a. Solids by Volume: Greater than 70%.
      b. VOC:
         1) (Unthinned): 1.81 lbs./gallon (420 grams/litre).
         2) No. 39 Thinner (Maximum 20%): 2.55 lbs./gallon (305 grams/litre).
         3) No 42 Thinner (Maximum 20%): 2.63 lbs./gallon (315 grams/litre).
         4) Curing Time: At 75 degrees F (24 degrees C) (curing time varies with surface temperature, air movement, humidity and film thickness).
      a. To Touch: 1 hour
      b. To Handle: 2-1/2 to 6 hours
      c. To Re-coat: 5 to 6 hours

4. Performance Criteria: Unless otherwise indicated, coating systems for tests were applied to SSPC SP10 cleaned steel and cured at 75 degrees F (24 degrees C).
   a. Abrasion; ASTM 04060, (CS-17 Wheel, 1,000 grams load): No more than 75 mg loss after 1,000 cycles.
   b. Adhesion; ASTM 03359, (Method B. 5 mm Crosshatch): No less than a rating of 5.
   c. Adhesion: ASTM D4541 (Elcometer): No less than 825 psi (5.86 MPa) pull; average of three tests.
   d. Exterior Exposure: exposed at 45 degrees facing south (South Florida marine exposure): No blistering, cracking or chalking of film; less than 40% gloss loss and less than 4.0 MacAdam units color change after two years exposure.
   e. Flexibility: ASTM D522 (Method B Cylindrical Mandrel): Passes 1/8” (3.2 mm) mandrel with elongation greater than 36.4% when cured for either seven or 30 days at 75 degrees F (24 degrees C).
   f. Graffiti Resistance: Complete and easy removal. Graffiti material as follows shall be applied to coating and allowed to dry for seven days; acrylic, epoxy-ester and alkyd spray paints, crayon, lipstick, shoe polish, ball point ink and markette marker. Removal first attempted with xylene, if graffiti remained then menthyl ethyl ketone (MEK) used: if graffiti remained Spray Pak Vandal Mark Remover used.
   g. Hardness; ASTM D3363: No gouging with an HB or less pencil.
   h. Humidity: ASTM D4585: No blistering, cracking or delamination after 150 inch/pounds or less indirect impact.
   i. QUV Exposure: ASTM G53 (FS-40 bulbs, 4 hour light, 4 hours dark): No blistering, cracking or chalking; less than 55% gloss loss and less than 1.6 MacAdam units color change after 1 ,000 hours exposure.
   j. Salt Spray (Fog); ASTM 8117: No blistering, cracking, rusting or delamination of film. No more than 1/32" (.8 mm) rust creepage at scribe after 1,000 hours exposure.

2.02 COATING SYSTEMS FOR EXTERIOR STEEL

A. Exterior Exposed Ferrous Metals:
   1. System: Epoxy/urethane.
   2. Surface Preparation: SSPC-SP6/NACE 3 or as specified by manufacturer.
   3. Shop or Field Primer: DFT 2.5 to 3.5 mils, or as specified by manufacturer.
   4. Field Intermediate Coat: DFT 2.0 to 3.0 mils, or as specified by manufacturer.
   5. Field Finish Coat: DFT 2.0 to 5.0 mils, or as specified by manufacturer.
   6. Total DFT: 6.5 to 11.5 mils, or as specified by manufacturer.
   7. Finish Color: As selected by AR from manufacturer's standard colors.

B. Galvanized Steel with Mild to Moderate Atmospheric or UV Exposure:
   1. System Type: Epoxy/urethane.
   2. Surface Preparation: Abrasive blast and/or chemically clean. Consult manufacturer for requirements.
   3. Shop or Field Primer: DFT 2 to 3 mils, or as specified by manufacturer.
   4. Field Finish Coat: DFT 2 to 3 mils, or as specified by manufacturer.

5. Total DFT: 4 to 6 mils, or as specified by manufacturer.
6. Finish Color: As selected by AR from manufacturer's standard colors.

2.03 ACCESSORIES

A. Coating Application Accessories:
   1. Accessories require for application of specified coatings in accordance with manufacturer’s instructions, including thinners.
   2. Products of coating manufacturer.

2.04 MATERIAL PREPARATION

A. Mix and thin materials according to manufacturer’s latest printed instructions.

B. Do not use materials beyond manufacturer’s recommended shelf life.

C. Do not use mixed materials beyond manufacturer’s recommended pot life.

2.05 PAINTING SCHEDULE

A. Structural Steel: All galvanized steel saddles used at concrete double tee corbels.

B. Steel Rails: All new and existing handrails and guardrails indicated in the Contract Drawings.

C. Miscellaneous Steel: All steel pipes, storm drain risers, stand pipes, drain brackets and pipe assemblies, fire lines, bollards, utility guards, and other steel indicated in the Contract Drawings.

D. Colors:
   1. Prior to beginning work, the Contractor will be furnished sample color chips and a Color and Material Schedule for surfaces to be painted.
   2. Match the colors of the chips and submit samples before proceeding. Label samples for surface finishes such as satin, flat or gloss as listed in the Color and Material Schedule.
   3. Tint each coat of paint slightly lighter or darker than the preceding coat or the finish coat.
   4. Final approval of colors will be made by the AR on samples applied on the Job.
   5. Safety Colors Items specified to be safety colors, e.g. OSHA red (safety red) and ANSI orange, to be in compliance with ANSI Z535 1, Safety Color Code

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to be coated and report conditions that would adversely affect the appearance or performance of coating systems, and which cannot be put into an acceptable condition by preparatory work specified. Notify Quality Control Engineer of areas or conditions which are not acceptable.

B. Do not proceed with surface preparation and application until surface is acceptable.

C. Coordinate surfaces to be painted with Section 05100 and Section 05500.

3.02 PROTECTION OF SURFACES NOT SCHEDULED TO BE COATED

A. Protect surrounding areas and surfaces not scheduled to be coated from damage during surface preparation and application of coatings.

B. Immediately remove coatings that fall on surrounding areas and surfaces not scheduled to be coated.

3.03 SURFACE PREPARATION OF STEEL

A. Prepare steel surfaces in accordance with manufacturer's instructions. Dislodge dirt, rust, mortar spatter and other dry material by scrapping or brushing. Remove dust and loose material by brushing, sweeping, vacuuming or blowing with high-pressure air.

B. Fabrication Defects:
   1. Correct steel and fabrication defects revealed by surface preparation.
   2. Remove weld spatter and slag.
   3. Round sharp edges and corners of welds to a smooth contour.
   4. Smooth weld undercuts and recesses.
   5. Grind down porous welds to pinhole-free metal.
   6. Remove weld flux from surface.

C. Ensure surfaces are dry.

D. Steel Surfaces: Remove visible oil, grease, dirt, dust paint, oxides, corrosion products, and other foreign matter in accordance with SSPC-SP 6/NACE 3.

E. Totally Spray-Applied Shop Coating Systems for Steel: Remove visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter in accordance with SSPC-SP 6/NACE 3.

F. Abrasive Blast-Cleaned Surfaces: Coat abrasive blast-cleaned surfaces with primer before visible rust forms on surface. Do not leave blast-cleaned surfaces uncoated for more than 8 hours.

G. Shop Primer: Prepare shop or field primer to receive field coat in accordance with manufacturer's instructions.

3.04 SURFACE PREPARATION OF GALVANIZED STEEL AND NONFERROUS METAL

A. Prepare galvanized steel and nonferrous metal surfaces in accordance with manufacturer's instructions. Surface preparation recommendations will vary depending on substrate and exposure conditions.

3.05 APPLICATION

A. Steel:

.

1. All rails and posts shall be shop primed and coated with air spray equipment in accordance with the manufacturer's application recommendations.
2. All painted steel shall be wrapped and protected during transportation and while stored on site.
3. Follow the manufacturer's product data sheets for mixing, application and curing.
4. Mix and thin coatings, including multi-component materials, in accordance with manufacturer's instructions.
5. The surface shall be dry and at least 5°F above the dew point temperature prior to primer, intermediate or finish coat application. Minimum application temperature: 35°F. Maximum application temperature: 135°F. Apply and cure coatings in accordance with manufacturer's recommendations.
6. Keep containers closed when not in use to avoid contamination.
7. Do not use mixed coatings beyond pot life limits.
8. Use application equipment, tools, pressure setting, and techniques in accordance with the manufacturer’s instructions.
9. Uniformly apply coatings at spreading rate required to achieve specified DFT.
10. Apply coatings to be fee of film characteristics or defects that would adversely affect performance or appearance of coating systems.
11. Stripe paint with brush critical locations on steel such as welds, corners, and edges using specified primer.

3.06 REPAIR

A. Inspector’s Services:
   1. Verify coatings and other materials are as specified.
   2. Verify surface preparation and application are as specified.
   3. Verify DFT of each coat and total DFT of each coating system are as specified using wet film and dry film gauges.
   4. Coating Defects: Check coatings for film characteristics or defects that would adversely affect performance or appearance of coatings systems. Check for holidays on interior steel immersion surfaces using holiday detector.
   5. Report:
      a. Submit written reports describing inspections made and actions taken to correct nonconforming work.
      b. Report nonconforming work not corrected.
      c. Submit copies of report to Architect and Contractor.

B. Manufacturer's Field Services: Manufacturer's representative shall provide technical assistance and guidance for surface preparation and application of coating systems.

3.07 CLEANING

A. Remove temporary coverings and protection of surrounding areas and surfaces.

B. Remove coating splatters from glass and adjacent surfaces.

C. Repair and touch-up all work that is damaged, scratched or marred.

D. Remove all debris from the work area.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 10605

WIRE MESH PARTITIONS

PART 1 - GENERAL

1.01 DESCRIPTION:

A. This section specifies providing woven wire mesh panels for the following:
   1. Wire mesh partitions.
   2. Wire mesh window guards.
   3. Wire mesh railing insert panels.

1.02 QUALITY ASSURANCE

A. Manufacturer Qualifications: Engage a firm experienced in manufacturing wire mesh partitions similar to those indicated for this Project and that have a record of successful in-service performance.

B. 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 wire mesh partitions and wire mesh insert panels that are similar to those indicated for this Project in material, design, and extent.

1.03 DEFINITIONS

A. The types of weaves for the wire mesh specified in this Section and defined in ASTM E 437 and its Appendix X4.2:
   1. Plain Weave: Wires pass over one and under the next adjacent wire in both directions.
   2. Lock Crimped: Deep crimps at points of intersection to lock the wires securely in place.
   3. Intercrimped: Similar to plain weave with extra crimps between the intersections.

1.04 SUBMITTALS:

A. Submit the following for approval in accordance with the Special Conditions and with the additional requirements as specified for each:

   1. Product Data for each type of product specified, consisting of manufacturer's specification, technical data, and installation instructions.

2. Shop Drawings showing fabrication and installation of wire mesh partitions, window guards, railing insert panel and access panels, including plans, elevations, and large-scale details showing anchorage and accessory items. Provide location template drawings for items supported or anchored to permanent construction.
   a) For steel channel and tube framing of wire mesh partitions and railing insert guards, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
3. Samples of a 12-by-12-inch300-by-300-mm wire mesh panel constructed of specified frame members, wire mesh, and color charts.

1.05 JOB CONDITIONS

A. Field Measurements: Check actual locations for wire mesh products by accurate field measurements before fabrication and show recorded measurements on Shop Drawings. Coordinate fabrication and delivery schedules with construction progress to avoid delaying the Work.
   1. Where field measurements cannot be made without delaying the Work, guarantee location dimensions and proceed with fabricating wire mesh products without field measurements. Coordinate wall, column, floor, and ceiling construction to ensure that actual location dimensions correspond to guaranteed dimensions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Woven wire partitions, Window Guards and Insert Panels: Manufactured by the G - S Company, or provide systems, as approved by the Engineer, of similar quality and appearance to match construction quality and appearance of the specified manufacturer.

2.02 MATERIALS

A. Steel Channels, Angles, Plates, and Bars: ASTM A 36ASTM A 36M.

B. Steel Sheet: ASTM A 568ASTM A 568M.

C. Cold-Rolled Steel Channels: Formed from steel sheet.

D. Square Steel Tubing: Cold-formed structural steel tubing, ASTM A 500.

E. Galvanized Steel Wire: ASTM A 641ASTM A 641M.

F. Galvanized Steel Sheet: Commercial-quality, hot-dip-coated steel sheet, ASTM A 653, with G60 or A60ASTM A 653M, with Z180 or ZF180 coating.

G. Bent Plate Channel: Formed from galvanized steel sheet.

2.03 WIRE MESH PARTITIONS:

A. Mesh: 0.135-inch-3.4-mm- diameter, plain-weave, galvanized steel wire woven into 3 inch38-mm square pattern, insert through frame members, and welded into frame square pattern, inserted through.

B. Frames: Provide galvanized steel fasteners and other items shown or necessary for partition installation.
   1. Vertical Members: 1-1/4-by-5/8-by-0.108-inch hot dipped galvanized steel C-Section channels with 1/4-inch- diameter bolt holes approximately 18 inches450 mm o.c.
   2. Horizontal Members: 1-by-1/2-by-1/8-inch hot dipped galvanized steel channels, mortised and tenoned to vertical members.
   3. Horizontal Reinforcing Members: 1-by-1/2-by-1/8-inch hot dipped galvanized steel channels with wire woven through or two 1-by-1/2-inch galvanized steel channels bolted or riveted toe-to-toe through mesh, and secured to vertical members. Provide number of horizontal reinforcing members to suit panel height as recommended by partition manufacturer.

C. Top Capping Bars: 2-1/4-by-1-inch hot dipped galvanized steel channels, secured to top framing channels with 1/4-inch- diameter, galvanized "U" bolts spaced not more than 28 inches o.c.

D. Corner Posts: 1-1/4-by-1-1/4-by-1/8-inch hot dipped galvanized steel angles with floor shoe galvanized per ASTM A 123 and 1/4-inch- diameter bolt holes to align with bolt holes in vertical frame members.

E. Floor Shoes: Cast aluminum or steel galvanized per ASTM A 123, sized to suit vertical framing and to provide approximately 3 inches75 mm of clear space between finished floor and bottom horizontal frame members. Furnish units with set screws for leveling adjustment.

2.04 DOORS:

A. Hinged Door: Door frame of 1-1/4-by-1/2-by-1/8-inch hot dipped galvanized steel c-section channels with 1-1/4-by-1/8-inch flat steel bar cover plates on 3 sides, and 1/8-inch- thick angle strike bar and cover on lock side. Provide 1-1/2 pairs of 3-by-3-inch butt hinges riveted or welded to door and frame, and mortise-type cylinder lock operated by key outside

with recessed knob inside. Align bottom of door with bottom of adjacent panels.

B. Provide manufacturer's standard cylinders for lock.

2.05 WINDOW GUARDS

A. Mesh: 0.135-inch-diameter, lock-crimped galvanized steel wire woven into a 4-inch , 45 degree pattern, inserted through frame holes and welded into frame.

B. Frames:
1. Frames 1 1/4-by-1/2-by-1/8-inch hot dipped galvanized, cold-rolled steel channels.
2. Frames at Window Guards: Hot dipped galvanized bent plate channel, sized to fit adjacent to curtainwall framing.

C. Anchorage Devices: Furnish appropriate types and quantities of anchorage devices to provide adequate anchorage to adjacent structures.

D. Access Panels: Provide the following at bridge walkway guards where shown:
1. Jambs: Provide 1-1/4-by-1-1/4-by-1/8-inch steel angle jamb bars with bolt holes for anchorage spaced a maximum of 24 inches o.c.
2. Hinging: Furnish 1 pair of 3-by-3-inch butt hinges.
3. Locking Device: mortise l- type cylinder lock as specified in Section 08410.

2.06 STAIRWAY PARTITIONS RAILING INSERT PANELS:

A. Mesh: 0.135-inch-diameter, plain-weave galvanized steel wire woven into a 3-inch square pattern, inserted through frame holes and welded into frame. Vertical wires are plumb. Horizontal wires are perpendicular to vertical wires.

B. Frames: 11/4 -by-1/2-by-1/8-inch hot dipped galvanized cold-rolled steel channels.

2.07 FABRICATION:

A. Do not use components less than sizes indicated. Use larger-size components as recommended by partition component manufacturer.

B. Provide bolts, hardware, and accessories for complete installation.

2.08 FINISHES:

A. Wire Mesh Partitions and Doors: Manufacturer's standard shop - applied enamel finishes.

B. Stairway Partitions and Railing insert panels:
   1. Manufacturer's standard shop - applied enamel finish.

C. Window Guards:
   1. Manufacturer's standard polyester powered coat finish.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.02 INSTALLATION

A. Erect partitions plumb, rigid, properly aligned, and securely fastened in place, complying with Drawings and manufacturer's recommendations.

B. Provide additional field bracing as shown on approved shop drawings or necessary for rigid, secure installation. Installer to provide additional clips and bracing as required.

C. Attach window guards to inside face of aluminum curtain wall as shown on approved shop drawings. Fasten screws into pre-drilled holes with vinyl insert to prevent contact between dissimilar metals. Provide fasteners spaced evenly to screw to curtain wall system as shown on the approved shop drawings.

3.03 ADJUSTING AND CLEANING

A. Adjust moving components for smooth operation without binding.

B. Touch up damaged finish after completing installation using field-applied paint to match color of shop-applied finish.

END OF SECTION

SECTION 13905

FIRE PROTECTION, SUPPRESSION AND ALARM

PART 1 - GENERAL

1.01 DESCRIPTION:

A. This section specifies providing dry standpipe, wet standpipe, sprinkler, exterior fire protection and clean agent fire-suppression systems.

B. Related Work Specified Elsewhere:
1. Field painting: Section 09900.
2. Identification of mechanical equipment and piping: Section 15075.
3. Piping system: Section 15205.

C. Description of System:
1. Dry standpipe system: Consists of siamese fire-department connection, dry fire line, check valves, automatic air vents, drain valves and angle hose valves.
2. Wet standpipe system: Consists of siamese fire-department connection, wet fire line, check valves, drain valves, fire water-line surveillance valve, angle hose valves and capped branch connections for sprinkler systems where shown.
3. Fire-suppression system for entrance escalators: Consists of fire line to point inside entrance escalator pit/machine room capped for future extension by escalator contractor, supplied from wet standpipe system.
4. Sprinkler system, other than escalator: Consists of sprinkler lines, fire water-line surveillance valve, flow-alarm check valve, drain valve, and sprinkler heads as well as heating tracers in areas subject to freezing temperatures, supplied from wet standpipe system or from domestic water line as shown.
5. Exterior fire-protection system: Consists of lead-ins to wet standpipe system, valves and accessories, supplied from the city water main.
6. Automatic, total-flooding clean agent suppression system: Consists of smoke detectors, agent storage containers, nozzles, clean agent suppression system control and detection panel, manual pull station, alarm bell, evacuation horn, clean agent suppression system discharge visual alarm and necessary interface boxes for signals from and to HVAC and communications. Each room or hazard area to have its own system designed to provide a concentration of 7 percent by volume.

1.02 QUALITY ASSURANCE:

A. Codes, Regulations, Reference Standards and Specifications:

1. Comply with codes and regulations of the jurisdictional authorities.
2. AWS: A5.13
3. FM Approval Guide.
4. NFPA: 12A, 13, 14, 15, 24, 2001.
5. UL: 262, 312, 1479, Fire Protection Directory.
6. ANSI/ASME: B16.1, B16.5, B16.9, B31.1.
7. ANSI: Z535.1.
8. NEMA: 250.
9. FS: A-A-1992 SS-C-153, WW-P-421, WW-P-501, WW-U-516, WW-U-531.
10. MSS: SP-58.
11. ASTM: A36, A47, A53, A135, A183, A234, A 240, A276, B766, D1752, D2000.

B. Qualification of Welding Personnel: Section 05120.

C. Design Criteria:
1. NFPA 12A, 13, 14, 15 and 2001 as applicable.

1.03 SUBMITTALS:

A. Submit the following for approval in accordance with the General Requirements and with the additional requirements as specified for each:
1. Shop Drawings:
   a. Methods of joining, welding, fastenings, and anchoring.
   b. Materials and locations for wet standpipe, dry standpipe, sprinkler, clean agent suppression and external systems.
   c. Pipes and piping layout, including pipe hangers and supports.
   d. Pipe hangers and supports.
   e. Valves.
   f. Escutcheons.
   g. Gauges.
   h. Automatic air vents.
   i. Pipe sleeves.
   j. Mechanical couplings.
   k. Layout of sprinkler and clean agent suppression systems and detail drawings approved by Fire Marshal of jurisdiction in which work is to be performed.
   l. Reports covering test materials.
2. Certification:
   a. Fire line test results.
   b. Manufacturer's certification that pipe-joint gaskets and lubricants are satisfactory for use with pipe and fittings specified and that couplings are designed and tested as specified.
3. Samples: Paint, Section 09900.
4. Operation and Maintenance Manuals.

1.04 JOB CONDITIONS:

A. Do not perform welding when the temperature of the base metal is less than zero degree F.

B. Do not perform welding when surfaces are wet or during periods of high winds unless operator and work are properly protected.

C. Environmental Requirements: Paint, Section 09900.

1.05 OPERATION AND MAINTENANCE TRAINING:

A. Upon completion of installation and in accordance with the General Requirements furnish for a period of not less than two consecutive man-days services of a manufacturer's field engineer with specialized experience in the components of the system to instruct Authority personnel in the proper operation and maintenance of the systems.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General Requirements:
   1. In design and purchase of equipment, provide for interchangeability of items of piping and electrical equipment sub-assemblies, parts and relays.

B. Pipe and Fittings:
   1. Exterior fire-protection system:
      a. Ductile-iron pipe and fittings:
         1) Piping embedded or otherwise inaccessible: FS WW-P-421, Type III, Grade C, 250-pound pressure class.
         2) Piping from point of connection to inside of structure: FS WW-P-421, Grade C, 250-pound pressure class, flanged. Flanges: ANSI B16.1.
         3) Pipe coated on outside with bituminous coating and lined with cement mortar of twice standard thickness specified for pipe size used.
            a) Cement-mortar lining having seal coat of nontoxic, tasteless and odor-free bituminous material.
         4) Neoprene gaskets furnished for joints.
   2. Interior fire-protection system:
      a. Fire lines, embedded or otherwise inaccessible:
         1) Pipe: Galvanized steel, ASTM A53, Type E ,Grade B, with the following additional requirements:
            a) Fire-protection piping: Extra-strong weight, Schedule 80.
         2) Fittings and flanges: Galvanized, furnished with wall thickness equal to or greater than that of adjacent pipe, with the following additional requirements:

a) Fire lines: ASTM A234, Grade B, and ANSI B16.9 for dimensions and tolerances.
(1) Flanges: ASTM A234 and ANSI B16.5 for dimensions and tolerances.

b. Fire lines, exposed or otherwise accessible:
1) Pipe:
a) Galvanized steel: One of the following:
(1) ASTM A53: One of the following:
(a) Type E, Grade B.
(b) Type F, Grade A.
(2) ASTM A13
b) Welded or seamless.
c) Standard weight, Schedule 40, with grooved ends. Use of Schedule 10 pipe is not allowed.
2) Mechanical joint couplings: Keyed for joining grooved-end piping.
a) Coupling housing: Malleable iron in accordance with ASTM A47, Grade 32510, galvanized, fabricated in two or more parts enclosing resilient gasket seal, with keys to fit machined grooves on pipe ends. Rated at 300-psig minimum pressure and factory-finished with manufacturer's standard paint coating.
b) Coupling gasket: Chlorinated butyl, ASTM D2000, specification 3-BA-615-A14-B13, with following additional requirements:
(1) Molded grooves.
(2) Pressure-responsive seal, integrity increasing with internal pressure.
c) Coupling bolts and nuts: Oval-neck track-type bolts with hexagonal nuts conforming to ASTM A183 permitting single-wrench assembly, having minimum tensile strength of 110,000 psi, with cadmium-plated finish ASTM B766, Type III.
3) Fittings:
a) Grooved-end, fabricated of malleable-iron casting in accordance with ASTM A47, Grade 32510, galvanized; nonstandard fittings fabricated from Schedule 40 steel pipe.
b) Mechanical branch outlets:
(1) Victaulic 920 or equal.
(2) Victaulic Style 72 or equal.
c) Threaded pipe fittings: FS WW-P-501, Type 1, Class B.
d) Welding fittings made of same wall thickness as pipe.
(1) Factory-made welding fittings.

(2) Mitered-joint elbows and field-made reducers are prohibited.

e) Butt-welded fittings larger than 1-1/2 inches: ANSI B16.9.

f) Flanges for welded piping system: ANSI B16.5, galvanized forged steel, welded-neck type, 175 pressure class for stations and 250 pressure class for tunnels.

4) Paint, Primer, and Undercoat: Alkyd Semigloss System as specified in Section 09900, Color: OSHA Red (Safety Red) in compliance with ANSI Z535.1 for piping, White for stenciling.

c. Unions: WP 175 psig.

1) 1-1/2 inches and smaller: Threaded, FS WW-U-531, Type B to match piping.

2) Two inches and larger: Flanged.

a) Two union flanges, 2-1/2 and three inches: Steel, FSA WW-U-531, or cast iron, ANSI B16.1.

3) Four inches and larger: Forged steel, slip-on weld neck flanges, ANSI B16.5.

4) Nonferrous piping unions: Brass, FS WW-U-516.

C. Valves:

1. Fire-line valves, outside stem and yoke (OS&Y), UL Fire Protection Directory listed or FM Approval Guide listed for 175-psig minimum, meeting requirements of listed NFPA Standards, with UL or FM symbol cast or stamped on valve body.

2. Gate valves: UL 262 or FM Approval Guide listed, 175-psig WP

3. Check valves: UL 312 or FM Approval Guide listed, 175-psig WP, flanged-end connections, swing-type, metal-to-metal, rubber-faced or equivalent, valve seat 15 degrees from perpendicular to direction of flow.

4. Sprinkler flow-alarm check valves: Designed to operate on 10 gpm or more with restriction bypass which allows restricted flow of water to pass from supply to system side of alarm-valve clapper, to decrease possibility of false alarms resulting from increase in supply water pressure or from water hammer.

a. Furnished with retarding chamber, test and drain connections and electric contact unit.

b. Cast-iron bodies with nonferrous-metal seat, rings, bearings and renewable clapper facing.

c. Contacts: Section 15900.

5. Fire water-line surveillance valve:

a. Double-disc, solid-wedge gate-type with outside stem and yoke (OS&Y) and renewable ring seats.

b. Designed for position indicator contact:

1) Contacts open with valve fully open.

2) Contacts close and alarm condition is initiated with two turns of hand wheel or when valve stem has moved one-fifth of distance from normal fully open position.

6. Sprinkler alarm check-valve surveillance: Contact closes on flow amounting to 10 gpm or greater.
7. Ball drip valves: 3/4 inch, threaded both ends and rated at 175-psig minimum.
8. Air and vacuum valves:
   a. Automatic.
   b. High-capacity; minimum flow, 3.0 cfs; pressure differential, 5.0-psig maximum.
   c. Designed for maximum system working pressure; 175-psig minimum; suitable for working pressures from zero psig to maximum capacity.
9. Angle hose valves:
   a. Cast bronze, male outlet, replaceable rubber disc and rising stem.
   b. Rough-bronze body, polished-finish bonnet, nut and stem, complete with cap and chain.
   c. Cast-iron or aluminum hand wheel, red-enameled.
   d. Working pressure: 200 psig.
   e. UL Fire Protection Directory listed with symbol cast or stamped on valve body.
   f. American National Standard Fire Hose threads.
10. In-line cut-off valves:
   a. Flanged gate valve, with outside stem and yoke
   b. Comply with UL 262, UL Fire Protection Directory listed or FM Approval Guide listed with symbol cast or stamped on valve body.
   c. Working pressure, 175 psig.
   d. Cast-iron or aluminum hand wheel, red-enameled.

D. Fire Department Siamese Connection:
1. Free standing:
   a. Paved areas: Double clapper, with sidewalk sleeve, sidewalk plate, two rocker-lug plugs and chains, polished brass, two female inlets with 2-1/2 inch American National Standard Fire Hose Threads, UL Fire Protection Directory listed or FM Approval Guide listed, working pressure of 200 psig and with cast recessed Type B Metro logo and inscription, as shown, except inside fenced Authority property.
   b. Landscaped areas: As specified for paved areas, except no sidewalk sleeve or plate.
   c. Paint, Primer, and Undercoat: Alkyd Semigloss System as specified in Section 09900, Color: OSHA Red (Safety Red) in compliance with ANSI Z535.1 for piping, White for stenciling.
2. Wall-mounted: Double clapper rectangular wall plate for flush mounting, two rocker-lug plugs and chains, polished brass, two female inlets with 2-1/2 inch American National Standard Fire Hose Threads, UL Fire Protection Directory listed or FM Approval Guide listed, working pressure

of 200 psig, and with cast raised Type B Metro logo and inscription as shown. Provide sill cock where necessary for drainage.

E. Sprinkler Heads:
1. Standard fusible-link type.
2. Bronze finish, exposed and temperature rating of 165F in accordance with listed NFPA Standards.

F. Sprinkler Test Connections:
1. Drain piping, valves and fittings necessary for testing in accordance with listed NFPA Standards.

G. Control System: Except as specified for clean agent suppression systems: Provided by others.

H. Supporting Devices:
1. Pipe hangers and supports:
   a. Adjustable, stainless steel, clevis-type, threaded full length, with diameter consistent with pipe size and the load imposed: MSS SP-58.
   b. Hanger rods: 3/8-inch minimum diameter, stainless steel, ASTM A276,Type 304, threaded full length, with diameter consistent with pipe size and the load imposed: MSS SP-58.
   c. Nuts and washers: Stainless steel.
   d. Supported from stainless steel inserts in concrete slab: MSS SP-58.
2. Adjustable U-bolt type:
   a. U-Bolt: Fabricated from stainless steel, MSS SP-58.
   b. Nuts and washers: Stainless steel..
   c. Chair: Cast iron or fabricated from stainless steel.
3. Z-bar: Fabricated from stainless steel: ASTM A240, Type 304.
4. Pipe anchors:
   a. Designed to withstand a minimum of five times anchor load.
   b. Vertical pipes anchored by means of clamps welded around pipes and secured to wall or floor construction.
5. Expansion-bolt anchors:
   a. Consisting of bolt, expander, star lock washer and nut.
   b. Fabricated of stainless steel, Alloy S30300 in accordance with ASTM E527, including expander and star lock washer.
   c. Anchor assemblies: FS A-A-1992, Group II, Type 4, Class 1.
6. Self-drilling anchors:
   a. Self-drilling, expansion anchors with self-cutting annular broaching grooves.
   b. Anchor and expander plug: Double-plated, FS A-A-1992, Group III, Type 1.
7. Pipe sleeves:

a. Through interior masonry-unit walls: PVC, as shown, large enough to accommodate pipe but minimum two sizes larger than pipe size.
b. Through cast-in-place concrete interior walls and concrete ceilings: Factory-made cast iron with anchor flange and cast-iron plate collar screw-fastened to slab and pipe.
1) Sleeves minimum two sizes larger than pipe; for floors and ceilings projecting four inches above finish floor.
c. Through exterior structural elements: Minimum two sizes larger than pipe and as shown.
d. Sleeves designed for pipe-movement allowance due to expansion and contraction.

8. Escutcheon plates:
a. Polished brass or stainless steel, screw-fastened to wall or ceiling.
b. Plate collars caulked with silicone sealant or intumescent putty.
c. Sealant: UL-1479.

I. Pressure Gauges: Spring pressure-type, 3-1/2 inch dial, in accordance with NFPA 14.

J. Bonding Strap: 2AWG single-conductor cable: Section 16060.

K. Preformed Joint Filler: ASTM D1752.

L. Coal-Tar Epoxy: Section 02535.
1. Thinner of type recommended by manufacturer of coating and used only when approved.

M. Water-Flow Indicator: Vane-type water flow switch, UL Fire Protection Directory listed, FM Approval Guide listed. Electrical rating: 24 volts dc, 1.5 amperes, normally open contacts to actuate with flow of 10 gpm or more.

N. Clean agent suppression system:
1. Smoke detectors: Products of combustion, dual-chamber, ionization-type, operating voltage of 22 to 28 volts dc, 30 milli-amperes (ma) standby current drain at 24 volts dc and alarm current drain of 60 ma at 24 volts dc. Three amperes minimum alarm contact rating at 24 volts dc. Detector will activate alarm approximately five seconds after product of combustion particulate enters ionization chamber. Detectors equipped with indicator lamp which will remain lighted until reset. Unit listed by UL Fire Protection Directory and FM Approval Guide as signal and release device.
2. Manual pull station: Contained in cast-metal housing for mounting on standard four-inch junction box unit to have dual-action release configuration such as discharge lever protected by lift cover, to prevent accidental discharge, and tamper-resistant screw to prevent unauthorized access to reset procedure. For operation at 24 volts dc. Listed by UL Fire Protection Directory as release device.

3. Abort switch: A momentary, normally closed push-button switch. Time delay to restart at designated setting when abort switch is released. Switch to be accessible and labeled 'CLEAN AGENT ABORT.' Activation of the abort switch to silence discharge warning horn.
4. Clean agent suppression system control equipment:
   a. Control panel: Multizone for operation by smoke detectors and manual pull station, singly or in combination, to activate prealarm or release of agent as required. Power source for operating extinguishing system as well as specified auxiliary functions.
      1) Panel enclosure: NEMA 250, Type 1 surface-mounted, dead front; indicators and control switches visible, mounted on panel behind hinged, locked glass-paneled door, complete with relays, trouble and alarm bell, silencing switch with ring-back feature, LED indicating lamps, nameplates, switches and terminals to provide relays for fire-alarm system tie-in, for HVAC systems fan shut-down, HVAC-damper closing, for test delay switch with automatic reset to permit testing fire-alarm system without activating auxiliary control functions.
      2) Operating circuitry: Solid-state electronics with plug-in circuit modules for detection and release circuits; 120-volt ac, 60-Hertz supply; 24 volts dc signal and release circuits including power for operating extinguishing sub-system and other functions. Power consumption 10 watts steady state, 200 watts peak.
      3) Functional circuitry: Provide two detection zones and two output circuits for signal and release, all Class B supervised. Detection circuits to accommodate smoke detectors and manual stations intermixed. Signal output circuit of the polarity-reversal type. Release circuit to include supervised abort switch and adjustable time delay. Provide separate relay output for each zone alarm, general alarm, trouble, predischarge and system-fired circuit; utilize 10-ampere contact.
      4) Operation: Activation of detector, circuit to light zone alarm lamp on indication panel, sound audible local alarm, activate the extinguisher system and energize auxiliary relays for remote alarm or equipment shut-down. Loss of dc power or discontinuity in detection circuits to light trouble lamp on indicator panel and actuate bell alarm; provide trouble bell silence switch with ring-back circuit to silence trouble bell alarm. Receipt of zone alarm to override trouble alarm. A single switch to reset control unit.
      5) Indicator lights, as follows:
         a) POWER ON: Green.
         b) TROUBLE: Yellow.
         c) ALARM ZONE 1: Red.

d) ALARM ZONE 2: Red.
e) PRE-DISCHARGE: Red.
f) SYSTEM FIRED: Red.

b. Extinguishing system:

1) Provide system designed to discharge seven-percent volume concentration of extinguishing agent with discharge not to exceed 10 seconds. The system to comply with NFPA 2001. Each extinguishing system to include the following

a) Agent storage container: Container fabricated of high-strength alloy steel with burst-disc actuator valve assembly, safety plug, cable assembly, 0 - 600-psig pressure gauge, pressure switch and lifting ring. Container to conform to applicable DOT specifications; to automatically relieve between 850 psi and 100 psi in event of excessive pressure buildup. Super-pressurize filled container with dry nitrogen to 390 psig at 70F to assist rapid distribution. Container designed for on-site reconditioning and refilling. Actuator valve assembly to be an integral part of container.

b) Discharge nozzle: Provide series of one-piece, nonclogging nozzles to distribute agent in protected volume. Nozzle size selection determined by container size and geometry of volume to be protected. Nozzles connected through reducer, elbow and piping. Nozzle discharge pattern to deliver uniform agent coverage to all areas of enclosed hazard.

c) Actuator: Electrical device to operate on demand to provide path for relief and discharge of agent.

d) Mounting bracket: Designed for wall-mounting agent storage container and capable of withstanding 1,000-pound thrust for five seconds in any direction.

e) Agent: Liquefied compressed clean agent suppression system conforming to requirements of NFPA 2001.

f) Alarm bell: Motor driven, with six-inch gong, 24-volt dc operating voltage, 90 dBA sound-pressure level at one meter and OSHA Safety Red finish.

g) Evacuation horn: Vibrating, 24-volt dc, 0.063 amperes, 97 dBA sound-pressure level at one meter.

h) Discharge indication light: Flashing device with legend CLEAN AGENT DISCHARGE; 24-volt dc.

i) Clean agent suppression system interface box: Data-transmission system (DTS) cabinet specified

in Section 16130, with the following additional requirements:
(1) Cabinet: Hoffman A161206LP.
(2) Terminal strip: 16 terminals minimum.
(3) Exterior finish color: OSHA Safety Red.
(4) Identify cabinet on cover with COMMUNICATION INTERFACE in one-inch high yellow letters.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Fit equipment and appurtenances to space provided and make serviceable.

B. Provide support beams, concrete pads, platforms, and hangers necessary for proper installation of equipment as recommended by manufacturer.

C. Install complete fire-protection systems as shown and as specified. During installation, protect work, equipment, and materials. Plug or cap pipe openings.

D. Flush underground mains before connection to wet-standpipe risers at following minimum flow rates:
1. Six-inch pipe: 750 gpm.
2. Eight-inch: 1,000 gpm.
3. 10-inch pipe: 1,500 gpm.
4. 12-inch pipe: 2,000 gpm.

E. Fasten escutcheon plates to wall or ceiling. Seal plate collars watertight with mastic.

F. Welding Procedure:
1. As specified in Section 05120, with the following additional requirements:
   a. Manual metallic arc process, except for pipe sizes four inches and smaller where oxyacetylene welding may be used.
      1) Use electrodes and rods of composition recommended by AWS A5.13 for pipe.
      2) Heat surface within three inches from point where weld will start to a temperature warm to hand before welding.
   b. Leave joint surfaces smooth, uniform and free from fins, tears and other defects which adversely affect proper welding.
   c. After each pass of weld on multiple-pass welding, clean weld free of slag and other deposits before applying next pass.
   d. Peen with light blows of blunt-nosed peening hammer. Do not peen surface layers or first pass in groove welds.

e. For groove welds, center surface pass substantially on seam, smooth and free from depressions.
f. Fillet weld with minimum cutting back of outside surface of pipe.
1) Leave throat of full fillet weld not less than 0.707 of thickness of pipe.
2) Repair excess cutting back and undercutting of base metal in pipe adjoining the weld.
3) Fill craters to full cross section.
g. Position pipes to be welded so that joints will be in alignment. Joints misaligned more than 20 percent of pipe wall thickness or maximum of 1/8 inch are prohibited.
h. Install welding pipe in accordance with ANSI B31.1.

2. Cut ends of screw-jointed pipes squarely to seat in bottom of recess of fittings. Ream after cutting so waterway is not reduced in size.
3. Apply thread dope or compound to male thread only.
4. Where cathodic protection is shown, apply coal-tar epoxy coating as specified in Section 02535 and test as specified in Section 13115.

G. Buried Ductile-Iron Pipe: Install as specified in Section 02515, except use mechanical joints.

H. Steel-Pipe Installation:
1. Maintain OSHA required head clearance.
a. Install horizontal piping with minimum pitch of one inch in 40 feet.
b. Provide drains at low points: Minimum 3/4-inch valves with hose connection.
c. Install vertical pipes near wall from which they are supported.
2. Make connections to equipment without placing strain on piping and equipment.
3. Tunnel, vent and fan-shaft piping:
a. Joints of the following types:
1) Butt weld joints in pipe recessed in tunnel lining.
2) Use mechanical grooved couplings for remainder of joints in horizontal and vertical mains unless otherwise shown.
3) Use threaded joints in branch lines 2-1/2 inches or smaller.
b. Provide number of mechanical couplings necessary to allow minimum 1-1/4 inch expansion per 100 feet of main.
c. Use reducing tee for mechanical couplings or mechanical branch outlet at main-to-branch connections.
d. Make in-line cut-off valves accessible from floor or walkway level.
4. Underplatform station piping:
a. Provide the following types of joints or couplings:
1) Couplings: Mechanical, grooved, at intervals not to exceed 21 feet.
2) Where possible, cut grooves before galvanizing.
3) Where grooves are cut after galvanizing, apply zinc coating.
4) Other joints:
a) In lines four inches and larger: Welded joints.

b) In lines less than four inches: Welded or threaded joints.

b. Provide anchors, horizontally and vertically rigid, within one foot of one end of each length of pipe jointed with Victaulic-type mechanical couplings. Provide clevis-type support within one foot of other end, at midpoints between mechanical couplings and at each angle hose valve. Locate supports at angle hose valves to ensure resistance to rotation of valves and adjacent piping by water pressure at valve. Provide restraint for every third length of pipe to prevent excessive movement by a horizontal thrust. Roller-type hangers and pipeline guides are not required

5. Other station piping: Joints in balance of station fireline piping of mechanical-type, grooved or welded couplings for lines four inches and larger and screwed or welded for lines under four inches, except that mechanical-type groove couplings must be accessible.

I. Mechanical-Type Groove Couplings: Install couplings according to manufacturer's instructions and as follows:

1. After grooving, remove indentations, projections and roll warps as necessary. Cut pipe ends square to tolerance of plus-or-minus 0.03 inch. Provide zinc coating on exposed surface.
2. Lightly coat pipe ends and coupling gasket with non-petroleum-based lubricant.
3. Center gasket, install housing and ensure that keys are securely located in pipe grooves.
4. In underplatform station piping, provide separation of 1/8 inch between ends of adjacent sections of pipe within coupling, based on air temperature of plus 60F. Adjust based on actual air temperature at time of installation.
5. Install bolts and nuts tightened uniformly to manufacturer's recommended limits using torque wrench, without pinching gaskets.
6. Provide bonding across couplings for stray-current protection.

J. In-Line Valves: Install in-line valves by bolting fitting to valve and welding fitting to pipe.

K. Pipe Anchors: Securely anchor piping as specified, where shown and where necessary for proper installation to force pipe expansion in proper direction.

L. Expansion-Bolt Anchors: Drill holes and install expansion-bolt anchors in manner recommended by anchor-bolt manufacturer. Do not install less than eight inches from concrete edge.

M. Pipe Sleeves: Fill annular space between pipe and sleeves with preformed joint filler, tightly placed to form effective seal against groundwater.

N. Bonding: In accordance with Section 16060, and with the following additional requirements:

1. Bond mechanical joints and fittings, including valves, by exothermic-welding method.
2. Make welds in accordance with manufacturer's recommendations. Clean and coat with coal-tar epoxy.
3. Bond pipe using bonding strap welded to each side of joint not less than six inches from joint. Allow sufficient slack in conductor for expansion of pipe.

O. Air Vents: Install high-capacity automatic air vent(s) at opposite end(s) of dry-standpipe system from fire-department siamese connection or where shown. Pipe air-vent outlet to nearest drain or as directed.

P. Firestopping: Section 07841.

3.02 PROTECTION OF PIPING AND EQUIPMENT:

A. Protect pipe, openings and valves from dirt, foreign objects and damage during construction.

B. Replace damaged piping, valves and other appurtenances, should damage occur prior to final acceptance of the work.

3.03 FIELD QUALITY CONTROL:

A. Field Tests:
1. Flush piping with water until clean and free of scale, slag, dirt, oil, grease and other foreign material.
2. Perform final testing, acceptance, and certification in accordance with NFPA 13, 14, and 24, as applicable.
3. Test electrical continuity of bonded joints by measuring resistance. Total resistive value of joint not to exceed calculated resistance of bond cable plus 10 percent.

B. Water-Pressure Testing:
1. In the presence of the Engineer, test piping, prior to burial or concealment, using specified procedures specified.
2. In the presence of the Engineer, completely test piping system for leaks until approved.
3. Notify the Engineer at least 36 hours prior to tests.
4. Test piping at the following pressures:
   a. Fire-protection piping, inaccessible: 400 psi-minimum.
   b. Ductile-iron pipe: At lowest point in system, 150 psi or 1-1/2 times maximum working pressure, whichever is greater.
   c. Fire-protection piping, exposed and accessible: At lowest point in system, 150 psi or 1-1/2 times maximum working pressure, whichever is greater.

C. Test Procedures:
1. Test fire-protection piping in accordance with NFPA.

2. Fire-protection piping, inaccessible:
   a. Avoid excessive pressure on safety devices and mechanical seals.
   b. Fill entire system with water and vent air from system at least 24 hours before test pressure is applied.
   c. Apply test pressure when water and average ambient temperature are approximately equal and constant.
   d. Maintain test pressure for six hours minimum without drop after force pump has been disconnected.
3. Water-test entire system with pressure at highest point of 250 psig.
4. After filling system, shut off water supply and allow it to stand for two hours under test without loss or leakage.
5. Coordinate with and assist local fire department in performing flow tests. After performing hydrostatic test, drain water from firelines. Perform flow test at rate of 500 gpm with pumper connected to siamese connection, starting testing with sudden full flow into empty firelines.
6. Drain system immediately after hydrostatic and flow testing.

D. Repair of Leaks:
1. The following are prohibited:
   a. Repair of leaks by mechanical caulking.
   b. Introduction of material inside piping system to stop leakage.
2. Repair leaks in threaded piping by breaking joint, cutting new threads on pipe and installing new pipe fitting.
3. Coat field welds and repair damages to zinc-coated surfaces as follows:
   a. Wire brush areas to be coated to bright metal.
   b. Apply galvanizing repair compound at rate of two ounces per square foot.
4. Replace defective coupling assembly as necessary.
5. Remove defective welds by chipping or gouging.
   a. Reweld the chipped-out places.
   b. When base metals of fillet welds are cut back or throat of welds are less than specified, repair defect by adding additional weld metal.

3.04 CLEANING:

A. Flush firelines with water to remove sediment after completion of tests, repairs or replacements.

B. Disinfect firelines connected to potable-water system as follows:
1. Use chlorine for disinfection in form of hypochlorite solution or in form of compressed gas applied through approved chlorinator.
2. Operate valves and equipment during chlorination to ensure that chlorine reaches entire system.
3. Feed water and chlorination agent into system at rate providing for 50 ppm of chlorine and allow to stand 24 hours before flushing.
4. Residual chlorine, at end of 24-hour retention period, not less than 10 ppm.
5. Flush treated water from system completely after disinfection.

6. Continue flushing until samples show that quality of water delivered is comparable to public water supply and satisfactory to public-health authority having jurisdiction.
7. Do not take samples from hydrants or through unsterilized hose.

3.05 FIELD PAINTING: Section 09900.

A. Prepare piping, apply primer, undercoat and finish coats in accordance with Section 09900.

3.06 IDENTIFICATION OF PIPING AND VALVES: Section 15075.

END OF SECTION

SECTION 15075

IDENTIFICATION OF MECHANICAL EQUIPMENT AND PIPING

PART 1 - GENERAL

1.01 DESCRIPTION:

A. This section specifies providing nameplates/placards, tags, and labels on mechanical equipment and piping.

B. Related Work Specified Elsewhere:
   1. Field painting: Section 09900.

1.02 SUBMITALS:

A. Submit the following for approval in accordance with the General Requirements and with the additional requirements as specified for each:
   1. Samples:
      a. Placards, labels, markers, and tags in each size.
   2. Documentation:
      a. Charts for valves; include valve identification number, location and purpose.

PART 2 - PRODUCTS

2.01 PRODUCTS AND MATERIALS:

A. Nameplates/Placards: Engraved laminated acrylic plastic 1/8” thick, glossy surface.

B. Pipe Label: Polyester-coated, pre-printed

C. Pipe Marker: Cylindrically coiled or flat plastic, pre-printed.

D. Valve Tags: 18-gauge stainless steel.

E. Siamese Fire Department Connection Identification Plates: Bronze, Authority-furnished.

PART 3 - EXECUTION

3.01 IDENTIFICATION:

A. Equipment:
   1. Label equipment and apparatus with one-inch high black letters engraved on 1-1/2 inch high, white, laminated-plastic nameplates securely fastened to metal panels, showing function and unit number of item.

B. Devices:
   1. Identify devices including transducers, controls and switches by means of 1/2-inch high black letters engraved on one-inch high, white background, laminated plastic nameplates identifying manufacturer and function of equipment.

C. Piping:
   1. Snap-Around plastic pipe marker, plastic wrap-around pipe sleeves, or polyester-coated label showing service and direction of flow.
   2. Stencil legends and bands on piping showing service and direction of flow as specified in Section 09900.
   3. Color coding of exposed piping and terminating's of piping per following:
      a. Hot Water Lines – Yellow color field with black letters HW, HWR
      b. Potable Cold Water Lines – Blue color field with Black letters CW
      c. Chilled Water Lines – Blue & Yellow band color field with black letters CHWS, CHWR
      d. Fire Lines
         1) Standpipe – Red reflective color field with White letter, and Vent-shaft or Fan-shaft identification.
         2) Sprinkler – Red color field with White letter.
      e. Condensate Water Lines – White & Blue band color field with Black letters CWS, CWR
      f. Soil and Waste Lines (Sanitary) – White color field with Black letter S
      g. Vent Lines – Grey & White band color field with Black letter V
      h. Storm Water Lines – White color field with Black letter ST-W
      i. Pneumatic Control Lines – Green color field with Black letter A
      j. Compressed Air (Shop) Lines – CA
      k. Automatic Transmission Fluid – ATF
      l. Chassis grease – CG
      m. Engine Coolant – EC
      n. Engine Oil – EO
      o. Gear Oil – GO
      p. Windshield Wash Fluid – WWF
      q. Used oil – UO
      r. Used coolant – UC
   4. ID Size
      a. Pipe ¾" to 1¼": ½" letters on 8" long color field.
      b. Pipe 1½" to 2½": ¾" letters on 8" long color field.
      c. Pipe 3" to 6": 1 ¼" letters on 12" long color field.
      d. Pipe 7" to 10": 2 ½" letters on 24" long color field.
      e. Over 10": 3 ½" letters on 32" long color field.

D. Valves:
   1. Identify valves with 1-1/2 inch diameter, 18-gauge stainless-steel tags.
   2. Designate appropriate service on each tag with 1/4-inch stamped black-filled letters and valve number with 1/2-inch stamped black-filled numbers.

E. Siamese Fire Department Connection Identification Plate:
   1. Stamp information on Authority-furnished identification plates as shown and fasten to sleeve on Siamese fire-department connections for tunnel systems as shown.

3.02 INSTALLATION:

A. Equipment:
   1. Cement placard/nameplate with permanent adhesive on equipment. Clean surfaces thoroughly to ensure adhesion of nameplate. Nameplates to be attached to equipment to allow for easy viewing of nameplate during operation of equipment.

B. Devices:
   1. Affix placard/nameplate to surface of control and switch boxes by means of sheet-metal rivets. Placard/nameplate to be affix to wall or surface adjacent or below control devices such as thermostats, toggle switches, etc. Cement placards/nameplates to surface with permanent adhesive when rivets cannot be used.

C. Piping:
   1. Color coding as specified above is required for accessible piping systems, except associated supports, brackets, hangers and similar accessories. Apply color coding per Section 09900.
   2. Galvanized pipe is not to be painted, polyester-coated label applied with adhesive directly to the pipe or plastic wrap-around pipe markers with pre-printed graphics permanently secured to the pipe with plastic cable ties. For adhesive labels, clean pipe thoroughly to ensure adhesion of label.
   3. Insulated pipe or jacketed pipe, use polyester-coated label applied with adhesive directly to the insulation or jacket or plastic wrap-around pipe marker with pre-printed graphics permanently secured to the pipe with plastic cable ties. For adhesive labels apply to clean insulation or jacket to ensure adhesion of label.
   4. Location of pipe markers:
      a. Locate at points where pipes enter and leave rooms or spaces, at junction points and points of distribution, close to valves and equipment, at changes of direction, and at intervals of maximum 50 ft along each run of piping. Reduce intervals to 25 ft in congested areas of piping.
      b. Drainage pump stations to have pump riser pipes labeled with pump ID and discharge pipe to be labeled according to discharge designation Storm or Soil & Waste (Sanitary).
      c. Dry Standpipes in tunnels to have vent-shaft or fan-shaft identification adjacent to angle hose valves in tunnels.

D. Valves:
   1. Fasten tags securely to valves with brass jack chain, so as to permit easy reading.

E. Siamese Fire Department Plate:
   1. Identification plate shall be fastened to the brass sleeve of the Free Standing Siamese Fire Department connection with brass rivets as shown.

END OF SECTION

SECTION 15205

PIPING SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION:

A. This section specifies providing piping, fittings, valves, drains, specialties and supporting devices.

B. Related Work Specified Elsewhere:
1. Water distribution system: Section 02515.
2. Sanitary sewer: Section 02535.
3. Qualifications of welder: Section 05120
4. Firestopping: Section 07841.
5. Field painting: Section 09900.
6. Stray current and cathodic protection: Section 13110
7. Corrosion control testing system: Section 13115.
8. Fire protection, suppression and alarm: Section 13905.
9. Identification of mechanical equipment and piping: Section 15075.
10. Insulation: Section 15080.
11. Drainage Pumping System (DPS): Section 15444.
12. Grounding and bonding: Section 16060.
13. Closeout: Section 01775

1.02 QUALITY ASSURANCE:

A. Qualifications of Welder: Section 05120.

B. Codes, Regulations, Reference Standards and Specifications:
1. Comply with codes and regulations of the jurisdictional authorities.
2. The International Plumbing Code.
3. American Society of Safety Engineers (ASSE) Standards.
4. American Society for Testing and Materials (ASTM):
   a. A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   b. A74 Standard Specification for Cast Iron Soil Pipe and Fittings.
   c. A105 Standard Specification for Carbon Steel Forgings for Piping Applications.
   d. A126 Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
   e. A234 Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
   f. A395 Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
   ASME Code for Unfired Pressure Vessels.
   g. A536 Standard Specification for Ductile Iron Castings.

h. A888 Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm, Drain, Waste and Vent Piping Applications.
i. B32 Standard Specification for Solder Metal
j. B61 Standard Specification for Steam or Valve Bronze Castings
k. B62 Standard Specification for Composition Bronze or Ounce Metal Castings.
l. B88 Standard Specification for Seamless Copper Water Tube
m. B150 Standard Specification for Aluminum Bronze Rod, Bar, and Shapes.
n. B306 Standard Specification for Copper Drainage Tube (DWV)
o. C564 Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

5. American Society of Mechanical Engineers (ASME):
   a. Code for Unfired Pressure Vessels.
   b. B16.1 Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250.
   c. B16.3 Malleable Iron Threaded Fittings Classes 150 and 300.
   d. B16.5 Pipe Flanges and Flanged Fittings NPS ½ through NPS Metric/Inch Standard
   e. B16.51 Copper and Copper Alloy Press-Connect Pressure Fittings.
   f. B16.9 Factory-Made Wrought Buttwelding Fittings
   g. B16.11 Forged Fittings, Socket-Welding and Threaded
   h. B16.18 Cast Copper Alloy Solder Joint Pressure Fittings.
   i. B16.22 Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings
   j. B16.39 Malleable Iron Threaded Pipe Unions Classes 150, 250 & 300.
   k. Z21.22 Relief Valves for Hot Water Supply Systems.
6. American Water Works Assoc. (AWWA):
   a. C115/A21.15 Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
7. American Welding Society (AWS)
   a. A5.8 Specification for Filler Metals for Brazing and Braze Welding.
8. Federal Specification: A-A-1192, SS-C-153C, WW-P-51F, WW-P-460D, WW-P-501, WW-U-516B, WW-U-531, WW-V-51F.
9. Manufacturers Standardization Society (MSS):
   a. SP-58 Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application, and Installation.
   b. SP-67 Butterfly Valves
   c. SP-70 Cast Iron Gate Valves, Flanged, and Threaded Ends.
   d. SP-80 Bronze Gate, Globe Angle and Check Valves.
10. Plumbing and Drainage Institutes (PDI):
   a. WH-201 Water Hammer Arresters

1.03 SUBMITTALS:

A. Submit the following for approval in accordance with the General Requirements and with the additional requirements as specified for each:
   1. Product Data and Shop Drawings:

a. Submit complete catalog information/Product Data – Data shall consist of manufacturer's descriptive and technical literature, catalog cuts, performance, and installation instructions. Identify the model or material being supplied and all options included.
b. Shop drawings for material and equipment.
c. Submittals include, but are not limited to, the following:
   1) Pipes and piping layout, including locations of hangers and supports.
   2) Pipe hangers and supports.
   3) Valves.
   4) Cleanout deck plates and wall plates.
   5) Escutcheons.
   6) Gauges.
   7) Expansion joints, guides and anchors.
   8) Air eliminators.
   9) Pipe sleeves.
   10) Drains.

2. Certification:
   a. Certificates from manufacturers verifying the following:
      1) hat pipe-joint gaskets and lubricants are satisfactory for use with pipe and fittings specified.
      2) That expansion joints are designed and tested as specified.

2. Operation and Maintenance Manuals:
   a. All relevant items as required in Closeout, Section 01775
      1) Manuals shall include the following data:
         a) Table of contents.
         b) Design-Builder's name, address and telephone number, with similar data for its 24-hour service organization.
         c) Manufacturer's name, address and telephone number, with similar data for its local representative, distributor, and service agency.
         d) Catalog, model, and serial number of equipment installed. Include WMATA unit numbers where applicable.
         e) Description of equipment.
         f) Detailed Theory of Operation of each system and subsystem
         g) Troubleshooting and Diagnostic Procedures for each piece of equipment
         h) Block Diagrams and Schematics of equipment as installed
         i) Software administrative procedures for data input, failure diagnosis and system restoration
         j) Statement of warranty as specified.
         k) Description of modification, servicing and repairs performed prior to start of warranty.
         l) Dates warranty begins and expires.
         m) Standard starting, stopping and operating procedures.
         n) Emergency and special operating procedures.
         o) Routine maintenance procedures.
         p) Servicing and lubrication schedule.

q) Manufacturer's printed operating and maintenance instructions, manufacturer's parts list, illustrations, and diagrams.
r) O&M data as required to meet LEED required design goals.
s) One copy of each wiring diagram.
t) List of spare parts, prices and recommended stock quantities for routine maintenance of the equipment for 1 year and list of spare parts that are considered critical and for which extended time frames for acquisition would create undesirable down-time for equipment.
u) List of special tools required to perform inspection, adjustment, maintenance, and repair. Special tools are those developed to perform a unique function related to the particular equipment and not available from commercial sources.
v) Copy of each approved Shop Drawing of equipment and system. Include drawings which show outline dimensions, weights, and assembly data. Do not include drawings which show manufacturing details.

1.04 JOB CONDITIONS:

A. Do not perform welding when the temperature of base metal is less than zero degree F.

B. Do not perform welding when surfaces are wet from rain, snow, ice or during periods of high wind unless operator and work are properly protected.

PART 2 - PRODUCTS

2.01 PRODUCTS AND MATERIALS:

A. General Requirements.
   1. In design and purchase of equipment, provide for interchangeability of items of piping equipment, subassemblies and parts.
   2. Section 15444 Drainage Pumping System contains requirements for all piping, supports, valves, gauges, etc. which are used in Drainage Pumping Stations (DPS).
   3. Section 13905 Fire Protection and Suppression contains requirements for all piping, supports, valves, gauges, etc. which are used in standpipe and sprinkler systems.

B. Piping and Fittings:
   1. Cast-iron soil pipe and fittings:
      a. Piping and fittings: ASTM A74, Class SV (Service), uncoated for the following applications:
         1) Inside of structures.

2) Embedded within structures.
b. Piping and fittings: ASTM A74, Class XH (Extra Heavy), uncoated for the following applications:
1) Passing through underground structural elements.
2) Buried below structures.
3) Buried outside structures.
4) Embedded crossing structural contraction joints, provided with modified bell and spigot joints with molded-neoprene elastic compression gaskets.
a) Gaskets: ASTM C564
b) Pipe and fittings manufactured with spigot ends plain and beveled.
c) Bells modified to receive gaskets.
c. Piping and fittings: Hubless ASTM A888 for the following applications:
1) Drainage in aboveground structures.
2. Steel pipe and fittings:
a. Piping: ASTM A53, Type S Grade A or B, hot-dip galvanized, Schedule 40 for the following applications:
1) Waste and drainage piping and fitting, 2-1/2 inches and smaller where embedded or otherwise inaccessible.
2) Dry vents where embedded or otherwise inaccessible.
b. Fittings for chilled water, condenser water: ASTM A234 and ANSI/ASME B16.9 for dimensions and tolerances but not chemical properties.
c. Flanges: ASTM A105 and ANSI/ASME B16.5 for dimensions and tolerances.
d. Fittings and flanges furnished with properties equal to or greater than that of adjacent pipe.
3. Ductile-iron pipe and fittings:
a. Flanged Piping with threaded flanges :ANSI/AWWA C115/A21.15 for the following applications:
1) Embedded or otherwise inaccessible.
2) Water service from point of connection to inside of structure.
b. Fittings:
1) Threaded Flanges: ANSI/ASME B16.1.
c. Pipe coated on outside with bituminous coating and lined with cement mortar of twice standard thickness specified for pipe size used.
1) Cement-mortar lining having a seal coat of nontoxic, taste and odor-free bituminous material.
d. Neoprene gaskets furnished for joints.
4. Copper piping and fittings:
a. Copper piping ASTM B88 for the following applications:
1) Potable water, Pneumatic Sewage Ejector, and control air embedded or inaccessible: Type K, hard drawn.
2) Potable water and control where accessible: Type M.
3) Condensate drain pipes: Type L.
b. Seamless Copper Drainage Tube (DMV) and fittings ASTM B306 for the following applications:
1) Drainage, waste, and vent.
c. Fittings for potable-water piping:

1) ANSI/ASME B16.22 Fitting wall thickness after forming not less than that of adjacent piping.
2) For above ground 2" and smaller: ASME B16.51 Copper & Copper Alloy Press Connect Pressure Fittings:

d. Fittings for control-air piping:
1) Wrought copper, solder joint except at apparatus connections where brass compression fittings furnished.

e. Maximum pressure drop for high-pressure control-air mains: Five psi per 1,000 feet, with minimum 1-1/2 cubic feet per minute of 75-psi air flowing for each single station served and one cubic foot per minute for chilled-water plant.4. Copper tubing and fittings:
1) Minimum size for high-pressure control-air mains connecting chiller plants and underground stations: One-half inch ID, 5/8-inch OD.

f. Control-air piping graded to low points and each low point provided with 3/8-inch automatic drain cock.

g. Solder joints: Lead-free 95.5-percent tin, 4.0-percent copper and 0.5-percent silver with non-corrosive flux; ASTM B32.

5. Copper tubing and fittings:
a. Seamless copper tubing ASTM B280: for the following application:
1) Refrigeration service.

b. Fittings: Pure wrought copper, recessed solder joint, ANSI/ASME B16.18.

c. Solder joints: Brazing filler metal in accordance with ANSI/AWS A5.8 and the following:
1) Copper to Copper - 12-percent Sil-Foss (no flux 1300F).
2) Copper to Copper - 6-percent Dyna-Flow (no flux 1350F).
3) Copper to Steel - 45 silver solder (white flux 1150F)

6. Black-steel pipe and fittings:
a. ASTM A53, sch 40 for the following applications:
1) Exposed chilled water,
2) Exposed condenser-water supply
3) Exposed condenser-water return
4) Pipes larger than 12 inches in diameter: Minimum wall thickness 3/8 inch.

b. ASTM A53, sch 80 for the following applications.
1) Chilled-water and condenser-water supply and return embedded or otherwise inaccessible.

c. Fittings:
1) Pipes 1-1/2 inch and smaller connected with socket-weld fittings or screwed fittings.
2) Pipes two inches and larger connected with welded fittings.
3) Threaded-pipe fittings: FS WW-P-501, Type I, Class B.
4) Welding fittings made of same schedule or weight classification as the pipe.
5) Factory-made welding fittings.
6) Mitered joint elbows and field-made reducers will not be permitted.
7) Butt-welded fittings larger than 1-1/2 inches: ANSI/ASME B16.9.
8) Socket-welding fittings: ANSI/ASME B16.11.

9) Flanges for welded piping system: ANSI/ASME B16.5, forged steel, welded-neck type, 150-pressure class.

7. Drip Pans:
   a. Provide unpolished stainless-steel drip pans under water, waste or condensate-drain piping which run over transformer vaults or electric motor starters.
   b. Each drip pan provided with one-inch drain and routed with drainage pipe to nearest floor drain.
8. Unions:
   a. 1-1/2 inch and smaller: Threaded, ASME B16.39, Type A or B to match piping.
   b. Two inch and larger unions: ASTM A126, Class B, flanged.
      1) Two, 2-1/2 and three-inch union flanges: Steel, FS WW-U-531 or of cast iron, ANSI/ASME B16.1, 125-pound class.
   c. Four inch and larger union: Forged steel, 150-pound class, slip-on weld-neck flanges, ANSI/ASME B16.5.
   d. Nonferrous-piping unions: Brass, FS WW-U-516B.
9. Cleanouts:
   a. For cast-iron bell-and-spigot pipe: SVCI, ferrule caulked into cast-iron fittings and extra-heavy brass tapered screw plug with recessed head.
   b. For wrought-iron pipe: Extra-heavy brass plug in drainage fitting.
   c. Floor cleanouts: Cleanouts turning up through architecturally finished floors made by means of a long-sweep ell or Y and adjustable ABS housing with secured, scoriated, round satin-brass cover.
   d. Wall cleanouts: Cleanout plugs furnished with solid head tapped for 1/4-inch brass machine screw to secure cover plate. Cover plate to be polished-brass round access plate secured to plug with countersunk screw.
   e. For threaded pipes: Bronze, FS WW-P-460D, Class A.
   f. Furnished with adjustable recessed head in floor and where shown.
   g. Except for test openings, cleanout plugs for pipes up to four inches to be same size as pipe.
   h. On pipe sizes five inches and larger, cleanout plugs to be of four inches and pipe reduced to plug size with bushing.

C. Valves:
1. Gate valves two inches or smaller:
   a. MSS SP-80, Type 2, Class 150.
   b. Bronze with threaded ends, rough bodies and finished trim.
   c. Materials except handwheels: ASTM B61.
   d. Furnished with malleable-iron hand wheels.
2. Gate valves 2-1/2 inches and three inches:
   a. MSS SP-70, Type 3, Class 125, OS&Y flanged end, Type I, Class 2, cast-iron bodies and bonnets.
   b. Seat rings, disc, disc guide and stem furnished in bronze.
   c. Outside stem and yoke (OS&Y), flanged-end connections and malleable-iron hand wheels.
3. Gate valves four inches and larger:

a. MSS SP-70, Type 2, Class 125, OS&Y, flanged end, cast-iron bodies and bonnets.
b. Seat rings, disc, disc guide and stem furnished in bronze.
c. Outside stem-and-yoke type and cast-iron hand wheels.

4. Globe, angle and check valves:
   a. Two inches and smaller:
      1) WW-V-51F, Class B.
      2) Bronze with threaded ends, rough bodies and finished trim.
      3) Materials except hand wheels: ASTM B61.
      4) Globe and angle valves furnished with malleable-iron hand wheels.
      5) Check valves four inches and larger:
         a. Swing-type valve seat, with iron or steel body and cap and flanged-end connections.
         b. 150-pound class, renewable arm, disc assembly and seat ring with bronze trim.
         c. Outside arm and weight for pump discharge check valves.
5. Valves for copper piping:
   a. Gate valves with solder ends: MSS SP-80, Type 2, Class 150, Bronze, Type 1, Class B.
   b. Gate valves with flanged ends: MSS SP-80, Type 2, Class 150, Bronze.
   c. Globe, angle and check valves with solder or flanged ends: FS WW-V-51F, Bronze, Class B.
6. Pressure-reducing valves:
   a. Direct-acting type in which diaphragm and spring act directly on valve stem.
   b. Constructed to ensure that delivered pressure does not vary more than one psi for each ten-psi variation in inlet pressure.
   c. Wearing parts readily renewable.
   d. Valves two inches and smaller designed for working pressure of 250 psi, brass construction except yoke connecting valve body to separate diaphragm chamber having brass cover and assembled with brass bolts.
   e. Valves larger than two inches designed for minimum 125 psi, iron bodies and bronze trim.
   f. Adjustable to any outlet pressure.
   g. Gate valve and union on both inlet and outlet connections.
   h. Provided with bypass one pipe-size smaller than main water line.
   i. Stem-mounted pressure-reducing valve gauges, 3-1/2 inch dial, solid brass or stainless steel case and connections with T-handle stops.
   j. Pressure-reducing valve strainer: Brass, removable without disconnecting piping.
      1) Strainers two inches and smaller: Brass, bodies designed for minimum working pressure of 250 psi.
      2) Strainers 2-1/2 inch and larger: Iron bodies designed for minimum working pressure of 125 psi
7. Pressure-temperature relief valves:
   a. Temperature-and-pressure-actuated type, adjustable, bronze, single disc with bottom guide to ensure proper seating.
   b. Body, disc and base: Bronze, ASTM B62.

c. Spring and stem: Steel.
d. Lever: Malleable iron.
e. Pressure range from three psi to 250 psi rated and tested under ANSI/ASME Z21.22.
f. Temperature range: To 400F.

8. Automatic flow-control valve:
   a. Individually selected by manufacturer to automatically limit rate of flow to design capacity, regardless of system fluctuations.
   b. Selected to regulate flow within five percent of nameplate rating of system in which installed. Maximum operating differential between body tappings necessary for control not to exceed two psi.
   c. Self-cleaning, cartridge-piston type with stainless-steel variable-area orifices.
   d. Designed for minimum of 125 psi or 150 percent of system working pressure, whichever is greater.
   e. Tamperproof with body tappings for connecting instruments for verifying flow-control performance.
   f. Threaded or flanged connections as required for pipe fittings.
   g. Furnished with valve kit consisting of 1/8-inch by two-inch minimum size nipples, shutoff valves located outside of insulation and hose fittings for use with measuring instruments.
9. Refrigerant valves: UL listed.
10. Balancing cocks:
    a. Resilient-faced, eccentric-plug type designed for minimum of 125 psi or 150 percent of system working pressure, whichever is greater.
    b. Six inches and under, wrench-operated; eight inches and over, operated by worm or spur gear.
11. Line Strainers:
    a. Water strainers, Y or basket-type, 1-1/2 inches and smaller: ASTM A126, Grade B, iron bodies with screwed connections.
    b. Two inches and larger: ASTM A126, Grade B, iron bodies with flanged-end connections.
    c. Designed for minimum of 125 psi or 150 percent of system working pressure, whichever is greater.
    d. Stainless-steel or Monel screens as follows:
       1) Perforations:

Strainer size	Perforation size
¾-inch to two-inch inclusive	1/32 inch
2-1/2 inch to six-inch inclusive	1/16 inch
Eight-inch to 12-inch inclusive	1/8 inch

Over 12 inches	5/32 inch

2) Free area of screen minimum three times area of strainer inlet pipe.

e. Strainer provided with 3/4-inch drain valve.

12. Backflow preventer:
    a. Reduced-pressure type with two check valves and automatically operated pressure-differential relief valve located between two check valves.
    b. Relief valve and discharge port to drain intermediate chamber to level below supply-line inlet.
    c. Moving parts and trim constructed of corrosion-resistant material.
    d. Equipped with test cocks.
    e. Conform to applicable section of ASSE and AWWA Standards.
13. Butterfly valves:
    a. MSS SP-67, sizes as shown.
    b. Provide extended necks or neck extenders to accommodate two inches of insulation.
    c. Provide 10-position latch-lock handles.
    d. Provide enclosed work screw operators, sizes eight inches and larger.
    e. Provide chainwheels when above normal reaching area.
    f. Provide adjustable balance-return stops for balancing service.
    g. Meeting MSS SP-67.
    h. Test shell at 225 psi.
    i. Body:
        1) Wafer-type, cast iron, ASTM A126, Class B, or lug-type, ductile iron, ASTM A536 grade 60-40-18, or ASTM A395.
        2) To fit between ANSI/ASME B16.5 flanges.
        3) Bodies with integral flanges or full lugs drilled.
    j. Seat:
        1) Provide ethylene-propylene-terpolymer (EPT) bonded to rigid ring providing noncollapsible and replaceable seat.
        2) Provide bubble-tight shutoff of 150 psi at temperatures between 25F and 225F.
        3) Provide O-ring as secondary seal between seat and stem.
    k. Disc:
        1) Aluminum-bronze: ASTM B150.
    l. Stem:
    m. Stainless steel: AISI Type 304, 316, 410 or 416.
        1) Isolate from contact with piped material.

D. Portable Flow Meters:
1. Factory-fabricated case, carrying handle and fitted to hold meter securely to accommodate the following accessories:
    a. Two 10-foot lengths of connecting hose with female connectors for venturi-tube pressure-tap nipples.

1) Hose designed for minimum of 125 psi or 150 percent of system working pressure, whichever is greater.
2) Completely assembled three-valve manifold with two block valves and vent and drain valves piped and mounted on base.

b. Set of curves showing flow versus pressure differential for each orifice or venturi tube.
c. Metal instruction plate, secured inside cover, illustrating use of meter.

E. Orifices and Venturis:
1. Stainless steel, square-edge type, mounted between pipe flanges with factory made pressure taps.
2. Taps with shut-off valves and with quick-connection hose fittings for portable meters.
3. Orifice-throat diameter at specified flow and differential pressure in inches water gauge as follows:
   a. Fall in 60 to 80 percent of full scale reading for square-root meters.
   b. Twelve to 40 inches for linear-scale meters.
4. Venturi size selected with design flow rate between 10 and 40 inches of water-pressure differential.
   a. Permanent pressure loss: 25-percent maximum of indicated flow-rate differential pressure.
5. Flow-metering equipment: Supplied by same manufacturer.

F. Thermometer Wells:
1. Stainless steel with portions surrounding bulbs not over 1/16-inch thick, designed to hold engraved-stem thermometer.
2. Six inches projecting two inches into pipe with dust-excluding caps with gaskets and chains.
3. Pipe smaller than 2-1/2 inches enlarged where wells are located.
4. Set vertical or at angle to retain oil.

G. Gauges:
1. Liquid filled with Glycerin, vertical mount, resistant to vibration and shock ASME B40.100 Grade 1A
2. Size: 4” gauge case stainless steel 304 or 316, window polycarbonate with Buna-N gasket, and ¼” NPT threaded connection

H. Shock Absorbers:
1. Constructed of stainless steel, precharged with nitrogen, argon or pneumatic pure glycerin and permanently sealed.
2. Provided on cold-water supply piping to flush-valve water closets and urinals.
3. Provided on hot and cold supply piping to lavatories and mop service basins.
4. Certified to meet requirements of PDI WH-201.

I. Expansion Joints:
1. General:
   a. Designed for 150 psi and 200F for systems operating at 100 psi or less.

b. Provide expansion joint traverse with 150 percent of pipe expansion resulting from temperature variation of 80F.
c. Provide corrugated-bellows expansion joints for pipe expansion of
d. 1- 1/2 inches or less, minimum of 200 percent of expansion.
e. 1-1/2 inches and smaller, threaded ends; two inches and larger, flanged ends.

2. Flexible ball joints:
   a. Carbon steel, providing 360 degrees rotation plus 15 degrees minimum angular-flexing movement, furnished with asbestos-composition gaskets, steam-molded in steam-heat presses.
3. Corrugated-bellows expansion joints:
   a. Bellows constructed of single-ply or multiple-ply, formed, corrugated stainless steel for pipe sizes smaller than three inches.
   b. Self-equalizing type with equalizing or reinforcing rings, internal-telescoping stainless-steel or Monel sleeves, removable steel housing to protect bellows and support insulation.
   c. Corrugated element: Seamless tubing or of single sheet of metal rolled into cylinder having one longitudinal seam for sizes up to 16 inches.
   d. Joints 2-1/2 inches and smaller: Internal guides and limit stops.
   e. Designed for a minimum life of 5,000 full-rated traverse cycles when tested at specified pressures and temperatures.
4. Supporting Devices:
   a. Pipe hangers and supports:
      1) Provide adjustable steel pipe hangers and supports as follows: Clevis and clamp, cadmium-plated, zinc-plated, or stainless steel: ANSI/MSS SP-58, Type 1 and Type 8 for steel and cast-iron piping. Zinc-plated to be used in tunnels, hafts, exterior/exposed areas, and unconditioned areas. Stainless steel to be used in sewage ejector pits and wet areas. Cadmium to be used in conditioned areas.
      2) With cast-iron roller and sockets: ANSI/MSS SP-58, Type 41 for chilled-water piping.
      3) Space not greater than six feet for pipe sizes up to and including 1-1/2 inches; 10 feet for pipe sizes two inches through six inches; 16 feet for pipe sizes eight inches and larger.
   b. Pipe hangers for copper tubing: Steel, copper-plated, clevis-type, spaced at maximum five feet for tubing sizes through 1-1/2 inches and maximum eight feet for sizes two inches and larger.
   c. Hanger rods minimum diameter 3/8 inch, threaded full-length and diameter required by pipe size and load imposed.
   d. Hanger rod, nuts and washers: Tunnels, Shafts, Sewage Pits, wet areas, and exterior/exposed areas to be 316 stainless steel. All other areas to be Steel, zinc or cadmium-plated.
   e. Supported from stainless steel inserts in concrete slab: MSS SP-58, Type 18. All concrete anchors to be stainless steel.
5. Pipe rolls, plates and stands:
   a. Cast iron: ANSI/MSS SP-58, Types 44, 45, and 46.

1) Adjustable types selected for piping require grading after setting in place.

b. Protection saddles for support piping: ANSI/MSS SP-58, Type 39, welded to pipe.

6. Pipe anchors:
   a. Designed to withstand five times anchor load minimum.
   b. Vertical pipes anchored by means of clamps welded around pipes and secured to wall or floor construction.
7. Pipe guides:
   a. Factory-made cast semi-steel or heavy fabricated galvanized steel, consisting of bolted two-section outer cylinder and base with two-section guiding spider bolted or welded tight to pipe.
   b. Designed to clear pipe insulation and to prevent overtravel of spider and cylinder.
   c. Guides not less than 12 inches long and spiders not less than the following:

Pipe size/ inches	Spider length/ inches
1-1/2 and smaller	2
2 to 3	2-1/2
4	3
5 and larger	3-1/2

8. Expansion bolt anchors:
   a. Consisting of bolt, expander, star lock washer and nut.
   b. Fabricated of stainless steel, Type 303, including expander and star lock washer.
   c. Anchor assemblies: FS: A-A-1992, Group II, Type 4, Class 1.
9. Self-drilling anchors:
   a. Self-drilling expansion anchors, with self-cutting annular broaching grooves.
   b. Anchor and expander plug: FS: A-A-1992, Group III, Type 1, double-plated.
10. Pipe sleeves:

a. Through interior masonry-unit walls: As shown. Sleeve to be large enough to accommodate pipe and covering but not less than two sizes larger than pipe size.
b. Through poured-concrete interior walls, floors and ceiling: As shown.
c. Sleeves minimum two sizes larger than pipe. At floors, sleeves to project four inches above finish floor.
d. Through exterior structural elements: Minimum two sizes larger than pipe and as shown.
e. Sleeves designed to allow expansion/contraction movement of pipe.

11. Escutcheon plates:
    a. Polished brass or stainless steel, screw-fastened to wall or ceiling.
    b. Plate collars caulked watertight with mastic.
    c. Mastic: FS SS-C-153C, Type I.

J. Drains:
1. Area drains:
    a. Cast iron with flashing flange and flat grate for entrance areas.
    b. Outlets designed for connection to cast-iron soil pipe.
    c. Drain sizes and types as shown.
    d. Clamping devices: For securing membrane or flashing for drains installed in membrane-waterproofed floors and in floors not laid on ground.
2. Floor drains:
    a. Cast iron with flashing flanges and bottom or side outlet as required and designed for connection to cast-iron soil pipe.
    b. Clamping devices: For securing membranes or flashing, for drains installed in membrane-waterproofed floors and in floors not laid on ground.
    c. Reinforced-neoprene flashing: For drains installed in floors that are not membrane-waterproofed and are not laid on ground.
    d. Flashing of reinforced sheet neoprene, secured to drain by clamping device and extending 12 inches minimum from drain to ensure watertight connection.
    e. Area, yard and floor drains in public spaces having finished brass grates.
    f. Floor-drain sizes and types as shown.
3. Roof drains:
    a. Cast iron having integral flange and a clamping device for securing the roof covering to make a watertight connection.
    b. Drains for promenade roofs with removable, loose-set, round flat grate in square frame secured to nonpuncturing flashing clamp collar with weep holes and for two inch or more roof fill.
    c. Other roof drains furnished with cast-iron beehive or dome-shaped strainer.
    d. Openings in each strainer having a combined-area minimum twice the area of drain outlet.
    e. Each drain outlet having same size as downspout and with parts to make watertight connection to threaded pipe or cast-iron pipe as required.
    f. Meeting requirements shown.
4. Canopy drains (Roof Drain - Type 5):
    a. Ductile iron: ASTM A536, Grade 65-45-12.

b. 30 square inches minimum grate free area.
c. Removable gratings, contoured to match opening in concrete rib and as shown.

K. Air Separators:
1. Provide in-the-pipeline air separators with tangential openings for water in and out.
2. Design to create low-velocity vortex for internal separation of free air from water stream.
3. Size according to size of connecting pipeline as shown.
4. Equip with two-inch blowdown connection located at bottom of separator.
5. Equip with 1-1/4 inch minimum compression tank connection located at top of tank.
6. Tank:
   a. Size as shown and rated at 125-psi working pressure.
   b. Construct of carbon steel and in accordance with ASME Code for Unfired Pressure Vessels and so certified and stamped.
7. Strainer:
   a. Stainless steel with perforations sized for water flow.
   b. Install in location to assist in separation of air.
   c. Removable from bottom of separator.
8. Insulation: Section 15080.

L. Coal-Tar Epoxy Coating: Section 02535.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Welding Procedure:
1. Perform welding by manual metallic arc-process except for pipe sizes four inches and smaller where gas welding (oxyacetylene) may be used.
   a. Use electrodes and rods of composition recommended for pipe by AWS.
   b. Heat surface within three inches from point where weld will start to temperature warm to the hand before welding.
2. Weld corrosion-resistant nickel-copper alloy steel pipe by arc-process utilizing low-hydrogen electrodes of AWS E8016 or E8018 types.
3. Leave joint surfaces smooth, uniform, free from fins, tears and other defects which adversely affect proper welding.
4. After each pass of weld on multiple-pass welding, clean weld free of slag and other deposits before applying next pass.
5. Peen with light blows of blunt-nosed peening hammer.
   a. Do not peen surface layers or first pass in groove welds.
6. For groove welds, have surface pass substantially centered on the seam, smooth and free from depressions.
7. Perform fillet-welds with minimum cutting back of outside pipe.
   a. Leave throat of full fillet-weld not less than 0.707 of thickness of pipe.

b. Repair excess cutting back and undercutting of base metal in pipe adjoining weld.
c. Fill up craters to full cross section of weld.

8. Align and position accurately joints to be welded, so that pipe will not project beyond its adjoining pipe by more than 20 percent of pipe wall thickness or 1/8-inch maximum.
9. Install welded pipe in accordance with ANSI/ASME B31.1.

B. Soil, Waste, Vent and Drainage-Piping Installation:
1. Grade piping to 1/4 inch per foot and not less than that of main drain to which it is connected.
2. Use reducers to change pipe sizes on vent and drain lines.
3. Use long-sweep bends, Y-fittings, 1/8 or 1/16-bends, or combination Y and 1/8-bends to make changes in direction.
4. Join service-weight soil pipe and fittings with service-weight gaskets and extra-heavy soil pipe and fittings with extra-heavy gaskets.
   a. Designate and clearly identify service-weight and extra-heavy gaskets.
   b. Use lubricant for making joints.
   c. Make tight seal between external face of pipe and internal face of bell.
   d. Use gaskets capable of making and maintaining tight seal with deflection not exceeding five degrees.
   e. Assemble joints by use of tools recommended by pipe, fittings and gasket manufacturers.
   f. Employ trained workmen experienced in installation of gasket system to install entire gasket system.
5. Install embedded cast-iron piping at angle of 90 degrees to contraction joints with end of pipe bell coinciding precisely with centerline of contraction joint.
6. Cut ends of screw-jointed pipes squarely to seat in bottom of recess of fittings and ream after cutting so waterway is not reduced in size.
7. Apply thread dope or compound to male thread only.

C. Buried Ductile-Iron Pipe:
1. Install pipe with mechanical joints and neoprene gaskets and stabilize by use of thrust blocks.
2. Thrust blocks: Section 02515.

D. Potable-Water System Installation:
1. Connect and install service water piping, sizes as shown, to fixtures, equipment and outlets.
2. Install water meter in accordance with requirements of local water authority and provide the following valves:
   a. Main shut-off gate valve inside service room ahead of water meter.
   b. Drain with globe valve and hose nipple for 3/4-inch hose installed on house side of meter.
3. Pipe or tubing free from cuts, dents and other surface damage. Remove damaged pipe and replace with new pipe or tubing.
4. Cut square and ream ends of copper tubing.

5. Tubing ends to extend full depth of fitting recesses without binding.
6. Use lead-free 95.5-percent tin, four-percent copper and 0.5-percent silver solder with non-corrosive flux; ASTM B32.
7. Ream and clean ends of threaded pipes before assembling with fittings and apply approved joint compound to pipe thread only.
8. Make connections to equipment and fixtures without undue strain.
9. Run horizontal piping with minimum pitch of one inch in 40 feet and arrange for drains at low points.
    a. Install drain valves and hose nipples not smaller than 3/4 inch at low points.
10. Connect nonferrous piping to ferrous piping with dielectric couplings.
11. Install pressure-reducing valves where main water pressure exceeds 60 psi to maintain pressure of 15 psi at most remote fixture.

E. Control-Air Piping Installation:
1. Do not run piping concealed under duct insulation, inside of ducts or in direct contact with surfaces colder than normal room temperature.

F. Steel-Pipe Installation:
1. Weld embedded pipe and install so that pipe will not penetrate construction joints or structural contraction joints.
2. Install horizontal piping with minimum pitch of one inch in 40 feet and arrange for drains at low points.
    a. Install drain valves and hose nipples not smaller than 3/4 inch at low points.
3. Install high-capacity automatic air vents at high points, designed for 125 psi and suitable for operation on pressures under 125 psi.
    a. Pipe air-vent outlet to floor drains.
4. Pipe drip pan to discharge as shown; if not shown, discharge to nearest open drain.
5. Provide flexible connections to coils, pumps and other equipment so as to eliminate undue strains in piping and equipment.
6. Install condensate-drain lines for each air-handling unit with pitch of 1/4 inch per foot in the direction of flow.
    a. Run drain lines to nearest open drain.
    b. Do not exceed 400 feet maximum length of pipe between anchor and expansion joint or 90-degree offset.
7. Do not support embedded pipe from reinforcing bars with metallic means.

G. Expansion-Joint Installation:
1. Field set expansion joints for position corresponding to ambient temperature at time of installation.
2. Setting based on manufacturer's calibration data furnished with expansion joints.
3. Do not use corrugated-bellows expansion joints where exposed in train tunnels.
4. Install ball joints in accordance with approved published recommendations of manufacturer.
5. Do not use shims or steel spacers.

H. Pipe Anchors:

1. Securely anchor piping where shown and where necessary for proper installation to force pipe expansion in proper direction.

I. Expansion-Bolt Anchors:
   1. Drill holes and install expansion-bolt anchors as recommended by anchor-bolt manufacturer. Do not locate less than eight inches from concrete edge.

J. Pipe Sleeves:
   1. Exterior walls:
      a. Install as shown.
      b. For cathodically protected pipe, test in accordance with Section 13115.
   2. Interior walls:
      a. Install as shown. Seal to maintain integrity of walls.

K. Plumbing-Fixture and Equipment Connections:

   1. Make connections to wall-hung water closets and urinals with adjustable flanged nipples secured to chair supports, wax rings and rubber or impregnated-felt gaskets.

   2. Face plate of carrier not more than six inches from back of finish wall.

L. Drains:
   1. Install floor drains with traps.

M. Air-Separator Installation:
   1. Install air separator on suction side of chilled-water pump and as near to pump as practicable.

   2. Install dead-level in both directions and support from structure so that pipe can be removed without moving air separator.
   3. Install two-inch drain line, equipped with gate valve and union, from blowdown connection to nearest drain.

N. Attachments to Prestressed-Concrete Girders:
   1. Attach pipes and similar items to prestressed girders by welding to embedded plates or bolting to embedded fittings. Drilling into prestressed girders is prohibited, except as shown.

O. Refrigeration Copper Tubing Installation:
   1. Before heating joints, force nitrogen or carbon dioxide into the system.
   2. Sweat each copper tubing installation joint in accordance with standard accepted practice.

P. Bonding: In accordance with Section 16060, and with the following additional requirements:
   1. Bond mechanical joints and fittings, including valves, by exothermic-welding method.

2. Make welds in accordance with recommendations of the manufacturer. Clean and coat with coal tar epoxy.
3. Bond pipe using bonding strap welded to each side of joint not less than six inches from joint. Allow sufficient slack in conductor for expansion of pipe.

Q. Firestopping: Section 07841.
1. Pipe penetration through fire rated partitions to be sealed with approved fireproof sealant.

3.02 PROTECTION OF PIPING AND EQUIPMENT

A. Protect pipe, openings, valves and fixtures from dirt, foreign objects and damage during construction.

B. Replace damaged piping, valves, fixtures and appurtenances.

C. Prior to testing, flush piping with chemically treated water until systems are clean and free of scale, slag, dirt, oil, grease and other foreign material.

D. Hand-clean expansion joints and strainers.

E. Coal-Tar Epoxy Coating for Protection of Ferrous Piping: Apply as specified in Section 02535 and test as specified in Section 13115.

3.03 FIELD QUALITY CONTROL

A. Water-Pressure Testing:
1. Prior to burial or concealment, test affected piping in presence of the Engineer using specified procedures.
2. Test entire piping systems and test until found leak-free in presence of and to satisfaction of the Engineer.
3. Notify the Authority at least 36 hours in advance of making tests.
4. Test piping at following pressures:
   a. Soil, waste and vent piping: Requirements of local plumbing code but not less than equivalent to ten feet of water.
   b. Chilled-water and condenser-water piping embedded or otherwise inaccessible: 400-psi minimum.
   c. Ductile-iron pipe: 150 psi or 1-1/2 times maximum working pressure, whichever is greater, at lowest point in system.
   d. Potable-water piping: 1-1/2 times operating pressure but not less than 100 psi at topmost outlet.
   e. Chilled-water and condenser-water piping, exposed and accessible: 150 psi or 1-1/2 times maximum working pressure, whichever is greater, at lowest point in system.

B. Test Procedures:
1. Soil, waste and vent piping:
   a. Water test to include entire system from lowest point to highest point.

b. After filling system, shut off water supply and allow it to stand two hours without loss or leakage.
c. Conduct final test by smoke test or peppermint test as prescribed by jurisdictional authority.

2. Chilled-water and condenser-water piping embedded or otherwise inaccessible:
   a. Avoid excessive pressure on safety devices and mechanical seals.
   b. Fill entire system with water and vent air from system at least 24 hours before test pressure is applied.
   c. Apply test pressure when water and average ambient temperatures are approximately equal and constant.
   d. Maintain test pressure for minimum of six hours without drop after force pump has been disconnected.
   e. Visually inspect joints while pipe is under test pressure.
3. Ductile-iron pipe and black-steel piping:
   a. Use procedure specified for chilled-water and condenser-water piping embedded or otherwise inaccessible.
4. Potable-water piping:
   a. Use procedure specified for chilled-water and condenser-water piping embedded or otherwise inaccessible, except tests may be conducted in sections as long as no pipes or joints are left untested.

C. Control-air piping:
   1. Test main air piping at minimum of 150 psi and maintain pressure for one hour without pumping.
      a. Test low-pressure air piping at minimum of 30 psi and maintain pressure for one hour without pumping.
      b. Correct leaks by remaking joints.

D. Pressure Testing:
   1. Refrigerant piping: Test at 300 psi on high side and 150 psi on low side.
      a. Maintain pressure for minimum of 12 hours.
      b. Use electronic leak detector to check leaks, after soap-bubble test.

E. Repair of Leaks:
   1. Do not repair by mechanical caulking leaks in threads or welds occurring while pipeline is under test or in service.
   2. Introduction into piping system of material intended to stop leakage is prohibited.
   3. Repair leaks in threaded piping by breaking joint, cutting new threads on pipe and installing new pipe fitting.
   4. Remove defective welds by chipping or gas gouging from one or both sides of joint.
      a. Reweld chipped-out places.
      b. When base metals of fillet-weld are cut back or throat of weld is less than specified, repair defect by adding additional weld metal.

3.04 DISINFECTION:

A. Adjust and Clean:
   1. Flush entire hot and cold-water piping and other piping and equipment connected downstream from the domestic-water inlet main shutoff valve with water to remove sediment after completion of tests, replacements or repairs.
      a. Use chlorine for disinfection in form of hypochlorite solution or in form of compressed gas applied through approved chlorinator.
      b. Operate valves and equipment during chlorination to ensure that chlorine reaches entire system.
      c. Feed water and chlorination agent into system at rate providing for 50 ppm of chlorine and allow to stand 24 hours before flushing.
      d. Residual chlorine at end of 24-hour retention period: Two-ppm minimum.
   2. Flush treated water from system completely after disinfection.
   3. Continue flushing until samples show that quality of water delivered is comparable with public water supply and satisfactory to jurisdictional public-health authority.
   4. Do not take samples from hydrants or through unsterilized hose.

3.05 FIELD PAINTING:

A. Paint exposed soil and waste pipe lines in accordance with Section 09900.

END OF SECTION

SECTION 16050

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Requirements for basic electrical studies and reports, material handling, and other basic electrical materials and methods.

B. Related Sections:
   1. Refer to Procurement Documents
   2. Section 16060 Grounding and Bonding for Electrical Systems
   3. Section 16070 Hangers and Supports for Electrical Systems
   4. Section 16120 Low Voltage Electrical Power Conductors and Cables
   5. Section 16130 Conduit for Electrical Systems
   6. Section 16131 Wireways for Electrical Systems
   7. Section 16132 Boxes for Electrical Systems
   8. Section 16075 Identification for Electrical Systems
   9. Section 16080 Acceptance of Electrical Systems
   10. Section 16145 Wiring Devices

1.02 REFERENCES

A. Regulatory Agency Sustainability Approvals:
   1. Buy America Act:
      a. Except for those products which are exempt under the specific statutory waivers stipulated in 49 CFR 661, all other products supplied under this Section must comply with the requirements of the Buy America Act.

B. National Fire Protection Association (NFPA):
   1. NFPA 70, National Electrical Code (NEC).
   2. NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces.

1.03 SUBMITTALS

A. Submit the following information for approval in accordance with the requirements of the Procurement Documents:
   1. Product Data:
      a. Submit Product Data, including catalog cuts, for all products provided for the electrical work of this Contract and as specified in other Sections.
         1) Clearly indicate the usage of each product on each submittal.

1.04 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Buy America Act:
      a. Except for those products which are exempt under the specific statutory waivers stipulated in 49 CFR 661, all other products supplied under this Section must comply with the requirements of the Buy America Act.

B. Regulatory Requirements:
   1. Perform all electrical work in conformance with the requirements of NFPA 70, the National Electrical Code.

C. Certifications:
   1. Submit evidence with all Product Data that the products represented meet testing agency quality verification requirements, including agency listing and labeling requirements.
      a. Such evidence may consist of either a printed mark on the data or a separate listing card.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and equipment to the work site in accordance with the requirements of the Procurement Documents.
   1. Deliver materials and equipment in a clean condition.
      a. Provide packaging that plugs, caps, or otherwise seals openings both during shipping and temporary storage.
   2. Provide equipment needed for unloading operations, and have such equipment on the work site to perform unloading work when the material and equipment is delivered.
      a. If possible, clearly identify pick-points or lift-points on electrical equipment crating and packaging.
      b. In the absence pick-points or lift-points on equipment crating and packaging, identify pick-points or lift-points on the equipment itself.

B. Handle materials and equipment in accordance with the requirements of The Procurement Documents.
   1. Handle materials and equipment in accordance with manufacturer's written instructions.
   2. When unloading materials and equipment, provide special lifting harnesses or apparatus as required by manufacturers.

C. Store electrical materials and equipment, whether on-site or off-site, in accordance with The Procurement Documents and the following:
   1. Follow the manufacturer's written instructions for storing the items.

2. Store electrical equipment and products under cover.
   a. Except for electrical conduit, store electrical equipment and products in heated warehouses or enclosed buildings with auxiliary heat and that provide protection from the weather on all sides.

PART 2 PRODUCTS

2.01 MATERIALS

A. Grounding and Bonding Materials:
   1. Provide grounding and bonding materials in accordance with the requirements of Section 16060.

B. Hangers and Supports:
   1. Provide hangers and supports for electrical equipment in accordance with the requirements of Section 16070.

C. Electrical Identification Materials:
   1. Provide electrical identification materials in accordance with the requirements of Section 16075.

D. Wire and Cable:
   1. Provide low-voltage electrical wire, cable, and accessories in accordance with the requirements of Section 16120.

E. Conduit and Raceway:
   1. Provide conduit and raceway as indicated, as appropriate for the application per NFPA 70, and in accordance with the following:
      a. Conduit and Tubing: Provide electrical conduit and tubing in accordance with the requirements of Section 16130.
      b. Wireway and Fittings: Provide electrical wireway and fittings in accordance with the requirements of Section 16131.

F. Wiring Devices:
   1. Provide electrical wiring devices in accordance with the requirements of Section 16145.

2.02 SHOP FINISHING

A. For electrical equipment, factory-apply paint and coating systems that at a minimum meet the requirements of the NEMA ICS 6 corrosion-resistance test and the additional requirements specified in individual Specifications.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. The quality of finishing and refinishing work is subject to approval by the Authority.

END OF SECTION

SECTION 16060

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Requirements for connecting, energizing, testing, cleaning, and protecting grounding and bonding systems.

B. Related Sections:
   1. Refer to Procurement Documents
   2. Section 16050 Common Work Results for Electrical
   3. Section 16080 Acceptance of Electrical Systems
   4. Section 16130 Conduits for Electrical Systems

1.02 REFERENCES

A. Reference Standards:
   1. U. S. Government:
      a. Federal Transit Administration (FTA):
   2. 49 CFR 661 Buy America Requirements

B. American Society for Testing Materials (ASTM):
   1. ASTM B 1; Standard Specification for Hard-Drawn Copper Wire.
   2. ASTM B 8; Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

C. National Fire Protection Association (NFPA):
   1. NFPA 70, National Electrical Code (NEC).

D. National Electrical Manufacturing Association (NEMA):
   1. NEMA WC-7; Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

E. Underwriter's Laboratories, Inc. (UL):
   1. UL 467, Standard for Grounding and Bonding Equipment.
   2. UL 486A-486B, Wire Connectors.
   3. UL 486C, Standard for Splicing Wire Connections.
   4. UL 486D, Standard for Insulated Wire Connector Systems for Underground Use or in Damp or Wet *Locations.*
   5. UL 486E, Standard for Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors.

1.03 DESIGN REQUIREMENTS

A. Design the electrical system installation to conform to Article 300 of NFPA 70, Wiring Methods, and to other applicable articles of NFPA 70 governing methods of wiring.

B. Ground the conduit systems, metal enclosures and receptacles in accordance with Article 250 of NFPA 70, Grounding.
   1. Ground all metallic conduits, wiring channels, junction boxes, or pull boxes.
      a. Bond each run of raceways to form a continuous path for ground faults from end to end.
      b. When liquid tight flexible metal conduit is installed, provide external bond wires.
   2. Provide insulated, Type XHHW-2 internal equipment ground wire in all conduits.
      a. Bond the internal wire to all pullboxes, junction boxes, equipment enclosures, and other enclosures as required by NFPA 70.

C. Equipment Grounds:
   1. All feeders and branch circuits to include an equipment grounding conductor consisting of a copper wire within a raceway or cable and sized as specified herein.
      a. Where conductors are run in parallel in multiple raceways, run the equipment grounding conductor in parallel to the related conductors.
      b. Size each of the parallel equipment grounding conductors on the basis of the ampere rating of the circuit overcurrent protecting device.

D. Ground Wire Sizes:
   1. When the ground wire size is not specified or indicated on the Contract Drawings, provide wire sized in accordance with the requirements of NFPA 70.

E. Within 60 days of the Contract award, submit the following:
   1. The Submittals required by Section 16050.
      a. Include Product Data and Catalog Cuts for all products provided, and describe the usage of each product.

1.04 SUBMITTALS

A. Submit the following information for approval in accordance with the requirements of the Procurement Document:
   1. Product Data:
      a. Manufacturer’s product data

1.05 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Buy America Act:

a. Except for those products which are exempt under the specific statutory waivers stipulated in 49 CFR 661, all other products supplied under this Section must comply with the requirements of the Buy America Act.

B. Qualifications:
1. Installer Qualifications:
a. Employ installers who specialize in the work of this Section, and who can demonstrate a minimum of three years documented experience.
b. Submit the system installers' qualifications.
2. Supervisor's Qualifications:
a. Employ supervisor to supervise the installation work who are skilled licensed electricians.
b. Submit the installation supervisors' resumes.
3. All products are to be certified by Underwriters Laboratories, Inc. (UL),

C. Regulatory Requirements:
1. All grounding and bonding Work must comply with the requirements of NFPA 70, the National Electrical Code.

D. Certifications:
1. Testing Agency Product Certification:
a. Verify product quality by certifying products as meeting the requirements of one of the following:
1) Underwriters Laboratories, Inc. (UL).
a) Provide products listed and labeled by UL.
b. Testing agency product certification must include agency listing and labeling, either by a printed mark on the data or by a separate listing card.

1.06 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
1. Transport materials, both on site and from Contractor's storage to site, in accordance with the recommendations of the respective manufacturers.

B. Storage and Protection:
1. Store materials, both on and off site, in accordance with manufacturer's written instructions.
2. Store products indoors on blocking or pallets.

PART 2 PRODUCTS

2.01 MATERIALS

A. Wire:
1. Bare Ground Wire:

a. Soft drawn copper, Class A or Class B stranded, meeting the requirements of ASTM B8 for sizes #6 or larger.
b. Soft drawn solid copper, meeting the requirements of ASTM B1 for sizes #8 or smaller.

2. Insulated Ground Wire:
   a. Provide type XHHW-2 insulated Class B copper stranded wire rated for 600 volts that conforms to the requirements of NEMA WC-7, and is green in color.
3. Acceptable Manufacturers:
   a. Cablec Continental Co. www.continentalcablellc.com
   b. SouthWire www.southwire.com
   c. Okonite www.okonite.com
   d. Rome Cable
   e. Or Approved Equal

B. Clamps and Non-Welded Connectors:
   1. Provide bronze or brass clamps and connectors that are UL listed for use below grade.
      a. All bolts and other material must be bronze or brass, plated steel screws are unacceptable.
      b. Fabricate multi-bolt, solderless compression clamps from high strength electrical bronze, and provide silicon bronze clamping bolts and hardware.
   2. Provide bolts, nuts, lock-washers, and similar hardware designed not to damage ground wire.
   3. Acceptable manufacturers:
      a. Ilsco.
      b. Framatone Connectors Inc. (FCI), Burndy.
      c. Or Approved Equal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Site Verification of Conditions:
   1. The Contract Drawings are generally indicative of the Work, but due to their small scale, it is not possible to indicate some offsets and fittings required nor the minor structural obstructions that may be encountered.
      a. Perform field measurements to discover offsets and fitting requirements not shown.
      b. Locate all on-site utilities and other obstructions in the area of construction, and verify that interferences will not occur.

3.02 PREPARATION

A. Layout electrical work to suit actual field conditions and in accordance with accepted standard practice.

3.03 INSTALLATION

A. Construct each ground system and connection so it is mechanically secure and electrically continuous.
   1. Secure grounds to boxes in such a manner that each system is electrically continuous from the point of service to each outlet.
   2. Terminate conduits using double locknuts and bushings.
      a. Unless a conduit run enters a metallic enclosure via integral threaded hubs, provide the conduit run with two locknuts.
   3. Clean paint, grease and such other insulating materials from the contact points of grounds.

B. Equipment Grounds:
   1. Grounding Lighting Fixtures:
      a. Provide the housing of each lighting fixture with a separate, factory-installed grounding device and ground conductor.
      b. Use the factory-installed grounding device for connecting a separate grounding conductor meeting applicable grounding requirements of the NEC to the fixture.
         1) Provide a green covered grounding conductor of the same wire gauge as the two power feed wires.
         2) Provide a continuous ground for the fixture construction.

3.04 FIELD QUALITY CONTROL

A. Site Testing:
   1. Perform a continuity test from all utilization and distribution equipment to the ground grid on a run-by-run basis.

B. Inspection:
   1. Prior to completion of the Work of this Section, inspect the items provided for conformity to the Contract Drawings and Specifications.

3.05 PROTECTION

A. Protect finished insulated wires from being painted.

END OF SECTION

SECTION 16070

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Requirements for furnishing, installing, cleaning, and protecting hanger and support systems for electrical wiring, conduit boxes, and equipment.

B. Related Section:
   1. Refer to Procurement Documents
   2. Section 16050 Common Work Results for Electrical

1.02 REFERENCES

A. Reference Standards:
   1. U. S. Government:
      a. Federal Transit Administration (FTA):
   2. 49 CFR 661 Buy America Requirements

B. American Iron and Steel Institute (AISI):
   1. AISI Standard Steels (Handbook).

C. American Society for Testing Materials (ASTM):
   1. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi, Minimum Tensile Strength.
   2. ASTM A 563 - Standard Specification for Carbon and Alloy Steel Nuts.

D. American Welding Society (AWS):
   1. AWS D1.1/D1.1M - Structural Welding Code - Steel.

E. National Electrical Manufacturers Association (NEMA):
   1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts maximum).

F. National Fire Protection Association (NFPA):
   1. NFPA 70 - National Electrical Code (NEC).

G. Society of Automotive Authority's International (SAE):
   1. SAE J 429 - Mechanical and Material Requirements for Externally Threaded Fasterners.

H. U. S. General Services Administration (GSA)

1. Federal Specifications:
    a. A-A-1922A - Shield, Expansion (Caulking Anchors, Single Lead).
    b. FF-S-107C(2) - Screws, Tapping and Drive.

1.03 SUBMITTALS

A. Submit the following information to the Authority for approval in accordance with the requirements of the Procurement Documents, and Section 16050, Common Work Results for Electrical:
    1. Product Data:
        a. Provide product data and catalog cuts for the products provided under this Section.
    2. Quality Assurance/Control Submittals:
            1) Detailed drawings of proposed departures from the original design.
        b. Certificates:
            1) Testing Agency/Quality Verification:
                a) With the product data for electrical hangers and supports, provide evidence of quality verification, listing, and labeling by the Electrical Testing Agency (ETA); either by a printed mark on the data, or by a separate listing card.
            2) Manufacturers' Certificate of Compliance.
        c. Qualification Statements:
            1) Manufacturers' qualifications.

1.04 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
    1. Buy America Act:
        a. Except for those products which are exempt under the specific statutory waivers stipulated in 49 CFR 661, all other products supplied under this Section must comply with the requirements of the Buy America Act.

B. Qualifications;
    1. Electrical Testing Agency (ETA) Qualifications:
        a. Use the Electrical Testing Agency (ETA) qualified as specified in Section 16050, Common Work Results for Electrical.
    2. Manufacturers' Qualifications:
        a. Provide electrical support framing made by manufacturers that have been manufacturing support framing for a minimum of 5 years, and who carefully controls their operations to ensure that excellent product Authorizing, quality, safety, and reliability are achieved.
        b. Submit the manufacturer's qualifications to the Authority for approval.

C. Certifications:

1. Electrical Testing Laboratory (ETL) Certification:
   a. Provide products that are listed and labeled by Underwriters Laboratory, Inc. (UL) or certified as meeting the standards of UL by the Electrical Testing Laboratory (ETL) unless products meeting the requirements of these testing laboratories are not readily available or unless standards do not exist for the products.
2. Manufacturers Certificate of Compliance:
   a. Submit a manufacturer's Certificate of Compliance certifying that both the galvanizing and the products meet the requirements of the ASTM standards.

1.05 DELIVERY, STORAGE AND HANDLING

A. Packaging, Shipping, Handling, and Unloading:
   1. Deliver, store, and handle the hangers and supports in accordance with Section 16050, Common Work Results for Electrical, and as specified herein.
   2. Deliver material to Site in the original factory packaging.

B. Storage and Protection:
   1. Shelter and store the components under cover, and supported off the ground and floors on blocking.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

A. Metal U-Channel Electrical Support Framing Systems and Fittings:
   1. Carbon Steel U-Channel Support Framing Systems:
      a. Provide 1-5/8-inch nominal size U-channel supports fabricated from 12 gauge Type 316 stainless steel.
      b. Where combination members are required, spot-weld the members on 3-inch centers.
      c. Provide 1-5/8-inch or larger depths, except where supports are mounted directly to walls 13/16-inch or larger depths may be provided.
      d. Provide metal framing systems and fittings for metal framing systems from a single manufacturer.
      e. Manufacturers:
         1) Unistrut Corporation, Unistrut® Metal Framing System, www.unistrut.com.
         2) Thomas & Betts, Kindorf®, http://elec-cat.tnb.com.
         3) Cooper B-Line®, Inc., www.b-line.com.
         4) Or Approved Equal
   2. Stainless Steel U-Channel Support Framing Systems:
      a. Provide U-channel supports, fittings, threaded rod, and hardware fabricated from Type 316 stainless steel.

B. Conduit Supports:
   1. Malleable Iron Conduit Supports:
      a. Provide one-hole style galvanized malleable iron fasteners with pipe straps similar to those as manufactured by Thomas & Betts.
      b. Provide support devices consisting of threaded rods, channel supports, and conduit straps/fasteners.
   2. Manufacturers:
      a. Thomas & Betts, http://www-public.tnb.com/contractor/docs/superstrut.pdf.
      b. Or Approved Equal.

C. Bolts, Nuts, and Washers:
   1. For all bolts, nuts, and washers, provide 316 stainless steel fasteners complying with the requirements of ASTM A 325.

D. Anchors and Fasteners:
   1. Drive (Deep-Pitch) Screws:
      a. Provide Type 316 stainless steel self-tapping type drive (deep-pitch) screws that comply with the requirements of FF-S-107C(2).
   2. Drilled-In Anchors and Fasteners:
      a. Provide drilled-in anchors and fasteners that comply with the requirements of FF-S-107C(2).
      b. Masonry Anchors:
         1) Provide masonry anchors designed to accept both machine bolts and threaded rods as fasteners.
            a) Provide SAE J 429 Grade 2 machine bolt fasteners fabricated from AISI Type 316 stainless steel.
            b) Provide nuts and washers conforming to the requirements of ASTM A 563.
         2) Provide masonry anchors consisting of an expansion shield and expander nut contained inside the shield.
            a) Expander Nuts:
               (1) Fabricate square expander nuts with their sides tapered inward from the bottom to the top.
               (2) Design the expander nuts to simultaneously climb the bolt or rod thread and expand the shield as soon as the threaded expander nut reaches and bears against the shield bottom when being tightened.
            b) Expansion Shields:
               (1) Provide expansion shield bodies consisting of four legs, the inside of each tapered toward the shield bottom, or nut end.
               (2) The end of one leg shall be elongated and turned across shield bottom. Outer surface of shield body shall be ribbed for grip-action.
         3) Masonry Anchor Material:

a) Provide die cast Zamac No. 3 zinc alloy having a 43,000 psi minimum tensile strength.

4) Manufacturers:
   a) U.S.E. Diamond, Inc., FORWAY System, www.mktfastening.com.
   b) Or Approved Equal

c. Concrete Anchors:
   1) Stainless Steel Anchor/Fastener:
      a) Provide one-piece AISI Type 303 or 304 stainless steel studs (bolts) with integral expansion wedges, AISI Type 316 stainless steel nuts, and AISI Type 316 stainless steel washers.
      b) Provide stainless steel anchor/fasteners complying with the physical requirements of FF-S-325 for Group II, Type 4, Class 1.
   2) Acceptable Manufacturers:
      a) U.S.E. Diamond, Inc.; SUP-R-STUD, www.mktfastening.com.
      b) Hilti Fastening Systems; KWIK-BOLT, hilti.com.
      c) Molly Fastener Group; PARABOLT.
      d) Phillips; RED HEAD Wedge-Anchor, www.phillipsfastener.com.
      e) Or Approved Equal

3. Hammer drive-type explosive charge drive-type anchors and fastener systems are unacceptable.
4. Lead shields, plastic-inserts, fiber-inserts, and drilled-in plastic sleeve/nail drive systems are unacceptable.

2.02 ACCESSORIES

A. NOT USED

2.03 FABRICATION

A. Fit and shop assemble items in the largest sections practical for delivery to the Site.

PART 3 EXECUTION

3.01 EXAMINATION

A. Field Measurement:
   1. Although the Contract Drawings are generally indicative of the Work, take field measurements to verify actual conditions.
      a. Due to the small scale of the Contract Drawings it is not possible to indicate all offsets, fittings, and apparatus required or the minor structural obstructions that may be encountered during the Work.
   2. Carefully investigate the structural and finish conditions, and other construction work, at the Site which may affect the work of this Section.

3.02 PREPARATION

A. After carefully investigating structural and finish conditions and other in-place construction work, produce detailed Shop Drawings showing proposed departures from the original design due to field conditions or other causes.
   1. Layout the electrical work according to accepted standard electrical trade practice to suit actual field measurements.
   2. Arrange the electrical work to consider existing conditions and to preserve access to other equipment, rooms, areas, and similar features of the construction.

B. Obtain roughing-in dimensions of electrically operated equipment, including equipment being installed by both electrical and other construction trades.
   1. Set conduit and boxes only after receiving approved dimensions and checking such equipment locations.
   2. Arrange electrical Work accordingly and furnish such fittings and apparatus as required to accommodate such conditions and to preserve access to other equipment, rooms, areas, and similar spaces.

3.03 INSTALLATION

A. Install electrical Work in conformance to the requirements of NFPA 70 for wiring methods general requirements (Refer to Procurement Documents), and to other applicable Articles of the NEC governing methods of wiring.

B. Installing Anchors and Fasteners:
   1. For anchoring or fastening applications in masonry and hollow-core precast concrete structural elements, provide masonry anchors as specified herein.
   2. For anchoring or fastening applications in cast-in-place concrete and solid precast concrete structural elements, provide concrete anchors as specified herein.
   3. Threaded Bolts:
      a. Draw threaded bolted connections up tight using 316 stainless steel lock washers to prevent the bolt or nut from loosening.
   4. Drilled-In Expansion Anchors:
      a. Install expansion anchors in strict accordance with manufacturer's instructions and the following.
         1) Drill holes to the required diameter and depth in accordance with anchor manufacturer's instructions for the size of anchor being installed.
         2) Minimum Embedment:
            a) Embed expansion anchors to four and one-half bolt diameters minimum unless otherwise indicated on the Contract Drawings.

C. Installation of U-Channel Support Framing Systems in accordance with Table 16070 - 1 below:

Table 16070 - 1 U-Channel Support Framing Selection		
Condition 1	**Condition 2**	**Type**
Aboveground	All Locations	Stainless Steel

D. Installing Conduit Supports:
   1. For exterior locations provide malleable iron conduit supports.

E. Field Fabrication:
   1. Tightly fit and secure joints.
      a. Make exposed joints butt tight, flush, and hairline.
      b. Weld fabricated assemblies in accordance with AWS D1.1/D1.1M.
         1) Continuously seal joined members using intermittent welds and plastic filler.
         2) Dress welds smooth and free of sharp edges and corners.
      c. Grind exposed joints flush and smooth with the adjacent finish surface.
   2. For the attachment of work and for bolted connections, accurately drill or punch holes for the fasteners as required.
      a. Burned holes are unacceptable.
      b. Provide holes no more than 3/32-inch larger than the fasteners.
   3. Exposed Mechanical Fastenings:
      a. Except where specifically noted otherwise in the Contract Documents, provide flush countersunk screws or bolts; unobtrusively located, and consistent with the design of the component.
   4. Fabrication Tolerances:
      a. Squareness: 1/8 inch (3 mm), maximum difference in diagonal measurements.
      b. Maximum offset between faces: 1/16 inch (1.5 mm).
      c. Maximum misalignment of adjacent members: 1/16 inch (1.5 mm).
      d. Maximum bow: 1/8 inch (3 mm) in 48 inches (1.2 m).
      e. Maximum deviation from plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

3.04 FIELD QUALITY CONTROL

A. Inspection:
   1. Verify the adequacy of coatings.
   2. Inspect the items provided under this Section for adherence to the fabrication tolerances specified above, and correct any discrepancies:

3.05 PROTECTION

A. Protect the items provided under this Section from damage during the work of other trades.

END OF SECTION

SECTION 16075

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Requirements for furnishing, installing, and protecting identification signs and labels for electrical systems.

B. Related Section:
   1. Refer to Procurement Documents.
   2. Section 16050 Common Work Results for Electrical
   3. Section 16120 Low Voltage Electrical Power Conductors and Cables
   4. Section 16130 Conduit for Electrical Systems
   5. Section 16131 Wireways for Electrical Systems
   6. Section 16132 Boxes for Electrical Systems

1.02 REFERENCES

A. Reference Standards:
   1. U. S. Government:
      a. Federal Transit Administration (FTA):
         1) 49 CFR 661 Buy America Requirements.

B. National Electrical Manufacturer's Association (NEMA):
   1. NEMA 250, Enclosures for Electrical Equipment.

C. National Fire Protection Association (NFPA):
   1. NFPA 70, National Electrical Code (NEC).
   2. NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces.

D. U. S. Government:
   1. Code of Federal Regulations (CFR)
      a. 29 CFR 1910 Occupational Safety and Health Standards.

1.03 DEFINITIONS

A. Mimic bus refers to a graphical representation of the devices and bus work within an item of electric equipment.

1.04 SUBMITTALS

A. Submit the following information for approval in accordance with the requirements of the Procurement Documents and Section 16050:
   1. Product Data:
      a. Provide catalog cuts for the actual products provided, and indicate clearly the usage of each product.

1.05 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Buy America Act:
      a. Except for those products which are exempt under the specific statutory waivers stipulated in 49 CFR 661, all other products supplied under this Section must comply with the requirements of the Buy America Act.

B. Regulatory Requirements:
   1. Comply with the all applicable requirements of OSHA, but particularly those stated in 29 CFR 1910.144 and 29 CFR 1910.145.
   2. Comply with the requirements of NFPA 70E that are applicable to electrical identification items as listed below in this Specification Section.

1.06 DELIVERY, STORAGE AND HANDLING

A. Protect items from damage during delivery, storage, and handling in accordance with Section 16050 and as detailed below.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide products meeting the specified requirements from one of the following manufacturers, unless otherwise indicated:
   1. Brady Worldwide, Inc., P. O. Box 2131, Milwaukee, WI 53201-2131, Telephone (414) 358-6600.
   2. Seton Identification Products, 20 Thompson Road, P. O. Box 819, Branford, CT 06405-0819, Telephone (800) 243-6624.
   3. LEM Products, Inc.; P. O. Box 190, 4089 Landisville Road, Doylestown, PA 18901, Telephone (800) 220-2400 or (215) 348-9900.

B. To serve as examples of the quality required of the specified products, several Brady Worldwide, Inc. Product Numbers are listed for informational purposes only.

2.02 MATERIALS

A. Laminated Phenolic or Plastic:
   1. Provide rigid, thermosetting resin or polymer material that is heat- and fire-resistant, abrasion resistant, electronically non-conductive, and non-corroding.
   2. Extrude the thermosetting resin or polymer into sheets, and laminate the sheets together so that colored top and bottom layers sandwich a contrasting color core in the middle.

B. Mounting Hardware:
   1. Provide number10 hex-head machine screws and lock-washers, or hex-head bolts, lock-washers, and nuts for mounting identification nameplates onto electrical equipment.
   2. Provide either type 316 stainless steel or brass fasteners; however, all fasteners used on the same nameplate must be of the same material.

2.03 EQUIPMENT IDENTIFICATION NAMEPLATES

A. Provide laminated phenolic or plastic equipment identification nameplates having beveled edges and engraved lettering.
   1. Drill holes for mounting hardware in the equipment identification nameplates as follows:
      a. For nameplates that are more then 2 inches wide, drill four holes.
      b. For nameplates that are more than 1-1/2 inches high, drill four mounting holes.
      c. For smaller nameplates, drill holes for two fasteners.
   2. Provide equipment identification nameplates long enough to ensure that the heads of fastening hardware do not extend beyond the nameplate material, and come no closer than 1/16-inch to the nearest letter of the nameplate legend and no closer than 1/16-inch to the nearest edge.

B. Engrave equipment identification nameplates with all capital, Helvetica Medium font, or equal, lettering.
   1. Provide white nameplate lettering centered on black backgrounds, except for warning nameplates provide white lettering centered on red backgrounds.
   2. Provide a minimum 1/8-inch border between the nameplate lettering and the tops and bottoms of the nameplates.
   3. Use 3/8-inch high letters for the first line, and 1/4-inch letters for succeeding lines; except, in cases where the tag will not fit because the equipment is too small, use 3/16-inch letters for the first line and 1/8-inch letters for succeeding lines.

PART 3 EXECUTION

3.01 INSTALLATION

A. Wiring Identification:
   1. Identify wiring in conformance with the requirements of Section 16120.

END OF SECTION

SECTION 16080

ACCEPTANCE OF ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: The work specified in this Section consists of materials to performance test electrical systems and equipment.
   1. Items Supplied Under This Section:
      a. Electrical System Testing

B. Related Sections:
   1. Refer to Procurement Documents.
   2. Division 16 Sections, As Applicable

1.02 REFERENCES

A. Reference Standards:
   1. U. S. Government:
      a. Federal Transit Administration (FTA):
         1) 49 CFR 661 Buy America Requirements

B. Applicable Documents and Testing Requirements of:
   1. National Fire Protection Association (NFPA), as applicable, including:
      a. NFPA 70 - National Electrical Code (NEC).
      b. NFPA 70E - Electrical Safety Requirements for Employee Workplaces.
   2. State and Local Codes and Ordinances as applicable.

1.03 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Buy America Act:
      a. Except for those products which are exempt under the specific statutory waivers stipulated in 49 CFR 661, all other products supplied under this Section must comply with the requirements of the Buy America Act.

1.04 GENERAL REQUIREMENTS

A. Refer to Procurement Documents.

B. Field Inspection:

1. This Contractor is responsible for a complete inspection of all equipment, prior to testing and energizing to ascertain that it is free from any damage, scratches, or missing components and that all power connections are correct, and that they are tight in conformance with recommended standard practice. The inspection is to also include a check of control wiring, terminal connections and all bolts and nuts.
2. Perform field inspection by this Contractor during a time when the Authority is present to witness each inspection and its performance.
3. Correct any deficiencies found during the inspection by this Contractor prior to the energizing and testing of the equipment.

1.05 SCHEDULING

A. Schedule all testing with work of other contractors to ensure an orderly sequence of startup and completion of work.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 ELECTRICAL INSPECTIONS AND TESTS

A. Perform, supervise, and furnish all test equipment needed to perform tests and provide safety measures, procedures and equipment required for each test.

B. Schedule all testing with the Authority. Perform testing in the presence of the Authority except when the Authority approves in writing conducting a specific test without the Authority's presence.

C. Notify all involved parties including the Authority prior to tests, advising them of the test to be performed and the scheduled date and time. D. Coordinate the tests with others involved.

E. Safety and Precautions:
1. Safety practices are to include, but are not limited to, the following requirements:
   a. Occupational Safety and Health Act of 1970-OSHA.
   b. Accident Prevention Manual for Industrial Operations, National Safety Council, Chapter 4.
   c. Applicable State and Local safety operating procedures.

d. IETA Safety/Accident Prevention Program.
e. Authority's safety practices.
f. National Fire Protection Association - NFPA 70E.

2. Perform all tests with apparatus de-energized except where otherwise specifically required.

3.02 TESTING TO BE PERFORMED BY THE CONTRACTOR

A. Continuity Test: Make test for continuity and correctness of wiring and identification on all conductors installed.

3.03 CORRECTION OF DEFICIENCIES

A. Report all unacceptable values immediately. Correct all deficiencies found in work of this contract and separately report deficiencies in work of items of other contracts.

1. Retest items requiring correction. Correct or have corrected any remaining deficiencies and retest until work is acceptable.

END OF SECTION

SECTION 16120

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Requirements for furnishing, installing, connecting, energizing, testing, cleaning, and protecting low voltage cable, shielded cable, and accessories.

B. Related Sections:
   1. Procurement Documents
   2. Section 16050 Common Work Results for Electrical
   3. Section 16060 Grounding and Bonding for Electrical Systems
   4. Section 16075 Identification for Electrical Systems
   5. Section 16080 Acceptance of Electrical Systems
   6. Section 16130 Conduit for Electrical Systems
   7. Section 16131 Wireways for Electrical Systems
   8. Section 16132 Boxes for Electrical Systems

1.02 REFERENCES

A. Reference Standards:
   1. U. S. Government:
      a. Federal Transit Administration (FTA):
         1) 49 CFR 661 Buy America Requirements.

B. National Electrical Manufacturer's Association (NEMA):
   1. NEMA WC 26/EEMAC 201 - Binational Wire and Cable Packaging Standard.

C. American Society for Testing Materials (ASTM):
   1. ASTM B 8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

D. National Fire Protection Association (NFPA):
   1. NFPA 70 - National Electrical Code (NEC).

E. Underwriter's Laboratories, Inc. (UL):
   1. UL 13 - Standard for Power-Limited Circuit Cables.
   2. UL 1581 - Reference Standard for Electrical Wires, Cables, and Flexible Cords.

1.03 DESIGN REQUIREMENTS

A. Conductors in Raceway and Conduit Systems:

1. Provide conduit systems for installing the wiring that is outside of equipment.
2. Except for raceway or conduit for control wires or where otherwise indicated on the Contract Drawings, design raceway and conduit systems so that the maximum number of low-voltage conductors in each raceway or conduit does not exceed 4, including three phase conductors and one neutral, plus a ground.

B. Product Data and Catalog Cuts:
1. Submit low-voltage ground, power, and control wiring product data as listed below for the products provided as the Work of this Section; and clearly indicate the usage of each product on the data submitted.
   a. Wires and cables.
   b. Lugs.
   c. Connectors.
   d. Tapes.
   e. Pulling lubricant.

C. Use of Trade Names:
1. The use of trade names within the Contract Documents is intended to establish the basis of design and to illustrate the constructability and level of quality required.
   a. The use of trade names is not intended to exclude other manufacturers whose products are equivalent to those named, subject to compliance with Contract requirements.

1.04 SUBMITTALS

A. Submit the following information to the Engineer for approval in accordance with the requirements of the :
1. Product Data:
   a. Wires and cables.
   b. Lugs
   c. Connectors.
   d. Tape.
   e. Pulling lubricant.
2. Quality Assurance/Control Submittals:
   a. Certificates.
      1) Testing agency/quality verification.
   b. Manufacturers Instructions.
      1) Cable manufacturer’s recommendations.
   c. Qualification Statements.
      1) Documented experience of the installing firm.
      2) Qualifications of the licensed electricians supervising the Work.

1.05 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Buy America Act:
      a. Except for those products which are exempt under the specific statutory waivers stipulated in 49 CFR 661, all other products supplied under this Section must comply with the requirements of the Buy America Act.

B. Qualifications:
   1. Installer Qualifications:
      a. To install the Work of this Section, employ the services of a firm specializing in installing wire, cable, and accessories, and that has a minimum of 3 years experience doing so.
         1) Submit the documented experience of the firm installing the wire, cable, and accessories.
      b. To supervise installation of the Work of this Section, employ licensed electricians.
         1) Submit the qualifications of the licensed electricians supervising the Work of this Section.

C. Regulatory Requirements:
   1. Perform the Work of this Section in accordance with the requirements specified in NFPA 70, and to all other applicable state, local, and national governing codes and regulatory requirements.

D. Certifications:
   1. Provide products that are listed and labeled by Underwriters Laboratory, approved by Factory Mutual, or certified as meeting the standards of UL by the Electrical Testing Laboratory (ETL) for the location installed in, and the application intended, unless products meeting the requirements of these testing laboratories are not available or unless standards do not exist for the products.
      a. Provide copper conductors listed and labeled by UL for all wiring.
   2. Submit evidence of testing agency/quality verification, listing, and labeling for each product with the submitted product data either by providing a printed mark on the data or by attaching a separate listing card.

1.06 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
   1. Imprint insulated conductors with the date of manufacture, the wire type, and the manufacturer.
   2. Package wire and cable in conformance with the requirements of NEMA WC 26/EEMAC 201.
   3. Protect items from damage during delivery, handling, and installation.

a. Comply with the cable manufacturer's recommendations for inspection, handling, storage, temperature conditioning, bending and training limits, pulling limits, and calculation parameters for installing cable.
b. Submit the cable manufacturer's recommendations for inspection, handling, storage, temperature conditioning, bending and training limits, pulling limits, and calculation parameters for installing cable

B. Acceptance at Site:
1. Wire and cable manufactured more than 12 months before delivery to the Site is unacceptable for use under this Contract, and will be rejected.

C. Storage and Protection:
1. Store products indoors on blocking or pallets.
2. Protect items from damage during storage.

PART 2 PRODUCTS

2.01 LOW VOLTAGE CONDUCTORS

A. Conductor Design Requirements:
1. Provide conductors of the proper size and ampacity ratings based on Article 310 of NFPA 70.
a. Provide copper conductors that have 98 percent conductivity.
b. Unless otherwise indicated on the Contract Drawings, at a minimum provide conductors of the following American Wire Gauge (AWG) sizes:
1) For power and branch feeder circuits: 12 AWG.
a) For power and branch feeders, provide solid copper low-voltage conductors for sizes up to and including 10 AWG, provide stranded copper low-voltage conductors for 8 AWG and larger sizes.
2) For control circuits: 14 AWG.
3) For alarm and status circuits: 14 AWG.
4) For single conductor instrument wiring: 14 AWG.
5) For multiple conductor instrument wiring: 16 AWG.

B. Insulation Design Requirements:
1. Provide low voltage ground, power, and control wiring having the proper insulation types as follows, unless noted otherwise on the plans:
a. Above Ground
1) Feeders & Branch Circuits
a) All locations: Type XHHW-2

C. Manufacturers
1. Acceptable Manufacturers:
a. Cablec Continental Co.

b. SouthWire.
c. Okonite Co.
d. Rome Cable Corp
e. Or Approved Equal

2.02 MATERIALS

A. Cable Lubricant:
1. Provide cable lubricant specifically recommended by the cable manufacturer for cable pulling operations.
   a. For rubber of plastic jacketed cables, provide soapstone, graphite, or talc cable lubricant.

B. Grounding Braid:
1. Provide conformable, all-metal (tinned copper wires), corrosion resistant, woven grounding braid having a high current-carrying capacity approximately that of 6 AWG wire.
2. Manufacturers:
   a. 3M, Scotch, Scotch® 25 Electrical Grounding Braid, http://solutions.3m.com/portal/3M/en_US.
   b. Plymouth, www.plymouthrubber.com.
   c. Permacel, www.permacel.com.
   d. Or Approved Equal.

C. Tapes:
1. Vinyl Insulating Tape:
   a. Provide UL-listed flexible polyvinyl chloride (PVC) backed insulating tape with a pressure sensitive adhesive, such as black Scotch® 33+ Vinyl Electrical Tape, that is resistant to abrasion, acids, alkalis, and copper corrosion; resistant to, hot, cold and wet weather; and resistant to damage from UV sunlight exposure.
2. Manufacturers:
   a. 3M, Scotch, http://solutions.3m.com/portal/3M/en_US.
   b. Plymouth, www.plymouthrubber.com.
   c. Permacel, www.permacel.com.
   d. Or Approved Equal.

D. Tubing:
1. Heat Shrinkable Tubing:
   a. Provide flexible, flame retardant, polyolefin heat shrinkable thin wall tubing that has good resistance to common fluids and solvents, and has a high dielectric strength.
2. Waterproof Splice Kits:
   a. Provide heat shrinkable thin wall polyolefin electrical cable splice kits.

3. Manufacturers:
   a. Tyco Electronics, CGPT, http://catalog.tycoelectronics.com.
   b. Thomas & Betts Corp., www.tnb.com.
   c. Or Approved Equal.

E. Wire and Cable Connections:
1. Grounding Connectors:
   a. Provide grounding connectors conforming to the requirements of Section 16060, Grounding and Bonding.
2. Connectors for Service Wires and Cables, and for Wires and Cables Larger Than Number 6:
   a. Split Bolt Connectors or Compression Type Connectors:
      1) Provide UL-listed split bolt connectors or compression type connectors for making parallel or butt splices of stranded copper wire.
      2) Use companion preformed plastic insulating covers or tape insulation conforming to NFPA 70 (NEC) requirements.
   b. Mechanical compression connectors:
      1) Provide mechanical compression connectors that are capable of connecting single or multiple conductors, and of being installed with one wrench.
         a) Type: Compact, two-hole mechanical compression connectors having two clamping bolts.
            (1) Connector Body: Provide a high copper bronze or brass alloy body.
            (2) Bolts: Provide brass or bronze bolts; plated steel screws are unacceptable.
            (3) Fasteners: Provide silicon-bronze fasteners for bolting connectors to connections.
3. Connectors for Other Conductors:
   a. Any of the applicable types listed for larger wire may be provided.
   b. Wire Nuts:
      1) For making splices of copper wire, provide pre-insulated, UL-listed, solderless connectors of the spring-lock or compression type that can be installed by hand or using tools.
   c. Manufacturers:
      1) Thomas & Betts Corp., www-public.tnb.com/ps/pubint.
      2) Tyco Electronics, AMP Inc., www.amp.com.
      3) Ilsco Corp., http://ilsco.com.
      4) FCI-Burndy® Products, https://portal.fciconnect.com.
      5) Or Approved Equal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect all conduits, junction boxes, electrical vaults, and handholes to verify that they are clean, that they do not have burrs, that conduits are properly aligned, and that they are complete.
   1. Ensure that on all conduits without threaded hubs, two locknuts are installed.
   2. Ensure that in all conduits with wires larger than No. 10, bushings are installed.
   3. Ensure that grounding bushings and fittings are installed at all places specified in Section 16060, Grounding and Bonding for Electrical Systems.
   4. Verify that proper sized boxes are installed.

B. Verify that boxes and conduit fittings conform to the bending requirements specified in Article 314 of NFPA 70 (NEC).

3.02 PREPARATION

A. Verify that pulling calculations have been made and are available for long conduit runs and pulls as indicated in this Section.

B. Do not begin installing wiring until other work which might cause damage to the wires, cables, or conduits has been completed.
   1. Correct deficiencies in conduits and junction boxes that have been discovered by the inspection required in Paragraph 3.02.A.

C. Prepare conduits to receive wire and cable.
   1. Swab the conduits with a nylon brush and steel mandrel.
   2. Pre-lubricate the conduits for which the pulling tension calculations are based on a coefficient of friction less than that of a dry conduit.

D. Verify that a means of controlling the pulling tension on the wire or cable is installed on the mechanical assist devices furnished for pulling cable.

E. Take the necessary precautions to prevent water, dirt, or other foreign material from accumulating in the conduits during the execution of wiring work.

3.03 INSTALLATION

A. Low Voltage Ground, Power, and Control Wiring:
   1. Neutral Conductors:
      a. For each single-phase and each multi-phase feeder, provide separate neutrals.
   2. Equipment Ground Conductors:
      a. Provide a green equipment ground conductor with all runs.

1) Provide the equipment ground conductor wire type as specified in Section 16060, Grounding and Bonding for Electrical Systems.

B. Terminating Cable:
1. Terminate cable using materials and methods indicated or specified herein, or in accordance with the written instructions of the cable manufacturer or termination kit manufacturer.
   a. For equipment connections, provide split bolt or compression type connectors, mechanical compression connectors, or crimped compression type connectors as specified and approved by the equipment manufacturer; for all other types of connections provide connectors of one of the types specified:
2. Protect insulated power and lighting cable terminations from accidental contact, deterioration of coverings, and moisture by using proper terminating devices and materials.

C. Splicing Wire and Cable:
1. Only splice cables in accessible locations.
2. Within outlet or junction boxes, make wire and cable splices that conform to the requirements of NFPA 70 (NEC).

D. Wiring Identification:
1. Color code all feeder wires and cables as indicated in Table 16120 - 1.

Table 16120 - 1 Feeder Wire and Cable Color Coding

Phase	480Y/277 Volts	208/120 Volts
A	Brown	Black
B	Orange	Red
C	Yellow	Blue
Neutral	Gray or White with Yellow Tracer	White
Electrical Ground Conductor	Green	Green

END OF SECTION

SECTION 16130

CONDUITS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Requirements for furnishing, installing, energizing, and testing conduit, tubing, and fittings for communication lines and electrical transmission, distribution, and service lines.

B. Related Section:
   1. Refer to Procurement Documents
   2. Division 2 Existing Conditions
   3. Division 3 Concrete
   4. Section 16050 Common Work Results for Electrical
   5. Section 16060 Grounding and Bonding for Electrical Systems
   6. Section 16070 Hangars and Supports for Electrical Systems
   7. Section 16080 Acceptance of Electrical Systems

1.02 REFERENCES

A. Reference Standards:
   1. U. S. Government:
      a. Federal Transit Administration (FTA):
         1) 49 CFR 661 Buy America Requirements.

B. American National Standards Institute (ANSI):
   1. ANSI/ASME B1.20.1 - Pipe Threads, General Purpose (Inch).
   2. ANSI C80.1 - Rigid Steel Conduit - Zinc-Coated (GCR).

C. American Society for Testing and Materials (ASTM):
   1. ASTM A 568/A 568M - Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold Rolled, General Requirements (Refer to Procurement Documents).

D. National Fire Protection Association (NFPA):
   1. NFPA 70 - National Electrical Code (NEC).

E. Underwriters Laboratory, Inc. (UL):
   1. ANSI/UL 6 - Standard for Rigid Metal Conduit.
   2. ANSI/UL 360 - Standard for Liquid-Tight Flexible Steel Conduit.
   3. ANSI/UL 498 - Standard for Safety for Attachment Plugs and Receptacles.
   4. ANSI/UL 514A - Metallic Outlet Boxes.

F. Institute of Electrical and Electronics Engineers (IEEE):
   1. IEEE C2 - National Electrical Safety Code.

1.03 DEFINITIONS

A. Definitions for all items are as stated in NFPA 70, IEEE C2, and in other reference documents unless otherwise stated, specified, or noted.

1.04 DESIGN REQUIREMENTS

A. Conduit Systems:
   1. Provide conduit of the type and material shown in Tables 16130 – 1 below for the application indicated, or as indicated on the Contract Drawings.
      a. In a given location, provide only the type of conduit indicated or scheduled for that location.
   2. Provide conduit fittings made of material identical to that of the conduit system with which they are used.

Table 16130 - 1 Conduit System Selection

Location	Condition 1	Condition 2	Conduit Type	Minimum Size
Above Ground	All Locations	Recess Mounted Lighting Fixtures and Rotating or Vibrating Equipment & Expansion Joints	Liquidtight Flexible Metal Conduit	3/4 Inch
		Exposed Other Locations	Rigid Galvanized Steel	3/4 Inch

1.05 SUBMITTALS

A. Submit the following information to the Authority for approval in accordance with the requirements of the Procurement Document:
   1. Product Data:
      a. Liquidtite flexible metal conduit.
      b. Rigid galvanized steel conduit (RGS).
      c. Fittings for metallic conduit systems.
      d. Conduit spacers.
      e. Heat shrink tubing.
      f. Cold galvanize coating.
   2. Quality Assurance/Control Submittals:
      a. Qualification Statements:

1) Qualifications of the installer.
b. Certificates:
1) Testing agency/quality verification, listing, and labeling.

1.06 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
1. Buy America Act:
a. Except for those products which are exempt under the specific statutory waivers stipulated in 49 CFR 661, all other products supplied under this Section must comply with the requirements of the Buy America Act.

B. Qualifications:
1. Installer Qualifications:
a. Employ an installation firm with a minimum of three years documented experience installing conduit and tubing similar in type and scope to that required by this Contract to install the Work of this Section.
b. Employ skilled licensed electricians to supervise the Work of this Section.
c. Submit information verifying the installer's qualifications.

C. Regulatory Requirements:
1. Perform the Work of this Section in accordance with the requirements specified in NFPA 70 (NEC), and to other applicable state, local, and national governing codes and regulatory requirements.

D. Certifications:
1. Provide products that are listed and labeled by Underwriters Laboratory, approved by Factory Mutual, or certified as meeting the standards of UL by the Electrical Testing Laboratory (ETL) for the location the product is installed in, and the application intended, unless products meeting the requirements of these nationally recognized testing laboratories are not available or unless standards do not exist for the products.
a. Submit evidence with the Product Data that the products represented meet testing agency quality verification requirements, including agency listing and labeling requirements.
1) Such evidence may consist of either a printed mark on the data or a separate listing card.

1.07 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
1. Pack, ship, handle, and unload products in accordance with the requirements of Section 16050, Common Work Results for Electrical, and as detailed herein.

B. Acceptance at Site:

1. Acceptance products at the Site in accordance with the requirements of Section 16050, Common Work Results for Electrical, and as detailed herein.

C. Storage and Protection:
1. Store products in accordance with the requirements of Section 16050, Common Work Results for Electrical, and as detailed herein.
   a. Store all products indoors on blocking or pallets.

PART 2 PRODUCTS

2.01 METALLIC CONDUIT

A. Liquidtite Flexible Metal Conduit:
1. Provide PVC coated flexible metal conduit conforming to the requirements of Article 350 of NFPA 70 (NEC) for materials and uses and ANSI/UL 360.
2. Provide conduit with interlocking spiral strip construction capable of bending to a minimum radius of five times its diameter without deforming the spiral strips both inside and outside of the conduit.
   a. Provide conduit with a flexible, galvanized, interlocking spiral strip steel core jacketed with smooth, liquid-tight polyvinyl chloride designed to withstand temperatures from minus 40 degrees Celsius to plus 60 degrees Celsius.
3. Finish the interior and exterior of flexible conduit smooth and free from burrs, sharp edges, and other defects that may injure wires; and place the manufacturer's trademark on each length.
4. Furnish an integral continuous copper ground in 1/2-inch through 1-1/4-inch PVC coated flexible metal conduit.
5. Acceptable Manufacturers
   a. Electri-Flex Company, Liquatite®, Type LA, www.electriflex.com.
   b. ANAMET Electrical, Inc., Anaconda Sealtite®, www.anacondasealtite.com.
   c. Or Approved Equal.

B. Rigid Galvanized Steel Conduit (RGS):
1. Provide rigid galvanized steel conduit (RGS) conforming to the requirements of Article 344 of NFPA 70 (NEC) for materials and uses, ANSI C80.1, and UL 6.
2. Fabricate the RGS from mild steel piping, galvanized or sherardized inside and outside, and protected against corrosion by a dichromate rinse or a zinc chromate coating.
3. Provide defect free conduit bearing the UL label, and furnished in 10-foot minimum lengths with both ends threaded and one end fitted with a coupling.
   a. Provide tapered NTP 3/4 inch per foot threads complying with ANSI/ASME B1.20.1.
4. Acceptable Manufacturers:
   a. Tyco/Allied Tube and Conduit, www.alliedtube.com.

b. Wheatland Tube Company, Division of John Maneely Company, www.wheatland.com.
c. Or Approved Equal.

2.02 CONDUIT FITTINGS

A. Fittings for Metallic Conduit Systems:
1. Construct conduit bodies/fittings from cast malleable iron or cast steel.
2. Conduit Outlet Bodies:
   a. Provide malleable iron threaded entry type conduit outlet bodies with neoprene gaskets and cast steel conduit.
   b. Acceptable Manufacturers:
      1) EGS/Appleton Electric, www.appletonelec.com.
      2) EGS/O-Z/Gedney, www.o-zgedney.com.
      3) Or Approved Equal.
3. Conduit Expansion Joints:
   a. Provide telescoping sleeve type galvanized, weatherproof, and vapor tight conduit expansion joints designed for 4-inch maximum expansion with an insulated bushing and lead-wool packing.
   b. Acceptable Manufacturers:
      1) EGS/Appleton Electric, www.appletonelec.com.
      2) EGS/O-Z/Gedney, www.o-zgedney.com.
      3) Or Approved Equal.
4. Conduit Unions:
   a. Provide conduit unions capable of completing a conduit run when neither conduit end can be turned.
   b. Acceptable Manufacturers:
      1) EGS/Appleton Electric, UNF and UNY Unions, www.appletonelec.com..
      2) Thomas and Betts Company, Erickson® Coupling., www.tnb.contractor/docs/tnbhazardous.pdf.
      3) Or Approved Equal.
5. Conduit Outlet Boxes:
   a. Provide malleable or cast iron conduit outlet boxes conforming to the requirements of UL 886, and having a cover with O-rings to keep out moisture.
   b. Acceptable Manufacturers:
      1) EGS/Appleton Electric, GRF outlets and covers, www.appletonelec.com.
      2) EGS/O-Z Gedney, www.o-zgedney.com.
      3) Or Approved Equal.
6. Conduit Device Boxes:
   a. Provide malleable iron conduit device boxes with internal grounding screws and conforming to the requirements of UL 498 and UL 514A.
   b. Acceptable Manufacturers:
      1) EGS/Appleton Electric, FD device boxes, www.appletonelec.com.

2) EGS/O-Z Gedney, www.o-zgedney.com.
3) Or Approved Equal.

7. Conduit Sealing Fittings:
   a. Provide, triple coated, malleable iron conduit sealing fittings.
      1) Coat the conduit sealing fittings with zinc electroplate, dichromate, and an epoxy powder coat.
   b. Provide drain fittings in conduit sealing fittings where required.
   c. Provide sealing covers for junction boxes where required.
   d. Acceptable Manufacturers:
      1) EGS/Appleton Electric, www.appletonelec.com.
         a) Sealing hubs: ES.
         b) Sealing fittings: EYSEF, EYSDEF, and EYD.
      2) EGS/O-Z Gedney, www.o-zgedney.com.
      3) Or Approved Equal.

2.03 HEAT SHRINK TUBING

A. Provide all-weather corrosion resistant vinyl plastic heat shrink tubing designed for application on the exterior of metallic conduit to protect against galvanic action, moisture or other deteriorating contaminants.

B. Manufacturers:
   1. Tyco Electronics, Raychem, www.raychem.com.
   2. Thomas & Betts
   3. Or Approved Equal.

2.04 FINISHES

A. Cold Galvanize Coating:
   1. Provide a cold galvanize coating to provide protection against corrosion by forming an insoluble zinc salt barrier from a cathodic reaction when the coating is damaged by abrasion and exposed to weather.
      a. Provide a single component pre-mixed liquid organic zinc compound producing 95 percent zinc in the dry film.
      b. Provide a coating that bonds to clean iron, steel, or aluminum through electrochemical action.
   2. Acceptable Manufacturers:
      a. ZRC. Worldwide, www.zrcworldwide.com.
      b. Clearco
      c. Krylon
      d. Rustoleum
      e. Or Approved Equal

PART 3 EXECUTION

3.01 EXAMINATION

A. Although the Contract Drawings are generally indicative of the Work, take field measurements to verify actual conditions.
   1. Due to the small scale of the Contract Drawings it is not possible to indicate all offsets, fittings, and apparatus required or the minor structural obstructions that may be encountered during the Work.

B. Inspect the condition of existing conduit that is required for the Work of this Section.

3.02 PREPARATION

A. After carefully investigating structural and finish conditions and other in-place construction work.
   1. Layout the electrical work according to accepted standard electrical trade practice to suit actual field measurements.
   2. Arrange the electrical work to consider existing conditions and to preserve access to other equipment, rooms, areas, and similar features of the construction.

B. Submit Product Data and catalog cuts for all products provided under this Section.
   1. Clearly indicate the usage of each product on the submittal.
   2. Include Product Data for the conduit and tubing provided under this Section.

C. Obtain roughing-in dimensions of electrically operated equipment, including equipment being installed by both electrical and other construction trades.
   1. Set conduit and boxes only after receiving approved dimensions and checking such equipment locations.

D. Remove dirt, debris, and other obstructions from existing conduit required for the Work of this Section by blowing out and mandreling the conduits as applicable.

3.03 INSTALLATION

A. Perform the Work of this Section as specified in Section 16050, Common Work Results for Electrical.

B. Fabricate and install conduit and wireway systems in accordance with accepted electrical trade standard practice.
   1. Layout the electrical work of this Section to suit actual field measurements.
   2. Install the electrical Work of this Section in conformance to the wiring methods general requirements (Refer to Procurement Documents) of Article 300 in NFPA 70 (NEC), and to all other applicable Articles of NFPA 70 governing wiring methods.

3. Cut conduit and wireway square, and ream the cut ends according to the requirements of NFPA 70 (NEC) to deburr the openings so that they are not restricted more than cuts made by the material manufacturer.
4. Avoid bending conduits as much as possible and practical; but if bends are made, use an approved conduit bending tool or machine to make the bends.
5. Do not install crushed or deformed conduit, and remove crushed or deformed conduit from the Site.
6. On conduit that is installed outside, provide a second equipment ground conductor and use fittings with a built-in ground lug for bonding.
7. Provide flexible conduit only to the extent permitted by NFPA 70 (NEC).
    a. In flexible conduits that do not have an integral ground wire, install a green insulated wire in addition to the neutral wire for grounding purposes.
        1) Form a ‘J’ or ‘S’ hook with a drip loop to allow flexibility.
        2) Provide a second equipment grounding conductor on outside conduit and provide fittings with built-in ground lug for bonding.
    b. In exposed areas, use PVC coated flexible metal conduit and fittings.
    c. Use liquid tight flexible metal conduit for final connection to recessed lighting fixtures and rotating and vibrating equipment.
        1) Liquid tight flexible metal conduit, as herein specified, for final connection to recess mounted lighting fixtures in unconditioned spaces and to all rotating and vibrating equipment.
        2) Flexible conduit not to exceed 36 inches in length for equipment connections or 72-inches for lighting fixture connections.
8. Provide fittings and apparatus as required to construct the approved electrical design.
    a. Running threads on conduit are not permitted.
        1) Where couplings and connectors are required for metal conduits, use approved threaded couplings and connectors.
    b. Provide conduit unions where necessary to complete a conduit run when neither conduit end can be turned.
    c. Where conduit and raceway runs cross building expansion joints, make provision for expansion in the conduit and raceway runs.
    d. Provide sealing fittings with drain fittings in all lower runs and vertical runs.
    e. Provide sealing covers for junction boxes where required.
    f. Provide weatherproof conduit hubs on all conduit connections.
9. Installing RGS Conduit:
    a. Install RGS conduit using methods and techniques recommended by the conduit manufacturer.
    b. Threading Conduit:
        1) Field thread the conduits per the manufacturer’s instructions.

C. Exposed Work:

1. In exposed work, run conduit and raceway parallel to centerlines and structure surfaces; or perpendicular to centerlines where required, with right angle turns consisting of symmetrical bends or fittings.
2. Maintain at least 6 inches clearance between conduit and raceway runs and pipes, ducts, and flues of mechanical systems.
3. If a portion of a metallic conduit run is exposed to personnel, ensure that the conduit is properly bonded to an equipment grounding conductor at both ends.
   a. Install the equipment grounding conductor either inside or outside the box.

D. Hangers and Supports:
1. Install auxiliary support structures, anchors, and fasteners as specified in Section 16070 Hangars and Supports for Electrical Systems.
   a. Mount or suspend conduit and wireway systems directly on structural members of the structures and walls.
   b. Securely attach anchors into walls.
2. At all conduit attachments, allow space between the mounting surfaces and the conduit by providing U-channel supports, clamp-backs, or spacers.
   a. Attach wall-mounted conduit runs close to the walls following the contour of the walls, parallel to the walls and other building lines except at bends.

E. Wiring:
1. Install wiring in conduit as indicated.
2. Prior to the installation of any wire, verify that the conduit is clean and free of debris.
3. Install a separate ground conductor in all coated flexible metal conduit.

3.04 FIELD QUALITY CONTROL

A. Inspection:
1. Inspect installed conduit runs for obstructions, proper support, proper grounding, and completeness.

END OF SECTION

SECTION 16131

WIREWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: The work specified in this Section consists of constructing the metallic raceway systems for the project.

B. Related Sections:
   1. Section 16050 Common Work Results for Electrical
   2. Section 16070 Hangers and Supports for Electrical Systems

1.02 REFERENCES

A. Reference Standards:
   1. U. S. Government:
      a. Federal Transit Administration (FTA):
         1) 49 CFR 661 Buy America Requirements.

B. Federal Specifications:
   1. Fed. Spec W-C-582, Conduit, Raceway, Metal, and Fittings, Surface.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's catalog cuts for the following materials:
   1. Wireway and Fittings.

1.04 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Buy America Act:
      a. Except for those products which are exempt under the specific statutory waivers stipulated in 49 CFR 661, all other products supplied under this Section must comply with the requirements of the Buy America Act.

B. Product Quality Control:
   1. Manufacturers shall fabricate their products in such a manner that all criteria for appearance, fit and tolerances shall be complied with.
   2. Each manufacturer shall carefully control his operations to ensure that the engineering, quality, safety and reliability of product are achieved.

PART 2 PRODUCTS

2.01 WIREWAY SYSTEM MATERIALS

A. Wireway (Raintight, NEMA Type 3R): Lengths, connectors and fittings UL listed and constructed in accordance with Underwriters Laboratories Standard UL 870 for Raintight Wireways, Auxiliary Gutters and Associated Fittings.
   1. Wireway constructed without knockouts.
   2. Provide gasketing that cannot rip or tear during installation and maintain its raintight capability during the life of the wireway.
   3. 16 gauge galvanneal sheet metal parts provided with corrosion resistant phosphate primer and ASA-49 gray enamel finish.
   4. Acceptable Manufacturers:
      a. Hoffman Engineering Company.
      b. Wiegmann.
      c. Or Approved Equal.

PART 3 EXECUTION

3.01 INSPECTION

A. Carefully investigate the structural and finish condition, as well as other construction work, which may affect the work of this Section. Arrange Electrical Work accordingly and furnish such fittings and apparatus as required to accommodate such conditions and to preserve access to other equipment, rooms, areas, etc.

B. Prior to performance of work described above, make detailed drawings of proposed departures from original design due to field conditions or other cause, and submit for Engineer's approval.

C. Inspect installed wireways and remove obstructions, dirt and debris if present.

3.02 PREPARATION

A. Field Measurement: The Drawings are generally indicative of the work, but due to their small scale, it is not possible to indicate all offsets, fittings, and apparatus required nor the minor structural obstructions that may be encountered.

B. Obtain roughing-in dimensions of electrically operated equipment being installed in other construction work. Set wireways only after receiving approved dimensions and checking such equipment locations.

C. Layout electrical work to suit actual field measurements and according to accepted Trade standard practice. However, electrical installations shall conform to NEC 300

for wiring methods general requirements (refer to Procurement Documents), and to all other applicable Articles of the NEC governing methods of wiring.

3.03 INSTALLATION

A. Methods of Wiring: In general fabricate raceway systems in accordance with accepted Trade standard practice. The following installation requirements are in addition to requirements set forth in Article 300 of the NEC and are included to complement the same.
   1. Cut raceways square and deburr cuts to the same degree as cuts made by the material manufacturer. Ream cuts of conduits per NEC requirements with openings not restricted more than cuts made by the material manufacturer.
   2. Mount or suspend raceway systems directly on structural members of the structures, except where indicated as being wall mounted. Space supports in accordance with NEC requirements.
   3. Attach wall mounted raceway runs tight to walls, following contour of walls and securely attach anchors into walls.
   4. Do not weaken the structure by excessive or unnecessary cutting.
   5. Make provisions for expansion in raceway runs where same cross building expansion joints.

B. Exposed Work: Make raceway runs in exposed work parallel to centerlines and structure surfaces, and perpendicular to centerlines where required, with right angle turns consisting of symmetrical bends or fittings. Maintain at least 6 inches clearance between raceway runs and mechanical systems pipes, ducts, flues, etc.

3.04 ANCHOR AND FASTENER INSTALLATIONS

A. Auxiliary Support Fabrication: As specified in Section 16070.

B. Threaded Bolts: As specified in Section 16070.

C. Drilled-In Expansion Anchor Installation: As specified in Section 16070.

END OF SECTION

SECTION 16132

BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Requirements for furnishing, installing, connecting, cleaning, and protecting electrical pull and junction boxes.

B. Related Section:
   1. Refer to Procurement Documents
   2. Section 16050 Common Work Results for Electrical
   3. Section 16060 Grounding and Bonding for Electrical Systems
   4. Section 16070 Hangers and Supports for Electrical Systems
   5. Section 16080 Acceptance of Electrical Systems
   6. Section 16120 Low-Voltage Electrical Power Conductors and Cables
   7. Section 16130 Conduits for Electrical Systems

1.02 REFERENCES

A. Reference Standards:
   1. U. S. Government:
      a. Federal Transit Administration (FTA):
         1) 49 CFR 661 Buy America Requirements.

B. National Electric Manufacturer's Association (NEMA):
   1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
   2. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable.

C. National Fire Protection Association (NFPA):
   1. NFPA 70 - National Electrical Code (NEC).

D. American National Standards Institute (ANSI):
   1. ANSI Z55.1 - Gray Finishes for Industrial Apparatus & Equipment (*withdrawn 1990, no replacement*).

1.03 DESIGN REQUIREMENTS

A. Product Data:
   1. Submit a list of the materials proposed to satisfy the requirements of this Section.
   2. Submit Product Data and catalog cuts of the materials and equipment proposed to be used to satisfy the requirements of this Section.

1.04 SUBMITTALS

A. Submit the following information to the Engineer for approval in accordance with the requirements of The Procurement Documents:
   1. Product Data:
      a. List of the proposed materials.
      b. Catalog cuts of cast outlet boxes for general purpose applications used with steel conduit systems.
      c. Catalog cuts of equipment and control device enclosures for outdoor
   2. Quality Assurance/Control Submittals:
      a. Certificates.
         1) Testing agency/quality verification, listing, and labeling.
      b. Qualification Statements.
         1) Qualifications of the licensed electricians.

1.05 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Buy America Act:
      a. Except for those products which are exempt under the specific statutory waivers stipulated in 49 CFR 661, all other products supplied under this Section must comply with the requirements of the Buy America Act.

B. Qualifications:
   1. Installer Qualifications:
      a. To supervise installation of the Work of this Section, employ licensed electricians.
         1) Submit the qualifications of the licensed electricians supervising the Work of this Section.

C. Regulatory Requirements:
   1. Perform the Work of this Section in accordance with the requirements specified in Articles 250, 300, and 370 of NFPA 70 (NEC), and to all other applicable state, local, and national governing codes and regulatory requirements.

D. Certifications:
   1. Provide products that are listed and labeled by Underwriters Laboratory, approved by Factory Mutual, or certified as meeting the standards of UL by the Electrical Testing Laboratory (ETL) for the location installed in, and listed and labeled or approved for the application intended as indicated or specified, unless products meeting the requirements of these testing laboratories are not readily available or unless standards do not exist for the products.
      a. Provide products that are approved, listed, and labeled for the short circuit currents, voltages, and currents indicated or specified to be applied.

b. Provide service entrance labeled products for all service entrance equipment.

1.06 MATERIAL DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
1. Pack, ship, handle, and unload products in accordance with the requirements of Section 16050 Common Work Results for Electrical.

B. Acceptance at Site:
1. Accept products at the Site in accordance with the requirements of Section 16050 Common Work Results for Electrical.

C. Storage and Protection:
1. Store products in accordance with the requirements of Section 16050 Common Work Results for Electrical.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Use of Trade Names:
1. The use of trade names within the Contract Documents is intended to establish the basis of design and to illustrate the constructability and level of quality required.
2. The use of trade names is not intended to exclude other manufacturers whose products are equivalent to those named, subject to compliance with Contract requirements.

2.02 MANUFACTURED UNITS

A. Enclosures or Pull Boxes for Garage Locations:
1. Stainless Steel Box
   a. Provide box with continuously welded seams, ground smooth, no holes or knockouts except as required for conduit entry.
   b. Provide screw cover with stainless steel clamps or captivated screws.
2. Provide oil resistant gasket.
3. Conform to NEMA 250 for Types 3R and 4 enclosures.
4. Acceptable Manufacturers:
   a. Hoffman
   b. Rittal Corp
   c. Milbank Manufacturing
   d. Or Approved Equal

B. Cast Outlet Boxes for General Purpose Applications:
1. For Use with Steel Conduit Systems:

a. For use with steel conduit systems, provide small cast steel or cast malleable iron outlet boxes with threaded hubs that meet the NEMA 250 requirements for Type 12 enclosures.
b. If covers are indicated or specified, provide cast steel or cast malleable iron covers with neoprene gaskets.
   1) Provide captive Type 316 stainless steel mounting screws for the covers.
c. If fixture hangers are indicated or specified, provide ball type cast steel or cast malleable iron fixture hangers with neoprene gaskets.
   1) Provide captive Type 316 stainless steel mounting screws for the fixture hangers.
d. Finish:
   1) Provide outlet boxes, covers, and hangers with an electroplated zinc coating, followed first by a dichromatic prime, and then by an aluminum polymer finish coating conforming to NEMA FB 1.
e. Manufacturers:
   1) EGS/Appleton Electric, www.appletonelec.com.
   2) EGS/O-Z/Gedney, www.o-zgedney.com.
   3) Crouse Hinds
   4) Killark
   5) Or Approved equal.

2.03 SOURCE QUALITY CONTROL

A. NOT USED.

PART 3 EXECUTION

3.01 INSTALLERS

A. Install the work of this Section only under the supervision of licensed electricians.

3.02 EXAMINATION

A. Verify that conduit stub-ups to be mated with electrical boxes and enclosures are the correct type and size, and are at the proper location.

3.03 INSTALLATION

A. Installing Boxes for Electrical Outlets and Devices:
   1. Install boxes level and plumb within 1/16-inch of vertical or horizontal over the length of the box.
   2. When installing boxes outside or to exposed conduit in unfinished areas, provide cast boxes.
      a. Mount these boxes on spacers to be 1/8-inch from wall unless box has built-in raised pads to perform the same function.

3. Support cast boxes for outlet and device using one of the following methods:
   a. Mount the boxes directly to the structure using 4 or more anchors.
      1) Attach mounting screws to feet located outside of the box interior.
      2) Provide 1/4-inch spacers behind the boxes unless the box has raised pads.
   b. Attach the box to two 1-inch or larger conduits which are supported within 12-inches of the box.
   c. Attach the box to two 1-inch or larger conduits which exit from a poured concrete floor no further than 18-inches from the box.

B. Installing Pull and Junction Boxes for Other than Electrical Outlets and Devices:
   1. Accurately punch holes for conduit openings using a hydraulic punch and punches sized for the conduit to be installed.
   2. Install a conduit breather in the top of the box and a conduit drain fitting in the bottom of all boxes.
   3. Support boxes for other than electrical outlets and devices using one of the following methods:
      a. Mount the boxes directly to the structure using 4 or more anchors.
         1) Attach mounting screws to feet located outside of the box interior or seal the screw holes to prevent water penetration.
         2) Provide 1/4-inch spacers behind the boxes unless the box has raised pads.
      b. Attach the box to two 1-inch or larger conduits which are supported within 12-inches of the box.
      c. Mount the box on U-channel and structural supports conforming to Section 16070 Hangars and Supports for Electrical Systems.

C. Make up all conduit connections to boxes in accordance with the requirements of Section 16130 Conduits for Electrical Systems.

D. Install wiring in boxes in accordance with the requirements of Section 16120 Low Voltage Electrical Power Conductors and Cables.

E. Ground boxes in conformance with Section 16060 Grounding and Bonding For Electrical Systems.

3.04 REPAIR/RESTORATION

A. Touch up damaged coatings on electrical boxes and enclosures.

3.05 FIELD QUALITY CONTROL

A. Site Tests:
   1. Test all boxes to verify that they are properly connected to the grounding system.

B. Inspection:
   1. Inspect flush boxes to verify that the opening between the box and the wall finish is less than 1/16-inch.
   2. Inspect flush boxes to verify that each box is flush with the wall, or protrudes less than 1/16-inch, and is not set behind the wall surface.
   3. Inspect surface mounted boxes to verify that they are level and plumb within 1/16-inch as specified.

3.06 CLEANING

A. Waste Management and Disposal:
   1. Clear and dispose of waste materials in accordance with the requirements of Section 16050 Common Work Results for Electrical.

3.07 PROTECTION

A. Except for surfaces to be painted, mask electrical boxes to protect them from paint overspray or over-brushing during painting operations.

B. Protect boxes against damage from other work.

END OF SECTION

SECTION 16145

WIRING DEVICES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Requirements for furnishing, installing, connecting, energizing, testing, cleaning, and protecting wiring devices and cover plates.

B. Related Sections:
   1. Refer to Procurement Documents.
   2. Section 16050 Common Work Results for Electrical
   3. Section 16060 Grounding and Bonding for Electrical Systems
   4. Section 16070 Hangers and Supports for Electrical Systems
   5. Section 16075 Identification for Electrical Systems
   6. Section 16080 Acceptance of Electrical Systems
   7. Section 16120 Low Voltage Electrical Power Conductors and Cables
   8. Section 16130 Conduits for Electrical Systems
   9. Section 16132 Boxes for Electrical Systems

1.02 REFERENCES

A. Reference Standards:
   1. U. S. Government:
      a. Federal Transit Administration (FTA):
         1) 49 CFR 661 Buy America Requirements

B. National Electric Manufacturer's Association (NEMA):
   1. NEMA WD 1 - General Color Requirements for Wiring Devices.
   2. NEMA WD 6 - Wiring Devices - Dimensional Requirements.

C. National Fire Protection Association (NFPA):
   1. NFPA 70 - National Electrical Code (NEC).

D. Underwriter’s Laboratories, Inc. (UL):
   1. UL 231 - Standard for Power Outlets.
   2. UL 498 - Standard for Safety for Attachment Plugs and Receptacles.
   3. UL 1681 - Standard for Safety for Wiring Device Configurations.

E. U. S. General Services Administration (GSA):
   1. Federal Specifications:

a. W-C-596/40D - Connector, Receptacle, Electrical, General Purpose, Duplex, General Grade and Hospital Grade, Grounding, 2 Pole, 3 Wire, 20 Amperes, 125 Volts, 50/60 Hertz, Box Mount and Snap-In Mount.
b. W-C-596/41D - Connector, Receptacle, Electrical, General Purpose, Single, Hospital Grade, Grounding, 2 Pole, 3 Wire, 20 Amperes, 125 Volts, 50/60 Hertz.
c. W-C-596/107A - Connectors, Receptacle, Electrical, Special Purpose, Single, Grounding, 2 Pole, 3 Wire, 20 Amperes, 277 Volts, 50/60 Hertz.

1.03 DEFINITIONS

A. Definitions for all items are as stated in NFPA 70 and the other references listed unless otherwise stated, specified, or noted.

B. SPDT: An acronym for single pole, double throw type electrical switches.

C. Wiring Devices: Yoke mounted switches and receptacles with indicated line ratings of 300 Volts and 30 Amperes or less.

1.04 DESIGN REQUIREMENTS

A. Provide electrical power outlets designed in accordance with the requirements of UL 231 and UL 1681.

B. Product Data:
1. Submit a list of the products and accessories proposed to satisfy the requirements of this Section.
2. Submit Product Data and catalog cuts of the materials and equipment proposed to be used to satisfy the requirements of this Section.
   a. Clearly indicate the usage of each product on the submittal.

1.05 SUBMITTALS

A. Submit the following information to the Engineer for approval in accordance with the requirements of the Procurement Documents:
1. Product Data:
   a. List of the proposed materials.
   b. Catalog cuts of heavy duty specification grade receptacles.
   c. Catalog cuts of device plates and covers.
2. Quality Assurance/Control Submittals:
   a. Manufacturers Instructions.
      1) Manufacturer's printed installation instructions.

1.06 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Buy America Act:
      a. Except for those products which are exempt under the specific statutory waivers stipulated in 49 CFR 661, all other products supplied under this Section must comply with the requirements of the Buy America Act.

B. Regulatory Requirements:
   1. Perform the Work of this Section in accordance with the requirements specified in NFPA 70, and to all other applicable state, local, and national governing codes and regulatory requirements.

C. Certifications:
   1. Provide products that are listed and labeled by Underwriters Laboratory, approved by Factory Mutual, or certified as meeting the standards of UL by the Electrical Testing Laboratory (ETL) for the location installed in, and the application intended, unless products meeting the requirements of these testing laboratories are not available or unless standards do not exist for the products. Provide copper conductors listed and labeled by UL for all wiring.
   2. Submit evidence of testing agency/quality verification, listing, and labeling for each product with the submitted product data either by providing a printed mark on the data or by attaching a separate listing card.

1.07 MATERIAL DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
   1. Pack, ship, handle, and unload products in accordance with the requirements of Section 16050.

B. Acceptance at Site:
   1. Accept products at the Site in accordance with the requirements of Section 16050.

C. Storage and Protection:
   1. Store products in accordance with the requirements of Section 16050.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Use of Trade Names:
   1. The use of trade names within the Contract Documents is intended to establish the basis of design and to illustrate the constructability and level of quality required.

2. The use of trade names is not intended to exclude other manufacturers whose products are equivalent to those named, subject to compliance with Contract requirements.

B. Provide the receptacles of the same kind provided under this Contract from the same manufacturer; a mixture of manufacturer's products is unacceptable.

2.02 MANUFACTURED UNITS

A. NOT USED.

B. Receptacles:
1. Provide UL listed specification grade receptacles complying with the requirements of W-C-596/40D, W-C-596/41D, W-C-596/107A, NEMA WD 1, and NEMA WD 6 for the voltage and current indicated, and having screw terminals.
   a. Provide receptacles complying with the terminal identification requirements of UL 498.
2. Standard Face Design Receptacles:
   a. Heavy Duty Specification Grade Receptacles:
      1) Provide 2-pole, 3-wire, grounding type duplex receptacles rated for 125 Volts AC and 20 Amperes.
      2) Manufacturers:
         a) Hubbell, HBL5352 Series, www.hubbell-wiring.com.
         b) Pass & Seymour, www.passandseymour.com.
         c) Leviton Manufacturing Co., www.leviton.com.
         d) Or Approved equal.

2.03 ACCESSORIES

A. Wall Plates:
1. Unless otherwise indicated in the Contract Documents, provide AISI Type 302/304 stainless steel wall plates.
   a. Provide heavy cadmium-plated steel wall plates whose edges are flush with the edges of the associated boxes.
   b. For locations subject to wet or rain conditions, provide wet location wall plates marked with the words "Suitable for Wet Locations While in Use".
2. Thickness (Minimum): 0.040 inches thick (1mm).
3. Fasteners:
   a. For installing wiring devices and wall plates, provide the following of fastener types:
      1) For affixing metal wall plates, provide stainless steel screws.
4. Manufacturers:
   a. Hubbell, www.hubbell-wiring.com.
   b. Pass & Seymour, www.passandseymour.com.

c. Appleton, www.appletonelec.com.
d. Cooper Crouse-Hinds, http://crouse-hinds.com.
e. Approved equal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect the surfaces of concrete walls where wiring devices will be mounted to verify that the surface is level and complete.
   1. Verify that the required number of anchors of the correct type and size have been placed in the proper locations.
   2. Verify that there are no concrete spalls, honeycomb areas, or other concrete defects.

B. Verify that the pull and junction boxes installed are the correct type and size, and are at the correct location.
   1. Verify that flush boxes are plumb and level to within 1/8-inches of vertical and horizontal; and are either flush with the finish surface or protrude no more than 1/16 inch.
   2. Verify that surface mounted boxes are plumb and level to within 1/16-inch of vertical and horizontal.
   3. Verify that the size of each box conforms to the requirements of Article 370 of NFPA 70.

C. Verify that wiring pigtails within installed boxes are sufficiently long to re-terminate the wiring twice and still allow 6 inches of slack.

D. Verify that ground wires are the correct type and size, and are at the correct location.

3.02 PREPARATION

A. Correct defects discovered during the examination
   1. Remove any extraneous paint from the interior of boxes and from wiring.
   2. Clean the interior of boxes to remove dirt and debris.

B. Provide outlet boxes and supports for wiring devices in accordance with the requirements of Section 16070 and 16132.

3.03 INSTALLATION

A. Install wiring devices and accessories in accordance with the manufacturer's printed installation instructions.
   1. Submit the manufacturer's printed installation instructions to the Engineer for information.

2. Make connections to the devices in accordance with the requirements of Sections 16120 and 16130.
3. Ground the devices in accordance with the requirements of Section 16060.

B. Provide a wall plate for each receptacle and special purpose outlet.
1. If the Contract Drawings show two or more receptacles at the same location, gang these devices together and cover them with a single wall or cover plate.
2. For multi-gang boxes, provide multi-gang outlet plates; sectional gang plates are unacceptable.

3.04 REPAIR/RESTORATION

A. Correct the defects that are found in wiring devices during the specified inspections and tests, and retest the devices after correcting the defects.

3.05 FIELD QUALITY CONTROL

A. Site Tests:
1. Test each receptacle with a plug-in tester that checks for reversed line and neutral wiring, reversed ground and neutral wiring, open ground wiring, and open neutral wiring.
2. Test the last receptacle in each branch circuit to ensure that the neutral and ground wiring resistance does not exceed 1 ohm between the receptacle and its panelboard.

B. Inspection:
1. Inspect boxes to verify proper operation, for visual appearance, and to verify correct mounting height.

3.06 ADJUSTING

A. Adjust the final position of switches and devices to be plumb and level, and set the final position of the wall plates for flush boxes flush to the wall.

3.07 CLEANING

A. Waste Management and Disposal:
1. Clear and dispose of waste materials in accordance with the requirements of Section 16050.

3.08 PROTECTION

A. Mask electrical devices to protect them from paint overspray or over-brushing during painting operations.

B. Protect electrical devices against damage from other work.

END OF SECTION

SECTION 16525

LIGHTING FIXTURES AND MOUNTING POLES

PART 1 - GENERAL

1.01 DESCRIPTION:

A. This section specifies providing lighting fixtures and mounting poles.

B. Related Work Specified Elsewhere:
1. Grounding and bonding: Section 16060.
2. Identification for Electrical Systems: Section 16075.
3. Wireways for Electrical Systems: Section 16131.
4. Boxes for Electrical Systems: Section 16132.
5. Wiring Devices and control devices: Section 16145.

1.02 QUALITY ASSURANCE:

C. Codes, Regulations, Reference Standards and Specifications:
1. Comply with codes and regulations of jurisdictional authorities.
2. NEC.
3. UL: 496, 542, 1029, 1570, 1571, 1572, Electrical Construction Materials Directory.
4. FS: FF-B-588, FF-P-395, FF-S-325C.
5. MS: MIL-C-450.
6. FED STD: 595.
7. PEI: 1001.
8. SSPC: SP-8, SP-10.
9. ASTM: A53, A167, A276, A123, A507, A575, B26, B85, B117, B136, B137, B209, B221, B244, D635, D1056, D1400, D2240.
10. AASHTO: M314, LTS-3.
11. ITS: Directory of ITS Listed Products.
12. AA: Standard finishes as designated by the Aluminum Association and referenced in NAAMM Metal Finishes Manual.
13. ANSI/IEEE: C62.41.
14. IEEE Publication 587.
15. ANSI Standards.
16. FCC Rules and Regulations, Part 15, Part 18.
17. NEMA 1
18. AISI.
19. IES: RP-20

D. Each lighting fixture to be labeled or listed per referenced UL or ITS directory.

1.03 SUBMITTALS:

E. Submit the following for approval in accordance with the General Requirements and with the additional requirements as specified for each:
1. Shop Drawings:

a. Include photometric curves.
2. Samples: One of each type of fixture.
3. Certification:
a. Verification that each fixture is in compliance with applicable codes, regulations, reference standards and specifications for the location at which it is to be used. Indicate requirements that each fixture meets.
b. Calculations: Submit calculations by a professional engineer registered in the jurisdiction where material is to be installed certifying that assemblies of foundation, anchor bolts, pole, arms and luminaire will withstand specified wind pressure, wind speed, stress, deflection, vibration and fatigue.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING:

F. Ship each unit securely packaged and labeled for safe handling in shipment and to avoid damage or distortion.

G. Store lighting fixtures and mounting poles in secure and dry storage facility.

1.05 WARRANTY:

H. Globes and Diffusers: In addition to warranty requirements of the General Provisions, furnish warranty against discoloration and distortion for a total of four years.

I. Lamps: Warrant the life of lamps for periods specified.

PART 2 - PRODUCTS

2.01 PRODUCTS AND MATERIALS:

J. General Requirements for Lighting Fixtures:
1. Interchangeability: Components of same type, size, rating, functional characteristics and make are to be interchangeable.
2. In accordance with UL 1570, UL 1571 and UL 1572.
3. Materials:
a. Steel:
1) Sheet: ASTM A507, 22-gauge minimum.
2) Bar: ASTM A575.
b. Steel pipe: ASTM A53, Type S.
c. Stainless steel:
1) Sheet: ASTM A167, 22-gauge minimum.
2) Bar: ASTM A276, Type 316.
3) Finish: AISI Alloy S30400, NAAMM Finish No. 4, unless otherwise shown.
d. Aluminum: Alloy as recommended by manufacturer, unless otherwise shown or specified.
1) Sheet and plate: ASTM B209.

2) Extrusion: ASTM B221, 0.109-inch minimum thickness, unless otherwise shown.
3) Cast:
a) Die cast: ASTM B85, 0.1875-inch minimum thickness, unless otherwise shown.
b) Sand cast: ASTM B26, 0.1875-inch minimum thickness, unless otherwise shown.
c) Color-anodized cast: Kalcolor Casting Alloy No. 2 or equal.

4. Lamps:
a. Mercury vapor:
1) Watt rating: As shown.
2) Color: Deluxe white.
3) Finish: As shown.
4) Base:
a) Up to 100 watts: Medium screw base.
b) Above 100 watts: Mogul screw base.
5) Rated life: 24,000 hours.
6) Bulb size: As shown.
b. Fluorescent:
1) Wattage and size: As shown or specified.
2) Color: Warm white.
3) Type:
a) PL7 compact, PL13 compact.
b) F6T5/CW and F20T12WW, Preheat start.
c) F32T8/WW, F48T12/WW/SHO, F72T12/WW/SHO, and F96T12/WW/SHO: Rapid start.
4) Rated life:
a) Super-high output (SHO), very-high output (VHO) and high output (HO) lamps: 12,000 hours.
b) F32T8/WW: 20,000 hours.
c) PL compact lamps: 10,000 hours.
5) Base:
a) Super-high output (SHO), very-high output (VHO) and high output (HO) lamps: Recessed double contact.
b) F32T8/WW: Medium bi-pin.
c) PL7 medium.
c. Tungsten-halogen:
1) Wattage: As shown.
2) Size: T-3.
3) Base: Recessed single contact.
4) Rated life: 4,000 hrs.
5) Operating voltage:
a) 1,500-watt lamps: 277 volts, 60 Hertz.
b) All other lamps: 120 volts, 60 Hertz.
d. Metal-halide:
1) Wattage: As shown.
2) Size: As shown.

3) Color: Clear unless otherwise noted.
4) Lamp operating position: As shown.
5) Base: Mogul.
6) Rated life:
a) 175 watt: 7,500 hours.
b) 400 watt: 15,000 hours.
c) 1,000 watt: 10,000 hours.

5. Lamp holders:
a. Mercury vapor and metal halide:
1) In accordance with UL 496.
2) Black or white thermosetting phenolic compound, glazed-porcelain or neoprene base and body as shown. Neoprene unit molded in one-piece, weatherproof, oil-resistant, with vibration-absorbing socket construction.
3) Mercury vapor and metal halide:
a) Rated 660 watts, 600 volts: Medium screw base.
b) Rated 1,500 watts, 600 volts: Mogul screw base.
4) Provide mechanical self-retaining neoprene gasket for dust and moisture proof seal between lamp and lampholder.
5) Provide vibration proof feature to prevent incandescent lamp from loosening in lampholder in S-1 fixture
b. Fluorescent:
1) In accordance with UL 542.
2) Rated 660 watts, 600 volts.
3) Integral starter holder for preheat-type lamps, with starter.
4) White, thermosetting phenolic-compound base and body, silver-plated phosphorous-bronze contacts, self-aligning neoprene gasket face.
c. Tungsten-halogen: Porcelain with silver-plated contacts, to suit RSC lamp base.

6. Ballasts:
a. Mercury-vapor lamps and metal-halide lamps:
1) UL 1029, high-power-factor type.
2) Operable on 120-volt or 277-volt, 60 Hertz as shown or necessary, type and rating suitable for associated lamp.
3) Capable of starting lamp at ambient temperature of minus 20F and above.
4) Equip with individual fuse protection installed in ballast compartment of fixture.
b. Fluorescent lamps:
1) FCC part 15 subpart J, UL listed Class P.
2) Operable on 120-volt or 277-volt, 60 Hertz, as shown or necessary, type and load rating suitable for associated lamps.
3) Capable of starting lamps at ambient temperature as follows:
a) F32T8/WW lamps: Zero degree F.
b) F48T12/WW/SHO, F72T12/WW/SHO, and F96T12/WW/SHO lamps: Minus 20F.

4) Sound rating:
   a) For use with F32T8/WW lamps installed in office areas: A.
   b) For use with F32T8/WW lamps installed in ancillary areas: B or better.
   c) For use with F48T12/WW/SHO, F72T12/WW/SHO, and F96T12/WW/SHO lamps: D or better.
5) Maximum utilization of two-lamp ballasts in public-area lighting fixtures.
6) Equipped with individual fuse protection, installed in the fixture wiring channel.

7. Fixture body and housing: Shape, size and material as shown.
8. Reflector: Shape, size and material as shown. Aluminum or stainless steel polished to mirror finish unless otherwise shown. Minimum thickness 22 gauge unless otherwise shown.
9. Diffusers:
   a. Shape and size as shown, one-piece molded or extruded clear virgin acrylic or polycarbonate plastic having the following properties:
      1) Interior diffusing with smooth exterior surface.
      2) Self-extinguishing, in accordance with ASTM D635.
      3) No material color change when used with 4500K fluorescent lamp.
      4) No apparent yellowing after 500 hours exposure to fluorescent-lamp source under conditions similar to those existing in the lighting fixture.
      5) No alteration to optical properties of the fixture when finished diffuser treated with anti-static wax.
   b. Formed by carefully controlled processes so that the finished piece retains its design contours and dimensions at normal operating temperature.
   c. Resistance to shrinking, warping, crazing, cracking, or discoloring, either in service or when stored in the manufacturer's standard shipping containers under normal conditions.
10. Globes:
   a. Clear seamless polycarbonate or high-impact heat-resistant glass as shown.
   b. Shape and size: As shown.
   c. Minimum thickness: 0.125 inch, surface free from visible mold seam.
   d. Reduction in strength: 10-percent maximum after five years.
   e. Maximum haze: Two percent.
   f. Minimum light transmittance: 88 percent.
11. Lenses:
   a. Plastic lenses: Clear polycarbonate as shown, minimum thickness 0.06 inch.
   b. Glass lenses: 1/4-inch tempered glass, laminated glass, or 1/8-inch double-strength clear glass as shown, capable of absorbing ultraviolet rays when used with mercury-vapor or metal-halide lamps.
   c. Refracted lenses: Heat-resistant, annealed, clear borosilicate glass, with the following additional requirements:
      1) Initial lumen distribution on horizontal plane evenly from zero to 90 degrees: 55 to 60 percent.

2) Minimum efficiency: 85 percent.

12. Fixture wire: Section 16120.

13. Gasket:

a. Keyed gasket: One-piece, extruded solid neoprene having Type A durometer hardness of 30 plus-or-minus five when tested in accordance with ASTM D2240.

b. Self-retaining gasket:

1) One-piece, closed-cell sponge neoprene, soft or medium density.

2) Resistant to aging, heat, ultra-violet light, water, oil, weathering and setting as determined by ASTM D1056.

3) Cemented to component with resilient neoprene sealing compound compatible with finish. Adhesive not applied to diffuser.

c. Silicone gasket equal to neoprene, at Contractor's option.

14. Hardware:

a. Latches, catches, release mechanisms, hinges, screws, bolts, studs, nuts, rivets, washers and springs. Heavy-duty stainless steel or bronze, as shown.

b. Latches and catches: Captive-type.

c. Operating hardware: Self-retaining type.

15. Construction:

a. Fixture body, reflectors, wiring channels, end caps and castings formed so as to prevent buckling or distortion.

b. Minimum of two wire clips provided in wiring channel to support wiring. Self-cleaning air filter provided on breather ports.

c. Seams and joints continuously welded and ground smooth.

d. When aluminum will be in contact with dissimilar metal, separate contact surfaces with gasket, non-absorptive tape, or coating to prevent corrosion.

16. Finish:

a. Baked enamel: Nonspecular finish consisting of six-stage hot-cleaning wash, phosphate coat, prime coat, and finish coat of sprayed white or other color acrylic enamel as shown, baked at 350F for a minimum of 30 minutes, with the following additional requirements:

1) Dry-film thickness (DFT) per ASTM D1400: 1.25 mils minimum.

2) Undercutting of enamel film from scored line after exposing to 10-percent salt spray for 1,500 hours, per ASTM B117: 0.067-inch maximum.

3) Baked white enamel after 100 hours exposure to fadeometer: 86-percent minimum reflectance factors, no appreciable visual color change.

4) Bronze color: FED STD 595, Color No. 20040.

b. Porcelain enamel: Opaque, fused vitreous surface finish, 88-percent average reflectance factor, in accordance with the following standards:

1) On steel: PEI 1001.

2) On aluminum alloy: PEI 1001.

c. Specular anodized coating: 14-stage process for permanently sealed specular or semispecular finish, as shown, in accordance with patented

electrolytic process, Alzak or equal. When shown dark-bronze color, match Duranodic 313 Dark Bronze.

d. Clear anodic coating: AA-M22C22-A41, minimum coating thickness 0.8 mil, coating weight 35 milligrams per square inch, hot-water seal overall, tested in accordance with the following requirements:
   1) Coating weight: ASTM B137.
   2) Coating thickness: ASTM B244.
   3) Sealing test: ASTM B136.
   4) Undercutting of anodic film from scored line after exposing to 10-percent salt spray for 1,500 hours, in accordance with ASTM B117: 0.067-inch maximum.

e. Color-anodized finish: NAAMM AA-M22-C22A42, minimum coating thickness 0.8 mil, coating weight 35 milligrams per square inch, hot-water seal overall, tested in accordance with the following requirements:
   1) Coating weight: ASTM B137.
   2) Coating thickness: ASTM B244.
   3) Sealing test: ASTM B136.
   4) Color: Dark Bronze. Kaiser Aluminum Color, Statuary Bronze; Alcoa Color, Dark Bronze, Duranodic 313.

f. Zinc coating: ASTM A123.

g. Factory-painting: Prepare surfaces by pickling in accordance with SSPC SP-8. Apply coating of 7.0-mil total DFT as follows:
   1) First coat: Inorganic zinc-silicate primer, 2.5-mil DFT.
   2) Second coat: High-build epoxy primer, 3.0-mil DFT.
   3) Third coat: Aliphatic polyurethane, 1.5-mil DFT, FED STD 595, Color No. 20040.

h. Field painting: Section 09900.

i. Electrostatic-powder coating: Prepare surfaces by sandblast cleaning complying with SSPC SP-10 near-white blast cleaning, applying coating promptly after cleaning. Ground material to be coated. Apply coating as electrostatically-charged dry powder using electrostatic spray gun to produce DFT of six mils plus-or-minus two mils. Cure by heat treatment.

17. Mark each fixture and its components in accordance with applicable reference standard.

18. Conduit: Section 16130.

19. Connectors: Section 16050.

20. Fasteners: Size and type shown or best suited to use.
   a. Expansion anchors: FS FF-S-325C, Group II, Type 3, Class 1, stainless steel, Type 303.
   b. Toggle bolts: FS FF-B-588.
   c. Powder-actuated: FS FF-P-395.
   d. Finish: Where exposed, custom finish exposed parts to match surface being fastened.

21. Anchor bolts, nuts and washers:
   a. AASHTO M314, hot-dip galvanized.
   b. Bolts hooked, unless otherwise shown or recommended by manufacturer of pole or structure being anchored.

c. Two nuts and one washer for each anchor bolt for plumbing pole or leveling structure.

d. Finish: Where exposed, custom finish exposed parts to match surface being fastened.

22. Mounting poles:

a. Steel or aluminum, straight or tapered as shown. Complete assembly of anchor bolts, pole, arms and luminaire designed to withstand wind pressure (P) developed by wind speed (V) of 80 MPH in accordance with AASHTO LTS-3. Pole assembly to fully comply with AASHTO requirements for permissible stresses, deflection, vibration and fatigue. Ratio of deflection to pole height under action of applicable static loading not to exceed 1/60.[*iii]

OR

b. Steel, straight or tapered as shown. Complete assembly of anchor bolts, pole, arms and luminaire designed to withstand wind pressure (P) developed by wind speed (V) of 80 MPH in accordance with AASHTO LTS-3. Pole assembly to fully comply with AASHTO requirements for permissible stresses, deflection, vibration and fatigue. Ratio of deflection to pole height under action of applicable static loading not to exceed 1/60.[*iii]

c. Size and shape: As shown.

d. Base assembly: Steel base plate, designed to withstand full-bending movement of shaft and welded to shaft; anchor bolts; and base cover.

e. Handhole size: As shown, with 12-gauge steel sheet coverplate.

f. Polygonal-shaped poles fabricated with sharp bends.

g. Longitudinally welded with welds continuous and ground smooth.

23. Grout: Section 03300, non-shrink. Where recommended by manufacturer, prime surfaces to be grouted.

24. Concrete base, including forms and reinforcement: Division 3.

25. Bituminous coating: MS MIL-C-450.

2.02 LIGHTING FIXTURES:

K. Parking Structure Lighting Fixtures: The low glare fixture shall comply with the latest IES Specifications, RP-20 (Lighting for Parking Facilities).The electrical components will carry a five year minimum warranty, with other components covered by a two (2) year warranty.

1. Housing: A die cast housing integrating the high power factor ballast and wiring splices. The wiring shall be rated for 90°C.
2. Ballast: High power factor with multitap power feature 120/277V, 60HZ. UL listed and capable for starting at -20°F.
3. Lamp: 150 W, Medium base, clear. Average life of 24,000 hours.
4. Fixture shall be fused, totally sealed and UL listed for wet location.

L. Other Lighting Fixtures: Types as shown, with materials and finishes shown and specified

PART 3 - EXECUTION

3.01 INSTALLATION:

M. Install lighting fixtures of types shown at locations shown as follows:

1. Mount fixtures rigidly in place. Use expansion anchors and machine screws for concrete surfaces and toggle bolts for hollow concrete-masonry surfaces. Use appropriate fasteners for attachment to other surfaces. Support lighting fixtures independent of suspended acoustical-panel ceiling systems.
2. Where aluminum contacts concrete or dissimilar metal, separate contact surfaces with gasket, non-absorptive tape or bituminous coating to prevent corrosion. Use stainless-steel fasteners.
3. Mount fixtures plumb, level and in straight lines. Install stems of suspended fixtures plumb. Group-mounted fluorescent fixtures to appear as one unit.
4. Install 12-inch minimum length of liquid-tight flexible conduit for connection between fixture and outlet box unless otherwise shown in accordance with Section 16130. Use fixture wire from outlet box in branch circuit to lighting fixture in accordance with Section 16525, and connect fixtures to branch circuit in accordance with Section 16145.
5. Install chase nipple where fluorescent fixtures are installed in continuous groups. Clean lamps, diffusers, globes, reflectors and exposed-to-view surfaces of fixtures after aiming and adjusting has been approved.

N. Installation of Pole-Mounted Fixtures:
1. Prepare and compact that earth foundation for mounting in accordance with Division 3. Form and reinforce concrete base as shown and in accordance with Section 03010. Mix and place concrete in accordance with Section 03010. Use finish Number 2 for exposed surfaces. Use templates for setting anchor bolts.
2. Install mounting pole of type shown at location shown. Use double nuts to erect poles plumb. Pack void between concrete base and pole with grout in accordance with Section 03010.
3. Install conductors in accordance with Section 16120, leaving three-foot minimum lengths of conductors for fixture connections; tape or otherwise secure in place pending final connection.
4. Install lighting fixtures in accordance with approved shop drawings.
5. Connect wiring using connectors in accordance with Section 16050. Tape connections.
6. Install photoelectric controls as shown or in accordance with fixture manufacturer's instructions.
7. Ground lighting fixtures and mounting poles in accordance with NEC and Section 16060.
8. Apply touch-up paint where necessary in accordance with Section 09900.

3.02 FIELD QUALITY CONTROL:

O. Ensure that earth foundation for mounting poles is prepared and compacted.

P. Testing:
1. Furnish necessary personnel and equipment and perform tests and adjustments in the presence of the Engineer. Schedule adjustment of exterior installations to occur during hours of darkness.
2. Test lighting circuits for continuity and operation.

3. Test fixtures and mounting poles for continuity of grounding system.
4. Aim and adjust fixtures to provide distribution pattern approximately as shown and as approved.

END OF SECTION

APPENDIX C

DRAWINGS LIST

REHABILITATION OF PARKING GARAGES AT LARGO TOWN CENTER NORTH AND SOUTH, NEW CARROLLTON, VIENNA NORTH, WEST FALLS CHURCH AND WHITE FLINT

DRAWING NO.	SHEET NO.	TITLE
		WHITE FLINT PARKING GARAGE
A12-G-001	01 OF 503	WMATA SYSTEM MAP
A12-G-002	02 OF 503	INDEX OF DRAWINGS
A12-PP-101	03 OF 503	LEVEL 1 - SUGGESTED PHASING PLAN
A12-PP-102	04 OF 503	LEVEL 2 - SUGGESTED PHASING PLAN
A12-PP-103	05 OF 503	LEVEL 3 - SUGGESTED PHASING PLAN
A12-PP-104	06 OF 503	LEVEL 4 - SUGGESTED PHASING PLAN
A12-S-001	07 OF 503	GENERAL STRUCTURAL NOTES
A12-S-002	08 OF 503	GENERAL KEY NOTES, ABBREVIATIONS AND SYMBOLS
A12-S-101	09 OF 503	LEVEL 1 - PARTIAL FLOOR PLAN 1
A12-S-102	10 OF 503	LEVEL 1 - PARTIAL FLOOR PLAN 2
A12-S-103	11 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 1
A12-S-104	12 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 2
A12-S-105	13 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 1
A12-S-106	14 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 2
A12-S-107	15 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 1
A12-S-108	16 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 2
A12-S-109	17 OF 503	LEVEL 5 - PARTIAL FLOOR PLAN 1
A12-S-110	18 OF 503	LEVEL 5 - PARTIAL FLOOR PLAN 2
A12-S-111	19 OF 503	LEVEL 6 - PARTIAL FLOOR PLAN 1
A12-S-112	20 OF 503	LEVEL 6 - PARTIAL FLOOR PLAN 2
A12-S-113	21 OF 503	LEVEL 2 - PARTIAL FRAMING PLAN 1
A12-S-114	22 OF 503	LEVEL 2 - PARTIAL FRAMING PLAN 2
A12-S-115	23 OF 503	LEVEL 3 - PARTIAL FRAMING PLAN 1
A12-S-116	24 OF 503	LEVEL 3 - PARTIAL FRAMING PLAN 2
A12-S-117	25 OF 503	LEVEL 4 - PARTIAL FRAMING PLAN 1
A12-S-118	26 OF 503	LEVEL 4 - PARTIAL FRAMING PLAN 2
A12-S-119	27 OF 503	LEVEL 5 - PARTIAL FRAMING PLAN 1
A12-S-120	28 OF 503	LEVEL 5 - PARTIAL FRAMING PLAN 2
A12-S-121	29 OF 503	LEVEL 6 - PARTIAL FRAMING PLAN 1
A12-S-122	30 OF 503	LEVEL 6 - PARTIAL FRAMING PLAN 2

A12-S-201	31 OF 503	EXTERIOR - NORTH AND WEST ELEVATIONS
A12-S-202	32 OF 503	EXTERIOR - SOUTH AND EAST ELEVATIONS
A12-S-401	33 OF 503	STAIR A - ENLARGED FLOOR PLANS
A12-S-402	34 OF 503	STAIR B - ENLARGED FLOOR PLANS
A12-A-001	35 OF 503	NOTES, ABBREVIATIONS, AND SYMBOLS
A12-A-002	36 OF 503	ARCHITECTURAL KEYNOTES BY DEFICIENCY
A12-A-101	37 OF 503	LEVEL 1 - PARTIAL FLOOR PLAN 1
A12-A-102	38 OF 503	LEVEL 1 - PARTIAL FLOOR PLAN 2
A12-A-103	39 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 1
A12-A-104	40 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 2
A12-A-105	41 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 1
A12-A-106	42 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 2
A12-A-107	43 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 1
A12-A-108	44 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 2
A12-A-109	45 OF 503	LEVEL 5 - PARTIAL FLOOR PLAN 1
A12-A-110	46 OF 503	LEVEL 5 - PARTIAL FLOOR PLAN 2
A12-A-111	47 OF 503	LEVEL 6 - PARTIAL FLOOR PLAN 1
A12-A-112	48 OF 503	LEVEL 6 - PARTIAL FLOOR PLAN 2
A12-A-401	49 OF 503	STAIR A/ ELEVATOR - FLOOR PLANS
A12-A-402	50 OF 503	STAIR B - FLOOR PLANS
A12-A-403	51 OF 503	ENLARGED ROOMS FLOOR PLANS
A12-A-501	52 OF 503	DOOR REPAIR SCHEDULE
A12-A-502	53 OF 503	TYPICAL REPAIR DETAILS
A12-A-503	54 OF 503	TYPICAL REPAIR DETAILS
A12-A-504	55 OF 503	TYPICAL REPAIR DETAILS
A12-A-601	56 OF 503	TYPICAL DEFICIENCY PHOTOGRAPHS BY KEYNOTE
A12-A-602	57 OF 503	TYPICAL DEFICIENCY PHOTOGRAPHS BY KEYNOTE
A12-A-603	58 OF 503	TYPICAL DEFICIENCY PHOTOGRAPHS BY KEYNOTE
A12-P-001	59 OF 503	GENERAL AND KEYED NOTES, ABBREVIATIONS
A12-P-101	60 OF 503	LEVEL 1 - FLOOR PLAN - PLUMBING
A12-P-102	61 OF 503	LEVEL 2 - FLOOR PLAN - PLUMBING
A12-P-103	62 OF 503	LEVEL 3 - FLOOR PLAN - PLUMBING
A12-P-104	63 OF 503	LEVEL 4 - FLOOR PLAN - PLUMBING
A12-P-105	64 OF 503	LEVEL 5 - FLOOR PLAN - PLUMBING
A12-P-106	65 OF 503	LEVEL 6 - FLOOR PLAN - PLUMBING
A12-E-001	66 OF 503	GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS
A12-E-501	67 OF 503	LEVEL 1 - LIGHTING AND POWER PLAN
A12-E-502	68 OF 503	LEVEL 2 - LIGHTING AND POWER PLAN

A12-E-503	69 OF 503	LEVEL 3 - LIGHTING AND POWER PLAN
A12-E-503	70 OF 503	LEVEL 4 - LIGHTING AND POWER PLAN
A12-E-505	71 OF 503	LEVEL 5 - LIGHTING AND POWER PLAN
A12-E-506	72 OF 503	LEVEL 6 - LIGHTING AND POWER PLAN
A12-E-507	73 OF 503	LEVEL 7 - LIGHTING AND POWER PLAN
A12-E-508	74 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
A12-E-509	75 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
A12-E-510	76 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
A12-E-511	77 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
A12-E-512	78 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
A12-E-513	79 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
		NEW CARROLLTON PARKING GARAGE
D13-G-001	80 OF 503	WMATA - SYSTEM MAP
D13-G-002	81 OF 503	INDEX OF DRAWINGS
D13-PP-101	82 OF 503	LEVEL 1 PHASING PLAN
D13-PP-102	83 OF 503	LEVEL 2 THROUGH LEVEL 5 & 7 TYPICAL PHASING PLAN
D13-PP-103	84 OF 503	LEVEL 6 PHASING PLAN
D13-PP-104	85 OF 503	LEVEL 8 PHASING PLAN
D13-S-001	86 OF 503	GENERAL STRUCTURAL NOTES
D13-S-002	87 OF 503	STRUCTURAL REPAIR KEY NOTES, ABBREVIATIONS AND SYMBOLS AND TYPICAL DETAILS
D13-S-101	88 OF 503	LEVEL 1 - PARTIAL FLOOR PLAN 1
D13-S-102	89 OF 503	LEVEL 1 - PARTIAL FLOOR PLAN 2
D13-S-103	90 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 1
D13-S-104	91 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 2
D13-S-105	92 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 1
D13-S-106	93 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 2
D13-S-107	94 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 1
D13-S-108	95 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 2
D13-S-109	96 OF 503	LEVEL 5 - PARTIAL FLOOR PLAN 1
D13-S-110	97 OF 503	LEVEL 5 - PARTIAL FLOOR PLAN 2
D13-S-111	98 OF 503	LEVEL 6 - PARTIAL FLOOR PLAN 1
D13-S-112	99 OF 503	LEVEL 6 - PARTIAL FLOOR PLAN 2
D13-S-113	100 OF 503	LEVEL 7 - PARTIAL FLOOR PLAN 1
D13-S-114	101 OF 503	LEVEL 7 - PARTIAL FLOOR PLAN 2
D13-S-115	102 OF 503	LEVEL 8 - PARTIAL FLOOR PLAN 1
D13-S-116	103 OF 503	LEVEL 8 - PARTIAL FLOOR PLAN 2
D13-S-117	104 OF 503	LEVEL 2 - PARTIAL FRAMING PLAN 1

D13-S-118	105 OF 503	LEVEL 2 - PARTIAL FRAMING PLAN 2
D13-S-119	106 OF 503	LEVEL 3 - PARTIAL FRAMING PLAN 1
D13-S-120	107 OF 503	LEVEL 3 - PARTIAL FRAMING PLAN 2
D13-S-121	108 OF 503	LEVEL 4 - PARTIAL FRAMING PLAN 1
D13-S-122	109 OF 503	LEVEL 4 - PARTIAL FRAMING PLAN 2
D13-S-123	110 OF 503	LEVEL 5 - PARTIAL FRAMING PLAN 1
D13-S-124	111 OF 503	LEVEL 5 - PARTIAL FRAMING PLAN 2
D13-S-125	112 OF 503	LEVEL 6 - PARTIAL FRAMING PLAN 1
D13-S-126	113 OF 503	LEVEL 6 - PARTIAL FRAMING PLAN 2
D13-S-127	114 OF 503	LEVEL 7 - PARTIAL FRAMING PLAN 1
D13-S-128	115 OF 503	LEVEL 7 - PARTIAL FRAMING PLAN 2
D13-S-129	116 OF 503	LEVEL 8 - PARTIAL FRAMING PLAN 1
D13-S-130	117 OF 503	LEVEL 8 - PARTIAL FRAMING PLAN 2
D13-S-400	118 OF 503	STAIR A / ELEVATOR FLOOR PLANS
D13-S-401	119 OF 503	STAIR A / ELEVATOR FLOOR PLANS
D13-S-402	120 OF 503	STAIR B FLOOR PLANS
D13-S-403	121 OF 503	STAIR C FLOOR PLANS
D13-S-404	122 OF 503	UTILITY ROOMS FLOOR PLANS
D13-A-001	123 OF 503	NOTES, ABBREVIATIONS, AND SYMBOLS
D13-A-002	124 OF 503	ARCHITECTURAL KEYNOTES BY DEFICIENCY
D13-A-101	125 OF 503	LEVEL 1 PARTIAL FLOOR PLAN 1
D13-A-102	126 OF 503	LEVEL 1 PARTIAL FLOOR PLAN 2
D13-A-103	127 OF 503	LEVEL 2 PARTIAL FLOOR PLAN 1
D13-A-104	128 OF 503	LEVEL 2 PARTIAL FLOOR PLAN 2
D13-A-105	129 OF 503	LEVEL 3 PARTIAL FLOOR PLAN 1
D13-A-106	130 OF 503	LEVEL 3 PARTIAL FLOOR PLAN 2
D13-A-107	131 OF 503	LEVEL 4 PARTIAL FLOOR PLAN 1
D13-A-108	132 OF 503	LEVEL 4 PARTIAL FLOOR PLAN 2
D13-A-109	133 OF 503	LEVEL 5 PARTIAL FLOOR PLAN 1
D13-A-110	134 OF 503	LEVEL 5 PARTIAL FLOOR PLAN 2
D13-A-111	135 OF 503	LEVEL 6 PARTIAL FLOOR PLAN 1
D13-A-112	136 OF 503	LEVEL 6 PARTIAL FLOOR PLAN 2
D13-A-113	137 OF 503	LEVEL 7 PARTIAL FLOOR PLAN 1
D13-A-114	138 OF 503	LEVEL 7 PARTIAL FLOOR PLAN 2
D13-A-115	139 OF 503	LEVEL 8 PARTIAL FLOOR PLAN 1
D13-A-116	140 OF 503	LEVEL 8 PARTIAL FLOOR PLAN 2
D13-A-401	141 OF 503	STAIR A/ ELEVATOR FLOOR PLANS
D13-A-402	142 OF 503	STAIR A/ ELEVATOR FLOOR PLANS

D13-A-403	143 OF 503	STAIR B FLOOR PLANS
D13-A-404	144 OF 503	STAIR C FLOOR PLANS
D13-A-501	145 OF 503	DOOR REPAIR SCHEDULE
D13-A-502	146 OF 503	TYPICAL REPAIR DETAILS
D13-A-503	147 OF 503	TYPICAL REPAIR DETAILS
D13-A-504	148 OF 503	TYPICAL REPAIR DETAILS
D13-A-601	149 OF 503	TYPICAL DEFICIENCY PHOTOGRAPHS BY KEYNOTE
D13-A-602	150 OF 503	TYPICAL DEFICIENCY PHOTOGRAPHS BY KEYNOTE
D13-A-603	151 OF 503	TYPICAL DEFICIENCY PHOTOGRAPHS BY KEYNOTE
D13-A-604	152 OF 503	TYPICAL DEFICIENCY PHOTOGRAPHS BY KEYNOTE
D13-P-001	153 OF 503	GENERAL AND KEYED NOTES, ABBREVIATIONS
D13-P-101	154 OF 503	LEVEL 1 PLUMBING REPAIR FLOOR PLAN
D13-P-102	155 OF 503	LEVEL 2 PLUMBING REPAIR FLOOR PLAN
D13-P-103	156 OF 503	LEVEL 3 PLUMBING REPAIR FLOOR PLAN
D13-P-104	157 OF 503	LEVEL 4 PLUMBING REPAIR FLOOR PLAN
D13-P-105	158 OF 503	LEVEL 5 PLUMBING REPAIR FLOOR PLAN
D13-P-106	159 OF 503	LEVEL 6 PLUMBING REPAIR FLOOR PLAN
D13-P-107	160 OF 503	LEVEL 7 PLUMBING REPAIR FLOOR PLAN
D13-P-108	161 OF 503	LEVEL 8 PLUMBING REPAIR FLOOR PLAN
D13-E-001	162 OF 503	GENERAL NOTES, ABBREVIATIONS, AND SYMBOL
D13-E-501	163 OF 503	LEVEL 1 LIGHTING AND POWER PLAN
D13-E-502	164 OF 503	LEVEL 2 LIGHTING AND POWER PLAN
D13-E-503	165 OF 503	LEVEL 3 LIGHTING AND POWER PLAN
D13-E-503	166 OF 503	LEVEL 4 LIGHTING AND POWER PLAN
D13-E-505	167 OF 503	LEVEL 5 LIGHTING AND POWER PLAN
D13-E-506	168 OF 503	LEVEL 6 LIGHTING AND POWER PLAN
D13-E-507	169 OF 503	LEVEL 7 LIGHTING AND POWER PLAN
D13-E-508	170 OF 503	LEVEL 8 LIGHTING AND POWER PLAN
D13-E-509	171 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
D13-E-510	172 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
D13-E-511	173 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
D13-E-512	174 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
		LARGO TOWN CENTER NORTH AND SOUTH PARKING GARAGES
G05-G-001	175 OF 503	WMATA SYSTEM MAP
G05-G-002	176 OF 503	INDEX OF DRAWINGS
G05-PP-101	177 OF 503	LEVEL 1 PHASING PLAN
G05-PP-102	178 OF 503	LEVEL 2 THROUGH LEVEL 5 TYPICAL PHASING PLAN
G05-PP-103	179 OF 503	LEVEL 6 PHASING PLAN

G05-PP-104	180 OF 503	BRIDGE PHASING PLAN
G05-PP-151	181 OF 503	LEVEL 2 - SUGGESTED PHASING PLAN
G05-PP-152	182 OF 503	LEVEL 3 - SUGGESTED PHASING PLAN
G05-PP-153	183 OF 503	LEVEL 4 - SUGGESTED PHASING PLAN
G05-PP-154	184 OF 503	LEVEL 5 - PHASING PLAN
G05-PP-155	185 OF 503	LEVEL 6 - PHASING PLAN
G05-S-001	186 OF 503	GENERAL STRUCTURAL NOTES
G05-S-002	187 OF 503	STRUCTURAL REPAIR KEY NOTES, ABBREVIATIONS AND SYMBOLS
G05-S-003	188 OF 503	GENERAL STRUCTURAL NOTES
G05-S-004	189 OF 503	STRUCTURAL REPAIR KEY NOTES, ABBREVIATIONS AND SYMBOLS
G05-S-101	190 OF 503	LEVEL 1 - FLOOR PLAN
G05-S-102	191 OF 503	LEVEL 2 - FLOOR PLAN
G05-S-103	192 OF 503	LEVEL 3 - FLOOR PLAN
G05-S-104	193 OF 503	LEVEL 4 - FLOOR PLAN
G05-S-105	194 OF 503	LEVEL 5 - FLOOR PLAN
G05-S-106	195 OF 503	LEVEL 6 - FLOOR PLAN
G05-S-107	196 OF 503	LEVEL 2 - FRAMING PLAN
G05-S-108	197 OF 503	LEVEL 3 - FRAMING PLAN
G05-S-109	198 OF 503	LEVEL 4 - FRAMING PLAN
G05-S-110	199 OF 503	LEVEL 5 - FRAMING PLAN
G05-S-111	200 OF 503	LEVEL 6 - FRAMING PLAN
G05-S-151	201 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 1
G05-S-152	202 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 2
G05-S-153	203 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 1
G05-S-154	204 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 2
G05-S-155	205 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 1
G05-S-156	206 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 2
G05-S-157	207 OF 503	LEVEL 5 - PARTIAL FLOOR PLAN 1
G05-S-158	208 OF 503	LEVEL 5 - PARTIAL FLOOR PLAN 2
G05-S-159	209 OF 503	LEVEL 6 - PARTIAL FLOOR PLAN 1
G05-S-160	210 OF 503	LEVEL 3 - PARTIAL FRAMING PLAN 1
G05-S-161	211 OF 503	LEVEL 3 - PARTIAL FRAMING PLAN 2
G05-S-162	212 OF 503	LEVEL 4 - PARTIAL FRAMING PLAN 1
G05-S-163	213 OF 503	LEVEL 4 - PARTIAL FRAMING PLAN 2
G05-S-164	214 OF 503	LEVEL 5 - PARTIAL FRAMING PLAN 1
G05-S-165	215 OF 503	LEVEL 5 - PARTIAL FRAMING PLAN 2
G05-S-166	216 OF 503	LEVEL 6 - PARTIAL FRAMING PLAN 1
G05-S-400	217 OF 503	STAIR A / ELEVATOR FLOOR PLANS

G05-S-401	218 OF 503	STAIR B FLOOR PLANS
G05-S-402	219 OF 503	UTILITY ROOMS FLOOR PLANS
G05-S-403	220 OF 503	BRIDGE FLOOR PLANS
G05-S-451	221 OF 503	STAIR C - FLOOR PLANS
G05-S-452	222 OF 503	STAIR D - FLOOR PLANS
G05-S-453	223 OF 503	STAIR E - FLOOR PLANS
G05N-A-001	224 OF 503	GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS
G05N-A-002	225 OF 503	ARCHITECTURAL KEYNOTES BY DEFICIENCY
G05N-A-101	226 OF 503	LEVEL 1 FLOOR PLAN
G05N-A-102	227 OF 503	LEVEL 2 - FLOOR PLAN
G05N-A-103	228 OF 503	LEVEL 3 - FLOOR PLAN
G05N-A-104	229 OF 503	LEVEL 4 - FLOOR PLAN
G05N-A-105	230 OF 503	LEVEL 5 - FLOOR PLAN
G05N-A-106	231 OF 503	LEVEL 6 - FLOOR PLAN
G05N-A-401	232 OF 503	STAIR A/ ELEVATOR FLOOR PLANS
G05N-A-402	233 OF 503	STAIR A/ ELEVATOR FLOOR PLANS
G05N-A-403	234 OF 503	STAIR B FLOOR PLANS
G05N-A-404	235 OF 503	ENLARGED ROOM PLANS
G05N-A-501	236 OF 503	DOOR REPAIR SCHEDULE
G05N-A-502	237 OF 503	TYPICAL REPAIR DETAILS
G05N-A-503	238 OF 503	TYPICAL REPAIR DETAILS
G05N-A-504	239 OF 503	TYPICAL REPAIR DETAILS
G05N-A-601	240 OF 503	TYPICAL DEFICIENCY PHOTOGRAPHS BY KEYNOTE
G05N-A-602	241 OF 503	TYPICAL DEFICIENCY PHOTOGRAPHS BY KEYNOTE
G05N-A-603	242 OF 503	TYPICAL DEFICIENCY PHOTOGRAPHS BY KEYNOTE
G05S-A-001	243 OF 503	NOTES, ABBREVIATIONS, AND SYMBOLS
G05S-A-002	244 OF 503	ARCHITECTURAL KEYNOTES BY DEFICIENCY
G05S-A-101	245 OF 503	LEVEL 2 PARTIAL FLOOR PLAN 1
G05S-A-102	246 OF 503	LEVEL 2 PARTIAL FLOOR PLAN 2
G05S-A-103	247 OF 503	LEVEL 3 PARTIAL FLOOR PLAN 1
G05S-A-104	248 OF 503	LEVEL 3 PARTIAL FLOOR PLAN 2
G05S-A-105	249 OF 503	LEVEL 4 PARTIAL FLOOR PLAN 1
G05S-A-106	250 OF 503	LEVEL 4 PARTIAL FLOOR PLAN 2
G05S-A-107	251 OF 503	LEVEL 5 PARTIAL FLOOR PLAN 1
G05S-A-108	252 OF 503	LEVEL 5 PARTIAL FLOOR PLAN 2
G05S-A-109	253 OF 503	LEVEL 6 FLOOR PLAN
G05S-A-401	254 OF 503	STAIR C/ELEVATOR - FLOOR PLANS
G05S-A-402	255 OF 503	STAIR C/ELEVATOR - FLOOR PLANS

G05S-A-403	256 OF 503	STAIR D - FLOOR PLANS
G05S-A-404	257 OF 503	STAIR E - FLOOR PLANS
G05S-A-405	258 OF 503	ENLARGED ROOM PLANS
G05S-A-501	259 OF 503	DOOR REPAIR SCHEDULE
G05S-A-502	260 OF 503	TYPICAL REPAIR DETAILS
G05S-A-503	261 OF 503	TYPICAL REPAIR DETAILS
G05S-A-504	262 OF 503	TYPICAL REPAIR DETAILS
G05S-A-601	263 OF 503	TYPICAL DEFICIENCY PHOTOGRAPHS BY KEYNOTE
G05S-A-602	264 OF 503	TYPICAL DEFICIENCY PHOTOGRAPHS BY KEYNOTE
G05S-A-603	265 OF 503	TYPICAL DEFICIENCY PHOTOGRAPHS BY KEYNOTE
G05S-A-604	266 OF 503	TYPICAL DEFICIENCY PHOTOGRAPHS BY KEYNOTE
G05-P-001	267 OF 503	GENERAL AND KEYED NOTES, ABBREVIATIONS
G05-P-002	268 OF 503	GENERAL AND KEYED NOTES, ABBREVIATIONS
G05-P-101	269 OF 503	LEVEL 1 LEVEL FLOOR PLAN
G05-P-102	270 OF 503	LEVEL 2 FLOOR PLAN
G05-P-103	271 OF 503	LEVEL 3 FLOOR PLAN
G05-P-104	272 OF 503	LEVEL 4 FLOOR PLAN
G05-P-105	273 OF 503	LEVEL 5 FLOOR PLAN
G05-P-106	274 OF 503	LEVEL 6 FLOOR PLAN
G05-P-151	275 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 1
G05-P-152	276 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 2
G05-P-153	277 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 1
G05-P-154	278 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 2
G05-P-155	279 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 1
G05-P-156	280 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 2
G05-P-157	281 OF 503	LEVEL 5 - PARTIAL FLOOR PLAN 1
G05-P-158	282 OF 503	LEVEL 5 - PARTIAL FLOOR PLAN 2
G05-P-159	283 OF 503	LEVEL 6 - PARTIAL FLOOR PLAN 1
G05-E-001	284 OF 503	GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS
G05-E-002	285 OF 503	GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS
G05-E-501	286 OF 503	LEVEL 1 LIGHTING AND POWER PLAN
G05-E-502	287 OF 503	LEVEL 2 LIGHTING AND POWER PLAN
G05-E-503	288 OF 503	LEVEL 3 LIGHTING AND POWER PLAN
G05-E-503	289 OF 503	LEVEL 4 LIGHTING AND POWER PLAN
G05-E-505	290 OF 503	LEVEL 5 LIGHTING AND POWER PLAN
G05-E-506	291 OF 503	LEVEL 6 LIGHTING AND POWER PLAN
G05-E-507	292 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
G05-E-508	293 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED

G05-E-509	294 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
G05-E-510	295 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
G05-E-511	296 OF 503	LEVEL 1 LIGHTING AND POWER PLAN
G05-E-512	297 OF 503	LEVEL 2 LIGHTING AND POWER PLAN
G05-E-513	298 OF 503	LEVEL 3 LIGHTING AND POWER PLAN
G05-E-514	299 OF 503	LEVEL 4 LIGHTING AND POWER PLAN
G05-E-515	300 OF 503	LEVEL 5 LIGHTING AND POWER PLAN
G05-E-516	301 OF 503	LEVEL 6 LIGHTING AND POWER PLAN
G05-E-517	302 OF 503	ELECTRICAL DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
G05-E-518	303 OF 503	ELECTRICAL DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
G05-E-519	304 OF 503	ELECTRICAL DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
G05-E-520	305 OF 503	ELECTRICAL DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
G05-E-521	306 OF 503	ELECTRICAL DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
G05-E-522	307 OF 503	ELECTRICAL DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
		WEST FALLS CHURCH PARKING GARAGE
K06-G-001	308 OF 503	WMATA SYSTEM MAP
K06-G-002	309 OF 503	INDEX OF DRAWINGS
K06-PP-101	310 OF 503	LEVEL 1 PHASING PLAN
K06-PP-102	311 OF 503	LEVEL 2 THROUGH LEVEL 5 TYPICAL PHASING PLAN
K06-PP-103	312 OF 503	LEVEL 6 PHASING PLAN
K06-S-001	313 OF 503	GENERAL STRUCTURAL NOTES
K06-S-002	314 OF 503	STRUCTURAL REPAIR KEY NOTES, ABBREVIATIONS AND SYMBOL
K06-S-101	315 OF 503	LEVEL 1 - PARTIAL FLOOR PLAN 1
K06-S-102	316 OF 503	LEVEL 1 - PARTIAL FLOOR PLAN 2
K06-S-103	317 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 1
K06-S-104	318 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 2
K06-S-105	319 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 1
K06-S-106	320 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 2
K06-S-107	321 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 1
K06-S-108	322 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 2
K06-S-109	323 OF 503	LEVEL 5 - PARTIAL FLOOR PLAN 1
K06-S-110	324 OF 503	LEVEL 5 - PARTIAL FLOOR PLAN 2
K06-S-111	325 OF 503	LEVEL 6 - PARTIAL FLOOR PLAN 1

K06-S-112	326 OF 503	LEVEL 6 - PARTIAL FLOOR PLAN 2
K06-S-113	327 OF 503	LEVEL 2 - PARTIAL FRAMING PLAN 1
K06-S-114	328 OF 503	LEVEL 2 - PARTIAL FRAMING PLAN 2
K06-S-115	329 OF 503	LEVEL 3 - PARTIAL FRAMING PLAN 1
K06-S-116	330 OF 503	LEVEL 3 - PARTIAL FRAMING PLAN 2
K06-S-117	331 OF 503	LEVEL 4 - PARTIAL FRAMING PLAN 1
K06-S-118	332 OF 503	LEVEL 4 - PARTIAL FRAMING PLAN 2
K06-S-119	333 OF 503	LEVEL 5 - PARTIAL FRAMING PLAN 1
K06-S-120	334 OF 503	LEVEL 5 - PARTIAL FRAMING PLAN 2
K06-S-121	335 OF 503	LEVEL 6 - PARTIAL FRAMING PLAN 1
K06-S-122	336 OF 503	LEVEL 6 - PARTIAL FRAMING PLAN 2
K06-S-400	337 OF 503	STAIR 1/ELEVATORS 1 & 2 FLOOR PLANS
K06-S-401	338 OF 503	STAIR 2 FLOOR PLANS
K06-S-402	339 OF 503	UTILITY ROOMS FLOOR PLANS
K06-A-001	340 OF 503	NOTES, ABBREVIATIONS, AND SYMBOLS
K06-A-002	341 OF 503	ARCHITECTURAL KEYED NOTES BY DEFICIENCY
K06-A-101	342 OF 503	LEVEL 1
K06-A-102	343 OF 503	LEVEL 2
K06-A-103	344 OF 503	LEVEL 3
K06-A-104	345 OF 503	LEVEL 4
K06-A-105	346 OF 503	LEVEL 5
K06-A-106	347 OF 503	LEVEL 6
K06-A-401	348 OF 503	STAIR 1 - FLOOR PLANS
K06-A-402	349 OF 503	STAIR 2 - FLOOR PLANS
K06-A-403	350 OF 503	ENLARGED ROOM PLANS
K06-A-501	351 OF 503	DOOR REPAIR SCHEDULE
K06-A-502	352 OF 503	TYPICAL REPAIR DETAILS
K06-A-503	353 OF 503	TYPICAL REPAIR DETAILS
K06-A-503	354 OF 503	TYPICAL REPAIR DETAILS
K06-A-601	355 OF 503	TYPICAL DEFICIENCY PHOTOGRAPHS BY KEYNOTE
K06-A-602	356 OF 503	TYPICAL DEFICIENCY PHOTOGRAPHS BY KEYNOTE
K06-A-603	357 OF 503	TYPICAL DEFICIENCY PHOTOGRAPHS BY KEYNOTE
K06-P-001	358 OF 503	GENERAL AND KEYED NOTES, ABBREVIATIONS
K06-P-101	359 OF 503	LEVEL 1 FLOOR PLAN
K06-P-102	360 OF 503	LEVEL 2 FLOOR PLAN
K06-P-103	361 OF 503	LEVEL 3 FLOOR PLAN
K06-P-104	362 OF 503	LEVEL 4 FLOOR PLAN
K06-P-105	363 OF 503	LEVEL 5 FLOOR PLAN

K06-P-106	364 OF 503	LEVEL 6 FLOOR PLAN
K06-E-001	365 OF 503	GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS
K06-E-501	366 OF 503	LEVEL 1 LIGHTING AND POWER PLAN
K06-E-502	367 OF 503	LEVEL 2 LIGHTING AND POWER PLAN
K06-E-503	368 OF 503	LEVEL 3 LIGHTING AND POWER PLAN
K06-E-504	369 OF 503	LEVEL 4 LIGHTING AND POWER PLAN
K06-E-505	370 OF 503	LEVEL 5 LIGHTING AND POWER PLAN
K06-E-506	371 OF 503	LEVEL 6 LIGHTING AND POWER PLAN
K06-E-507	372 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
K06-E-508	373 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
K06-E-509	374 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
K06-E-510	375 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
K06-E-511	376 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
K06-E-512	377 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
K06-E-513	378 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
		VIENNA NORTH PARKING GARAGE
K08-G-001	379 OF 503	WMATA SYSTEM MAP
K08-G-002	380 OF 503	INDEX OF DRAWINGS
K08-PP-101	381 OF 503	LEVEL 1 - SUGGESTED PHASING PLAN
K08-PP-102	382 OF 503	LEVEL 2 - SUGGESTED PHASING PLAN
K08-PP-103	383 OF 503	LEVEL 3 - SUGGESTED PHASING PLAN
K08-PP-104	384 OF 503	LEVEL 4 - SUGGESTED PHASING PLAN
K08-S-001	385 OF 503	GENERAL STRUCTURAL NOTES
K08-S-002	386 OF 503	GENERAL KEY NOTES, ABBREVIATIONS AND SYMBOLS
K08-S-101	387 OF 503	LEVEL 1 - PARTIAL FLOOR PLAN 1
K08-S-102	388 OF 503	LEVEL 1 - PARTIAL FLOOR PLAN 2
K08-S-103	389 OF 503	LEVEL 1 - PARTIAL FLOOR PLAN 3
K08-S-104	390 OF 503	LEVEL 1 - PARTIAL FLOOR PLAN 4
K08-S-105	391 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 1
K08-S-106	392 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 2
K08-S-107	393 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 3
K08-S-108	394 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 4
K08-S-109	395 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 1
K08-S-110	396 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 2
K08-S-111	397 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 3
K08-S-112	398 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 4
K08-S-113	399 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 1
K08-S-114	400 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 2

K08-S-115	401 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 3
K08-S-116	402 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 4
K08-S-117	403 OF 503	LEVEL 2 - PARTIAL FRAMING PLAN 1
K08-S-118	404 OF 503	LEVEL 2 - PARTIAL FRAMING PLAN 2
K08-S-119	405 OF 503	LEVEL 2 - PARTIAL FRAMING PLAN 3
K08-S-120	406 OF 503	LEVEL 2 - PARTIAL FRAMING PLAN 4
K08-S-121	407 OF 503	LEVEL 3 - PARTIAL FRAMING PLAN 1
K08-S-122	408 OF 503	LEVEL 3 - PARTIAL FRAMING PLAN 2
K08-S-123	409 OF 503	LEVEL 3 - PARTIAL FRAMING PLAN 3
K08-S-124	410 OF 503	LEVEL 3 - PARTIAL FRAMING PLAN 4
K08-S-125	411 OF 503	LEVEL 4 - PARTIAL FRAMING PLAN 1
K08-S-126	412 OF 503	LEVEL 4 - PARTIAL FRAMING PLAN 2
K08-S-127	413 OF 503	LEVEL 4 - PARTIAL FRAMING PLAN 3
K08-S-128	414 OF 503	LEVEL 4 - PARTIAL FRAMING PLAN 4
K08-S-201	415 OF 503	EXTERIOR - ELEVATIONS WEST AND SOUTH
K08-S-202	416 OF 503	EXTERIOR - ELEVATIONS EAST AND NORTH
K08-S-401	417 OF 503	STAIR #1 - ENLARGED FLOOR PLANS
K08-S-402	418 OF 503	STAIR #2 - ENLARGED FLOOR PLANS
K08-S-403	419 OF 503	STAIR #3 - ENLARGED FLOOR PLANS
K08-S-404	420 OF 503	STAIR #4 - ENLARGED FLOOR PLANS
K08-A-001	421 OF 503	NOTES, ABBREVIATIONS, AND SYMBOLS
K08-A-001	422 OF 503	ARCHITECTURAL KEYNOTES BY DEFICIENCY
K08-A-101	423 OF 503	LEVEL 1 - PARTIAL FLOOR PLAN 1
K08-A-102	424 OF 503	LEVEL 1 - PARTIAL FLOOR PLAN 2
K08-A-103	425 OF 503	LEVEL 1 - PARTIAL FLOOR PLAN 3
K08-A-104	426 OF 503	LEVEL 1 - PARTIAL FLOOR PLAN 4
K08-A-105	427 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 1
K08-A-106	428 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 2
K08-A-107	429 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 3
K08-A-108	430 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 4
K08-A-109	431 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 1
K08-A-110	432 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 2
K08-A-111	433 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 3
K08-A-112	434 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 4
K08-A-113	435 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 1
K08-A-114	436 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 2
K08-A-115	437 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 3
K08-A-116	438 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 4

K08-A-401	439 OF 503	STAIR 1 - FLOOR PLANS
K08-A-402	440 OF 503	STAIR 2 - FLOOR PLANS
K08-A-403	441 OF 503	STAIR 3 - FLOOR PLANS
K08-A-404	442 OF 503	STAIR 4 - FLOOR PLANS
K08-A-501	443 OF 503	DOOR REPAIR SCHEDULE
K08-A-502	444 OF 503	TYPICAL REPAIR DETAILS
K08-A-503	445 OF 503	TYPICAL REPAIR DETAILS
K08-A-504	446 OF 503	TYPICAL REPAIR DETAILS
K08-A-601	447 OF 503	TYPICAL DEFICIENCY PHOTOGRAPHS BY KEYNOTE
K08-A-602	448 OF 503	TYPICAL DEFICIENCY PHOTOGRAPHS BY KEYNOTE
K08-A-603	449 OF 503	TYPICAL DEFICIENCY PHOTOGRAPHS BY KEYNOTE
K08-P-001	450 OF 503	GENERAL AND KEYED NOTES, ABBREVIATION
K08-P-101	451 OF 503	LEVEL 1 - PARTIAL FLOOR PLAN 1
K08-P-102	452 OF 503	LEVEL 1 - PARTIAL FLOOR PLAN 2
K08-P-103	453 OF 503	LEVEL 1 - PARTIAL FLOOR PLAN 3
K08-P-104	454 OF 503	LEVEL 1 - PARTIAL FLOOR PLAN 4
K08-P-105	455 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 1
K08-P-106	456 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 2
K08-P-107	457 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 3
K08-P-108	458 OF 503	LEVEL 2 - PARTIAL FLOOR PLAN 4
K08-P-109	459 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 1
K08-P-110	460 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 2
K08-P-111	461 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 3
K08-P-112	462 OF 503	LEVEL 3 - PARTIAL FLOOR PLAN 4
K08-P-113	463 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 1
K08-P-114	464 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 2
K08-P-115	465 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 3
K08-P-116	466 OF 503	LEVEL 4 - PARTIAL FLOOR PLAN 4
K08-E-001	467 OF 503	GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS
K08-E-501	468 OF 503	LEVEL 1 - LIGHTING AND POWER PLAN A
K08-E-502	469 OF 503	LEVEL 1 - LIGHTING AND POWER PLAN B
K08-E-503	470 OF 503	LEVEL 2 - LIGHTING AND POWER PLAN A
K08-E-503	471 OF 503	LEVEL 2 - LIGHTING AND POWER PLAN B
K08-E-505	472 OF 503	LEVEL 3 - LIGHTING AND POWER PLAN A
K08-E-506	473 OF 503	LEVEL 3 - LIGHTING AND POWER PLAN B
K08-E-507	474 OF 503	LEVEL 4 - LIGHTING AND POWER PLAN A
K08-E-508	475 OF 503	LEVEL 4 - LIGHTING AND POWER PLAN B
K08-E-509	476 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED

K08-E-510	477 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
K08-E-511	478 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
K08-E-512	479 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
K08-E-513	480 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
K08-E-514	481 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
K08-E-515	482 OF 503	DEFICIENCY PHOTOGRAPHS & CORRECTIVE ACTIONS REQUIRED
		TYPICAL DRAWINGS
G-002	483 OF 503	DRAWING INDEX
S-501	484 OF 503	TYPICAL REPAIR DETAILS 1 OF 19
S-502	485 OF 503	TYPICAL REPAIR DETAILS 2 OF 19
S-503	486 OF 503	TYPICAL REPAIR DETAILS 3 OF 19
S-504	487 OF 503	TYPICAL REPAIR DETAILS 4 OF 19
S-505	488 OF 503	TYPICAL REPAIR DETAILS 5 OF 19
S-506	489 OF 503	TYPICAL REPAIR DETAILS 6 OF 19
S-507	490 OF 503	TYPICAL REPAIR DETAILS 7 OF 19
S-508	491 OF 503	TYPICAL REPAIR DETAILS 8 OF 19
S-509	492 OF 503	TYPICAL REPAIR DETAILS 9 OF 19
S-510	493 OF 503	TYPICAL REPAIR DETAILS 10 OF 19
S-511	494 OF 503	TYPICAL REPAIR DETAILS 11 OF 19
S-512	495 OF 503	TYPICAL REPAIR DETAILS 12 OF 19
S-513	496 OF 503	TYPICAL REPAIR DETAILS 13 OF 19
S-514	497 OF 503	TYPICAL REPAIR DETAILS 14 OF 19
S-515	498 OF 503	TYPICAL REPAIR DETAILS 15 OF 19
S-516	499 OF 503	TYPICAL REPAIR DETAILS 16 OF 19
S-517	500 OF 503	TYPICAL REPAIR DETAILS 17 OF 19
S-518	501 OF 503	TYPICAL REPAIR DETAILS 18 OF 19
S-519	502 OF 503	TYPICAL REPAIR DETAILS 19 OF 19
P-500	503 OF 503	TYPICAL PLUMBING REPAIR DETAILS

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX F

MEASUREMENT OF QUANTITIES

PART 2 GENERAL

2.01 SUMMARY

A. Related Documents, Contract Documents, this Section and other sections of the Specifications, and Drawings apply to entire Work of the Contract.

PART 3 MEASUREMENT OF QUANTITIES

3.01 LUMP SUM PAYMENT ITEMS

A. Lump sum items quantities will not be measured for payment. Work items to be undertaken on a lump sum basis at each parking garage include but are not limited to the following:

Quality Control

a. This work item will not be measured for payment. It will be undertaken on a lump sum basis and the bidder shall provide a lump sum price for each of the six parking structures.

Mobilization

a. This work item will not be measured for payment. It will be undertaken on a lump sum basis and the bidder shall provide a lump sum price for each of the six parking structures.

West Falls Church Parking Garage Lump Sum items include:

a. Repair Key Note 1A as shown on Drawing K06-A-002, corrosion on door, replace in kind.
b. Repair Key Note 7B as shown on Drawing K06-A-002, replace missing sign in kind.
c. Repair Key Note 8F as shown on Drawing K06-A-002, a stained and vandalized door and frame, power wash and repaint.
d. Cleaning and priming of existing exposed reinforcing steel in structural concrete element at underside of surfaces of structural decks.
e. Power wash seepage areas at underside.
f. Cleaning of drains.
g. Removal of loose and/or detached joint backer rods.
h. General lighting repairs and replacements.
i. General electrical conduit, receptacle, panel board repairs.
j. Emergency lighting system repairs and replacements.

White Flint Garage Lump Sum items include:

a. Repair Key Note 1A as shown on Drawing A014-A-002, corrosion on door, replace in kind.
b. Repair Key Note 1E as shown on Drawing A014-A-002, corrosion on pipe guard.

c. Repair Key Note 1F as shown on Drawing A014-A-002, corrosion on handrail.
d. Repair Key Note 7H as shown on Drawing A014-A-002, missing traffic delineator.
e. Cleaning and priming of existing exposed reinforcing steel in structural concrete element at underside of surfaces of structural decks.
f. Power wash seepage areas at underside.
g. Cleaning of drains.
h. Removal of loose and/or detached joint backer rods.
i. General lighting repairs and replacements.
j. General electrical conduit, receptacle, panel board repairs.

New Carrollton Garage Lump Sum items include:

a. Repair Key Note 1A as shown on Drawing D13-A-002, corrosion on door, replace in kind.
b. Repair Key Note 1F as shown on Drawing D013-A-002, corrosion on handrail.
c. Cleaning and priming of existing exposed reinforcing steel in structural concrete element at underside of surfaces of structural decks.
d. Power wash seepage areas at underside.
e. Cleaning of drains.
f. Removal of loose and/or detached joint backer rods.
g. General lighting repairs and replacements.

Largo South Parking Garage Lump Sum items include:

a. Repair Key Note 4A as shown on Drawing G05-A-002, chipped/ peeled paint on bollard.
b. Repair Key Note 4G as shown on Drawing G05-A-002, chipped/ peeled paint on clearance bar.
c. Cleaning and priming of existing exposed reinforcing steel in structural concrete element at underside of surfaces of structural decks.
d. Power wash seepage areas at underside.
e. Cleaning of drains.
f. Removal of loose and/or detached joint backer rods.
g. General lighting repairs and replacements.
h. General electrical conduit, receptacle, panel board repairs.

Largo North and Vienna Parking Garage Lump Sum items include:

a. Cleaning and priming of existing exposed reinforcing steel in structural concrete element at underside of surfaces of structural decks.
b. Power wash seepage areas at underside.
c. Cleaning of drains.
d. Removal of loose and/or detached joint backer rods.
e. General lighting repairs and replacements.

General electrical conduit, receptacle, panel board repairs.

Emergency lighting system repairs and replacements.

General electrical conduit, receptacle, panel board repairs.

Emergency lighting system repairs and replacements.

3.02 UNIT PRICE PAYMENT ITEMS

A. The exact location and quantity of work to be performed on a unit price basis has been estimated but is not fully known and will be identified as the Contract work progresses. The Quality Control Engineer or the AR will identify areas where unit price work is to be performed based on sounding and lay-out performed by the Contractor and notify the Contractor.

B. Components of work to be undertaken for this contract will be performed on either lump sum (LS) basis or unit price basis. Elements of work to be undertaken on a lump sum basis at each parking garage are defined on both the Bid Price of the specifications and on the compilation of quantities for each garage included on the contract drawings.

Work to be performed on a unit price basis shall be measured according to the methods described below. Basis of payment for some type of details is also indicated in the plans. Payment for unit price work will be made for work actually performed based on quantities recorded by the Contractor and reviewed and verified by the Quality Control Engineer or the AR. Unless stated otherwise, records shall consist of drawings showing the areas repaired with dimensions and a cumulative record of quantities repaired.

1. All Garages Unit Price items include:
   c. Typical Expansion Joint Repair, See Detail 1/S501. Repair expansion joints in accordance with Specification Section 03010 at all tooled joints as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The length of the joints repaired will be measured to the nearest inch and recorded on the as-built drawings. The length of each repaired joint shall be reported in linear feet (LF) to the nearest on linear foot.
   d. Typical Sealant Repair At Tooled Joint, See Detail 2/S501. Replace sealant in tooled joints in accordance with Specification Section 07920 at all tooled joints as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The length of the joints replaced will be measured to the nearest inch and recorded on the as-built drawings. The length of each repaired joint shall be reported in linear feet (LF) to the nearest on linear foot.
   e. Typical Sealant Repair At Double Tee Beam Joint, See Detail 3/S502. Replace sealant in joints in accordance with Specification Section 07920 at all Double Tee Beam joints as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The length of the joints replaced will be measured to the nearest inch and recorded on the as-built drawings. The length of each repaired joint shall be reported in linear feet (LF) to the nearest on linear foot.

f. Typical Double Tee Beam Flange Spall With Sealant Detail, See Detail 4/S502. Repair surfaces in accordance with Specification Section 07920 at all spalled areas as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of deteriorated concrete will be measured to the nearest square foot and recorded on the as-built drawings. The area of each repaired spall shall be reported in square feet (SF) to the nearest one square foot.
g. Typical Double Tee Beam Flange Spall Repair Detail, See Detail 5/S504. Repairs spalls in accordance with Specification Section 03010 at all spalled areas as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of repaired concrete will be measured to the nearest square foot and recorded on the as-built drawings. The area of each repaired spall shall be reported in square feet (SF) to the nearest one square foot.
h. Typical Vertical Joint Sealant Repair, See Detail 6/S503. Replace joints in accordance with Specification Section 07920 at all vertical joints as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The length of the joints repaired will be measured to the nearest inch and recorded on the as-built drawings. The length of each repaired joint shall be reported in linear feet (LF) to the nearest one linear foot.
i. Typical Underside Crack Repair, See Detail 7/S504. Repair cracks on underside surfaces with epoxy injection in accordance with Specification Section 03010 at all cracks as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The length of the cracks repaired will be measured to the nearest inch and recorded on the as-built drawings. The length of each repaired crack shall be reported in linear feet (LF) to the nearest one linear foot.
j. Typical Top Side Crack Repair, See Detail 8/S504. Repair cracks on surfaces with epoxy in accordance with Specification Section 03010 at all cracks as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The length of the cracks repaired will be measured to the nearest inch and recorded on the as-built drawings. The length of each repaired crack shall be reported in linear feet (LF) to the nearest on linear foot.
k. Typical Vertical Crack Repair, See Detail 9/S505. Repair cracks on vertical surfaces with epoxy injection in accordance with Specification Section 03010 at all cracks as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The length of the cracks repaired will be measured to the nearest inch and recorded on the as-built drawings. The length of each repaired crack shall be reported in linear feet (LF) to the nearest on linear foot.
l. Typical Vertical Spall Repair, See Detail 10/S505. Repair spalls on vertical surfaces in accordance with Specification Section 03010 at all spalls as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of deteriorated concrete will be measured to the nearest square foot and recorded on the as-built drawings. The area of

each repaired spall shall be reported in square feet (SF) to the nearest on one square foot.

m. Typical Concrete Top Side Spall Repair, See Detail 11 On Drawing S-506. Repair of spalls on surfaces in accordance with Specification Section 03010 at all spalls as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of deteriorated concrete will be measured to the nearest square foot and recorded on the as-built drawings. The area of each repaired spall shall be reported in square feet (SF) to the nearest on one square foot.
n. Typical Deep Spall Repair At Underside Of Concrete Deck, See Detail 12/S506. Repair of spalls on underside surfaces in accordance with Specification Section 03010 at all deep spalls as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of deteriorated concrete will be measured to the nearest square foot and recorded on the as-built drawings. The area of each repaired spall shall be reported in square feet (SF) to the nearest on one square foot.
o. Typical Shallow Spall Repair At Underside Of Concrete Deck, See Detail 13/S507. Repair spalls on underside surfaces in accordance with Specification Section 03010 at all shallow spalls as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of deteriorated concrete will be measured to the nearest square foot and recorded on the as-built drawings. The area of each repaired spall shall be reported in square feet (SF) to the nearest on one square foot.
p. Typical Repair At Horizontal Lifting Point, See Detail 14/S507. Repair to horizontal lifting points on surfaces in accordance with Specification Section 03010 at all lifting points as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of deteriorated concrete will be measured to the nearest square foot and recorded on the as-built drawings. The area of each repaired lifting point shall be reported in square feet (SF) to the nearest on one square foot.
q. 15
r. Typical Double Tee Web Spall Repair, See Detail 16/S508. Repair spalls on vertical web surfaces in accordance with Specification Section 03010 at all spalls as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of repaired concrete will be measured to the nearest square foot and recorded on the as-built drawings. The area of each repaired spall shall be reported in square feet (SF) to the nearest on one square foot.
s. Typical Connection Plate Repair, See Detail 17/S509. Repairs on surfaces in accordance with Specification Section 03010 at all connection plates as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of deteriorated concrete will be measured to the nearest square foot and recorded on the as-built drawings. The area of each repaired spall shall be reported in square feet (SF) to the nearest on one square foot.
t. Typical Double Tee Bearing Pad Replacement, See Detail 18/S510. Replacement of double tee bearing in accordance with Specification

Sections 02250 and 03010 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The number of bearings replaced will be measured each and recorded on the as-built drawings. The number of each replaced bearing shall be reported each (EA).

u. Typical Uneven Joint At Double Tee Flanges, See Detail 19/S510. Repair to remove uneven surfaces at joints in accordance with Specification Section 03010 at all spalls as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of removed concrete will be measured to the nearest square foot and recorded on the as-built drawings. The area of each repaired spall shall be reported in square feet (SF) to the nearest on one square foot.

v. Typical CMU Wall Crack Repair At Double Tee, See Detail 21/S512. Repairs on surfaces with cracks in accordance with Specification Sections 04200 and 07840 at all cracks as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The length of the cracks repaired will be measured to the nearest inch and recorded on the as-built drawings. The length of each repaired crack shall be reported in linear feet (LF) to the nearest on linear foot.

w. 22

x. Typical Traffic Topping System Repair, See Detail 23/S513. Surface preparation and application of urethane traffic bearing topping at roof level, stairwells, elevator landings and above office rooms. Concrete preparation work shall include removal of sharp edges and uneven joints by method of grinding. The area of urethane traffic bearing topping will be measured to the nearest square feet and recorded on the as-built drawings. The area of urethane traffic bearing topping application shall be reported in square feet (SF) to the nearest one square foot.

y. 24

z. Install New Plastic Cap At Vertical Lifting Point, See Detail 25/S514. Replace missing plastic caps on surfaces as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The length of the cracks repaired will be measured to the nearest inch and recorded on the as-built drawings. The length of each replaced cap shall be reported each (EA).

aa. Locations Marked On Plans With Ponding Area Shall Be Cleaned And Repaired With Concrete Topping To Provide Appropriate Drainage Slope, See Detail 26/S514. Repair to areas with ponding in accordance with Specification Section 03010 at all locations as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of repaired concrete will be measured to the nearest square foot and recorded on the as-built drawings. The area of each repaired curb shall be reported in square feet (SF) to the nearest on one square foot.

bb. 27

cc. Locations Marked On Plans With Mortar/Grout Deterioration And Cracked CMU Shall Be Retooled/Regrouted And Replace Cracked CMU Block, See Detail 28/S514. Repairs on surfaces with missing mortar or grout and/or cracked CMU’s in accordance with Specification Section 04200 at all cracks as indicated in the Project Drawings and as directed by Quality Control

Engineer or the AR. The length of the replacement grout/mortar and cracks repaired will be measured to the nearest inch and recorded on the as-built drawings. The length of each repaired crack shall be reported in linear feet (LF) to the nearest on linear foot.

dd. Locations Marked On Plans With Connection Plate Corrosion Shall Be Cleaned And Sealed By Applying Epoxy Sealant To The Areas Marked, See Detail 29/S515. Repairs on surfaces in accordance with Specification Section 03010 at all connection plates as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of corrosion will be measured to the nearest square feet and recorded on the as-built drawings. The area of each repaired area shall be reported in square feet (SF) to the nearest on one square foot.

ee. Locations Marked On Plans With Map Cracking Or Honeycomb Shall Be Cleaned And Coated With Waterproofing, See Detail 30/S515. Repairs on surfaces in accordance with Specification Section 07190 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of deteriorated concrete will be measured to the nearest square feet and recorded on the as-built drawings. The area of each repaired area shall be reported in square feet (SF) to the nearest on one square foot.

ff. Locations Marked On Plans With Water Leaking On Wall Shall Be Cleaned And Any Deteriorated Joint Shall Be Repaired, See Detail 31/S515. Repairs on surfaces in accordance with Specification Section 03010 at areas of leakage as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of cleaned concrete will be measured to the nearest square feet and recorded on the as-built drawings. The area of each repaired lifting point shall be reported in square feet (SF) to the nearest on one square foot.

gg. Locations Marked On Plans With Corroded/Missing Anchor Bolts Shall Be Installed With New Anchor Bolts And Painted, See Detail 32/S515. Repairs on surfaces in accordance with Specification Section 03010 at all locations of missing/corroded anchor bolts as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of deteriorated concrete will be measured each and recorded on the as-built drawings. The number of each repaired connection shall be reported each (EA).

hh. Replace Parking Garage Stop Curb, See Detail 33/S516. Replacement of wheel stops on surfaces in accordance with Specification Section 03010 at as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of deteriorated concrete will be measured each and recorded on the as-built drawings. The number of each repaired connection shall be reported each (EA).

ii. Locations Marked On Plans With Displaced Angle/Missing Anchor At Expansion Joint Support Shall Be Realigned And Installed With New Anchor And Paint, See Detail 34/S516. Repairs to anchors in accordance with Specification Sections 03010 and 09970 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of deteriorated anchors will be measured each and recorded on the as-built drawings. The number of each repaired anchor shall be reported each (EA).

jj. 35

kk. Typical Repair At Crack Parallel To Expansion Joint, See Detail 36/S517. Repairs to cracks in accordance with Specification Section 03010 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of repaired cracks will be measured each and recorded on the as-built drawings. The number of each repaired crack shall be reported each (EA).

ll. Typical Inverted Tee Spall Repair, See Detail 37/S517. Repair to spalled concrete in inverted tees in accordance with Specification Section 03010 at all locations as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of repaired concrete will be measured to the nearest square foot and recorded on the as-built drawings. The area of each repaired spall shall be reported in square feet (SF) to the nearest on one square foot.

mm. Typical Stair Nosing Repair, See Detail 38/S518, Repair to deteriorated concrete stairs and nosings in accordance with Specification Section 03010 at all locations as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of repaired concrete will be measured to the nearest square foot and recorded on the as-built drawings. The area of each repaired stair shall be reported in square feet (SF) to the nearest on one square foot.

nn. Typical Silane Sealer Coating System, See Detail 39/S519. Coating on surfaces in accordance with Specification Section 07190 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The area of deteriorated concrete will be measured to the nearest square feet and recorded on the as-built drawings. The area of each coated area shall be reported in square feet (SF) to the nearest on one square foot.

oo. Typical Minor Longitudinal Crack At Underside Of Double Tee, See Detail 40/S519. Repairs on surfaces with epoxy in accordance with Specification Section 03010 at all cracks as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The length of the cracks repaired will be measured to the nearest inch and recorded on the as-built drawings. The length of each repaired crack shall be reported in linear feet (LF) to the nearest on linear foot.

pp. Corrosion On Door 1A, See Dwg. A-002. Replace door in kind in accordance with Specification Sections 08110, 08120 and 08710. as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The replaced doors will be measured as the number of replaced as a piece and recorded on the as-built drawings. The number of repaired pieces shall be reported as pieces (PCS).

qq. Corrosion On Door Frame 1B. Replace door frame in kind in accordance with Specification Sections 08110, 08120 and 08710. as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The replaced door frames will be measured as the number of replaced as a piece and recorded on the as-built drawings. The number of repaired pieces shall be reported as pieces (PCS).

rr. 1C

ss. Corrosion On Bollard 1D, See Dwg. A-002. Repairs on surfaces with corrosion in accordance with Specification Section 09970 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of pieces repaired and recorded on the as-built drawings. The number of repaired pieces shall be reported as pieces (PCS).

tt. Corrosion On Pipe Guard 1E, See Dwg. A-002. Repairs on surfaces with corrosion in accordance with Specification Section 09970 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of pieces repaired and recorded on the as-built drawings. The number of repaired pieces shall be reported as pieces (PCS).

uu. Corrosion On Handrail Key Note 1F, see dwg. A-002. Repairs on surfaces with corrosion in accordance with Specification Section 09970 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The length of repaired handrail will be measured to the nearest inch and recorded on the as-built drawings. The length of each repaired handrail shall be reported in linear feet (LF) to the nearest on linear foot.

vv. Corrosion On Guardrail 1G, See Dwg. A-002. Repairs on surfaces with corrosion in accordance with Specification Section 09970 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of pieces repaired and recorded on the as-built drawings. The number of repaired pieces shall be reported as pieces (PCS).

ww. 1H

xx. Corrosion On Ramp Edge Key Note 1I, See Dwg. A-002. Repairs on surfaces with corrosion in accordance with Specification Section 09970 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repainted ramp edge will be measured as the number of lineal feet and recorded on the as-built drawings. The number of repainted areas shall be reported as lineal feet (LF).

yy. Corrosion On Sign Post 1J, See Dwg. A-002. Repairs on surfaces with corrosion in accordance with Specification Section 09970 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of pieces repaired and recorded on the as-built drawings. The number of repaired pieces shall be reported as pieces (PCS).

zz. Corrosion On Storefront Mullions 1K See Dwg. A-002. Repairs on surfaces with corrosion in accordance with Specification Section 09970 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repainted storefront mullions will be measured as the number of lineal feet reattached and recorded on the as-built drawings. The number of repainted storefront mullions shall be reported as lineal feet (LFT).

aaa. Corrosion On Gate Booth 1L, See Dwg. A-002. Repairs on surfaces with corrosion in accordance with Specification Section 09970 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repainted gatebooth will be measured as the number of lineal feet and

recorded on the as-built drawings. The number of repainted storefront mullions shall be reported as lineal feet (LFT).

bbb. Corrosion On Flashing 1M, See Dwg. A-002. Replace flashing in kind in accordance with Specification Section 07620. as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The replaced flashing will be measured as the number of lineal feet replaced and recorded on the as-built drawings. The number of replaced flashing shall be reported as lineal feet (LFT).

ccc. Misaligned Exit Gate Key Note 2A See Dwg. A-002. Realign misaligned gate as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The replaced doors will be measured as the number of pieces replaced and recorded on the as-built drawings. The number of replaced pieces shall be reported as pieces (PCS).

ddd. Dislodged Signpost 2B, See Dwg. A-002. Repairs to dislodged sign posts in accordance with Specification Section 05500 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of pieces repaired and recorded on the as-built drawings. The number of repaired pieces shall be reported as pieces (PCS).

eee. Damaged/ Misaligned Door 2C, See Dwg. A-002. Replace damaged/ misaligned doors in accordance with Specification Sections 08110, 08120 and/or 08710 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The replaced doors will be measured as the number of pieces replaced and recorded on the as-built drawings. The number of replaced pieces shall be reported as pieces (PCS).

fff. Damaged/ Misaligned Door Closer 2D, See Dwg. A-002. Repair damaged/ misaligned door closers in accordance with Specification Sections 08110, 08120 and/or 08710 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired doors will be measured as the number of pieces repaired and recorded on the as-built drawings. The number of repaired pieces shall be reported as pieces (PCS).

ggg. Dislodged Wheel Stop 2E, See Dwg. A-002. Realign Dislodged Wheel stops as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired wheel stops will be measured as the number of pieces realigned and recorded on the as-built drawings. The number of repaired pieces shall be reported as pieces (PCS).

hhh. Impact Damage To Flashing 2F, See Dwg. A-002. Replace flashing in kind in accordance with Specification Section 07620. as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The replaced flashing will be measured as the number of lineal feet replaced and recorded on the as-built drawings. The number of replaced flashing shall be reported as lineal feet (LFT).

iii. Dislodged/ Misaligned Hanging Sign, Key Note 2G See Dwg. A-002. Replace sign in kind as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The replaced signs will be measured as the number of replaced as a piece and recorded on the as-built drawings. The number of repaired pieces shall be reported as pieces (PCS).

jjj. Misaligned Threshold, Key Note 2H See Dwg. A-002. Replace threshold in kind as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The replaced thresholds will be measured as the number of replaced as a piece and recorded on the as-built drawings. The number of repaired pieces shall be reported as pieces (PCS).

kkk. Detached Storefront Mullions 3A, See Dwg. A-002. Reattach detached storefront as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The reattached storefront will be measured as the number of lineal feet reattached and recorded on the as-built drawings. The number of reattached shall be reported as lineal feet (LFT).

lll. Damaged Chain Link Fence 3B, See Dwg. A-002 SF Repair surfaces with chipped/peeled paint in accordance with Specification Section 09970 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured to the nearest square feet and recorded on the as-built drawings. The area of each coated area shall be reported in square feet (SF) to the nearest on one square foot.

mmm. Detached/Missing Tension Bar Key Note 3C See Dwg. A-002. Replace tension bar in kind in accordance with Specification Section 05500 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The replaced tension bar will be measured as the number of replaced as a piece and recorded on the as-built drawings. The number of repaired pieces shall be reported as pieces (PCS).

nnn. Detached Safety Strip 3D, See Dwg. A-002. Replace safety strip in accordance with Specification Sections 08110, 08120 and 08710. as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The replaced Safety Strip will be measured as the number replaced as a piece and recorded on the as-built drawings. The number of repaired pieces shall be reported as pieces (PCS).

ooo. Chipped/ Peeled Paint On Bollard 4A, See Dwg. A-002. Repair surfaces with chipped/peeled paint in accordance with Specification Section 09970 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of pieces repaired and recorded on the as-built drawings. The number of repaired pieces shall be reported as pieces (PCS).

ppp. Chipped/ Peeled Paint On Pipe Guard 4B, See Dwg. A-002. Repair surfaces with chipped/peeled paint in accordance with Specification Section 09970 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of pieces repaired and recorded on the as-built drawings. The number of repaired pieces shall be reported as pieces (PCS).

qqq. Chipped/ Peeled Paint On Handrail 4C, See Dwg. A-002. Repair surfaces with chipped/peeled paint in accordance with Specification Section 09970 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured to the nearest square feet and recorded on the as-built drawings. The area of each coated area shall be reported in square feet (SF) to the nearest on one square foot.

rrr. Chipped/ Peeled Paint On Guardrail 4D, See Dwg. A-002. Repair surfaces with chipped/peeled paint in accordance with Specification Section 09970 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repainted guardrail will be measured as the number of lineal feet and recorded on the as-built drawings. The number of repainted guardrail shall be reported as lineal feet (LFT).

sss. Chipped/ Peeled Paint On Walls, Key Note 4F See Dwg. A-002. Repair surfaces with chipped/peeled paint in accordance with Specification Section 09970 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured to the nearest square feet and recorded on the as-built drawings. The area of each coated area shall be reported in square feet (SF) to the nearest on one square foot.

ttt. Chipped/ Peeled Paint On Lightwall Bar 4H, See Dwg. A-002. Repair surfaces with chipped/peeled paint in accordance with Specification Section 09970 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured to the nearest square feet and recorded on the as-built drawings. The area of each coated area shall be reported in square feet (SF) to the nearest on one square foot.

uuu. Faded Or Missing Pavement Stop Bar 5A, See Dwg. A-002. Repair surfaces with faded or missing pavement paint in accordance with Specification Section 09910 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured to the nearest square feet and recorded on the as-built drawings. The area of each coated area shall be reported in square feet (SF) to the nearest on one square foot.

vvv. Faded Or Double ADA Pavement Marking 5B, See Dwg. A-002. Repair surfaces with faded or missing pavement paint in accordance with Specification Section 09910 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The The repaired area will be measured as the number of pieces repaired and recorded on the as-built drawings. The number of repaired pieces shall be reported as pieces (PCS).

www. Faded Or Double-Parking Stripe 5C, See Dwg. A-002. Repair surfaces with faded pavement paint in accordance with Specification Section 09910 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured to the nearest square feet and recorded on the as-built drawings. The area of each coated area shall be reported in square feet (SF) to the nearest on one square foot.

xxx. Faded No Parking Striping 5D, See Dwg. A-002. Repair surfaces with faded pavement paint in accordance with Specification Section 09910 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured to the nearest square feet and recorded on the as-built drawings. The area of each coated area shall be reported in square feet (SF) to the nearest on one square foot.

yyy. Faded Or Unreadable Sign 5E, See Dwg. A-002. Replace sign in kind in accordance with Specification Section 09970 as indicated in the Project

Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of pieces replaced and recorded on the as-built drawings. The number of replaced pieces shall be reported as pieces (PCS).

zzz. Faded Or Missing Pavement Arrows 5F, See Dwg. A-002. Repair surfaces with faded or missing pavement paint in accordance with Specification Section 09910 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repainted area will be measured as the number of lineal feet and recorded on the as-built drawings. The number of repainted arrows shall be reported as lineal feet (LF).

aaaa. Faded Or Scratched Curb Paint 5G, See Dwg. A-002. Repair surfaces with faded or missing curb paint in accordance with Specification Section 09910 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repainted area will be measured as the number of lineal feet and recorded on the as-built drawings. The number of repainted arrows shall be reported as lineal feet (LF).

bbbb. Faded Crosswalk 5H, See Dwg. A-002. Repair surfaces with faded pavement paint in accordance with Specification Section 09910 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured to the nearest square feet and recorded on the as-built drawings. The area of each coated area shall be reported in square feet (SF) to the nearest one square foot.

cccc. Damaged Sealant 6A, See Dwg. A-002. Replace damaged sealant in joints in accordance with Specification Section 07920 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The length of the joints repaired will be measured to the nearest inch and recorded on the as-built drawings. The length of each repaired joint shall be reported in linear feet (LF) to the nearest linear foot.

dddd. Detached Weather Stripping, Key Note 6B See Dwg. A-002. Reinstall detached weather stripping as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The length of the weather stripping repaired will be measured to the nearest inch and recorded on the as-built drawings. The length of each repaired weather stripping shall be reported in linear feet (LF) to the nearest linear foot.

eeee. Missing Acoustical Ceiling Tiles, Key Note 7A See Dwg. A-002. Replace missing ceiling tiles in accordance with Specification Section 09511 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured to the nearest square feet and recorded on the as-built drawings. The area of each repaired area shall be reported in square feet (SF) to the nearest one square foot.

ffff. Missing Sign 7B, See Dwg. A-002. Replace sign in kind in accordance with Specification Section 09970 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of pieces replaced and recorded on the as-built drawings. The number of replaced pieces shall be reported as pieces (PCS).

gggg. Missing Hardware 7C, See Dwg. A-002. Replace missing hardware in kind in accordance with Specification Section 08710 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The replaced hardware will be measured as the number of sets replaced and recorded on the as-built drawings. The number of replaced sets shall be reported as sets (SET).

hhhh. 7D

iiii. Missing Kickplate Key Note 7E See Dwg. A-002. Replace kickplate in kind as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of pieces replaced and recorded on the as-built drawings. The number of replaced pieces shall be reported as pieces (PCS).

jjjj. Missing Wall Ties Key Note 7G See Dwg. A-002. Replace missing wall ties in accordance with Specification Section 09320 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured to the nearest square feet and recorded on the as-built drawings. The area of each repaired area shall be reported in square feet (SF) to the nearest one square foot.

kkkk. Missing Traffic Delineator 7H, See Dwg. A-002. Replace delineator in kind as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of pieces replaced and recorded on the as-built drawings. The number of replaced pieces shall be reported as pieces (PCS).

llll. Stained/ Vandalized Sign, Key Note 8A See Dwg. A-002. Power wash surfaces of stained/vandalized walls as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The cleaned area will be measured as the number of pieces replaced and recorded on the as-built drawings. The number of cleaned pieces shall be reported as pieces (PCS).

mmmm. Stained/ Vandalized Wall 8B, See Dwg. A-002. Power wash surfaces of stained/vandalized walls as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The cleaned area will be measured to the nearest square feet and recorded on the as-built drawings. The area of each cleaned area shall be reported in square feet (SF) to the nearest on one square foot.

nnnn. Stained Ceiling Tile, Key Note 8C See Dwg. A-002. Replace stained ceiling tiles in accordance with Specification Section 09511 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured to the nearest square feet and recorded on the as-built drawings. The area of each repaired area shall be reported in square feet (SF) to the nearest one square foot.

oooo. Stained Or Worn Out Flooring 8D, See Dwg. A-002. Replace stained or worn out flooring in accordance with Specification Section 09650 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured to the nearest square feet and recorded on the as-built drawings. The area of each coated area shall be reported in square feet (SF) to the nearest one square foot.

pppp. Stained/ Vandalized Booth 8E, See Dwg. A-002. Power wash surfaces of stained/vandalized booths as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The cleaned area will be measured as the number of pieces cleaned and recorded on the as-built drawings. The number of pieces cleaned area shall be reported in pieces (PCS).

qqqq. Stained/ Vandalized Door And Frame, Key Note 8F See Dwg. A-002. Power wash and repaint doors and frames in accordance with Specification Section 09900 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured to the nearest square feet and recorded on the as-built drawings. The area of each repaired area shall be reported in square feet (SF) to the nearest one square foot.

rrrr. Wasp/Bird Nest, Key Note 9A See Dwg. A-002. Remove wasp/bird nests as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The cleaned area will be measured as the number of pieces cleaned and recorded on the as-built drawings. The number of pieces cleaned area shall be reported in pieces (PCS).

ssss. Plant Encroachment, Key Note 9B See Dwg. A-002. Remove plants as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The cleaned area will be measured to the nearest square feet and recorded on the as-built drawings. The area of each cleaned area shall be reported in square feet (SF) to the nearest one square foot.

tttt. Drain Body Corrosion. Replace Drain Body And Associated Corroded Piping. See Specifications. See Keyed Notes on Dwg XXX-P001.Replace drain body and associated corroded piping in accordance with Specification Section 15205 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of each drain body and associated piping replaced and recorded on the as-built drawings. The number of replaced pieces shall be reported as each (EA).

uuuu. Drainage Pipe Corrosion. Replace Piping To The Extent Shown In Table On Drawings. Replace Piping And Piping Hangers With Same Type And Material As Existing. See Keyed Notes on Dwg XXX-P001. Replace corroded piping and associated hangers in accordance with Specification Section 15205 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the lineal feet of each piping section replaced and recorded on the as-built drawings. The number of replaced pieces shall be reported as lineal feet (LF).

vvvv. Drainage Pipe Damaged. Observed Longitudinal Crack In Wall Of Piping. Replace Piping To The Extent Shown In Table On Drawings. Replace Piping Hangers With Same Type And Material As Existing. See Keyed Notes on Dwg XXX-P001 Replace corroded piping and associated hangers in accordance with Specification Section 15205 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The

repaired area will be measured as the lineal feet of piping replaced and recorded on the as-built drawings. The number of replaced pieces shall be reported as lineal feet (LF).

wwww. Drain Grate Blocked With Debris. Debris Shall Be Removed. See Keyed Notes on Dwg XXX-P001. Replace corroded piping and associated hangers in accordance with Specification Section 15205 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of each piping section replaced and recorded on the as-built drawings. The number of replaced pieces shall be reported as each (EA).

xxxx. Drain Grate Damaged. Replace Grating. See Keyed Notes on Dwg XXX-P001. Replace corroded piping and associated hangers in accordance with Specification Section 15205 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of each piping section replaced and recorded on the as-built drawings. The number of replaced pieces shall be reported as each (EA).

yyyy. Drainage Piping Disconnected From Drain Body. Reconnect Or Replace Piping To The Extent Indicated On Table On Drawings. Replace Piping And Piping Hangers With Same Type And Material As Existing. See Keyed Notes on Dwg XXX-P001. Replace corroded piping and associated hangers in accordance with Specification Section 15205 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of each piping section replaced and recorded on the as-built drawings. The number of replaced pieces shall be reported as each (EA).

zzzz. Drainage Piping Missing Elbow. Replace Elbow With Same Type And Materials As Rest Of Piping. See Keyed Notes on Dwg XXX-P001. Replace elbows and associated fittings and hangers in accordance with Specification Section 15205 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of each piping section replaced and recorded on the as-built drawings. The number of replaced pieces shall be reported as each (EA).

aaaaa. Water Leakage From Above Structure Causing PVC Piping To Be Coated With Debris. Clean Piping. See Keyed Notes on Dwg XXX-P001. Replace corroded piping and associated hangers in accordance with Specification Section 15205 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of each piping section replaced and recorded on the as-built drawings. The number of replaced pieces shall be reported as each (EA).

bbbbb. Cover Missing On Thru The Wall Air Conditioning Unit, Replace Cover in kind as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of each cover replaced and recorded on the as-built drawings. The number of replaced pieces shall be reported as each (EA).

ccccc. Valve Wheel Broken, Replace, See Keyed Notes on Dwg XXX-P001. Replace corroded piping and associated hangers in accordance with

Specification Section 15205 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of each piping section replaced and recorded on the as-built drawings. The number of replaced pieces shall be reported as each (EA).

ddddd. Washdown Riser Corrosion. See Keyed Notes on Dwg XXX-P001. Replace piping, fittings and hangers to the extent included in the table on the drawings in accordance with Specification Section 15205 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. Pipe type shall match existing pipe. The repaired area will be measured as the lineal feet of piping replaced and recorded on the as-built drawings. The number of replaced piping shall be reported as lineal feet (LF).

eeeee. Fire Protection Riser Piping Corrosion. See Keyed Notes on Dwg XXX-P001. Replace piping to the extent indicated in table on drawings. Replace piping, fittings and hangers to the extent included in the table on the drawings in accordance with Specification Section 13905 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. Pipe type shall match existing pipe. The repaired area will be measured as the lineal feet of piping replaced and recorded on the as-built drawings. The number of replaced piping shall be reported as lineal feet (LF).

fffff. Elevator Machine Room – Ventilation Intake Damper Actuator Disengaged. See Keyed Notes on Dwg XXX-P001. Repair or replace actuator as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of each piping section replaced and recorded on the as-built drawings. The number of replaced pieces shall be reported as each (EA).

ggggg. Elevator Machine Room – Ventilation Fan Not Running. See Keyed Notes on Dwg XXX-P001. Fan marked with caution tape. Repair or replace damaged fan as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will be measured as the number of each piping section replaced and recorded on the as-built drawings. The number of replaced pieces shall be reported as each (EA).

hhhhh. Reference Electrical Corrective Action Drawing K08-E-509 For Scope Of Work. Replace Piping Hangers With Same Type And Material As Existing. See Specifications. Replace corroded conduit, wiring, junction boxes and associated supports in accordance with Specification Sections 16050, 16060, 16070, 16075, 16080, 16120, 16130, 16131, 16132, 16145 and 16525 as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will not be measured separately for payment but shall be recorded on the as-built drawings. This item is paid lump sum (LS).

iiiii. Reference Electrical Corrective Action Drawing K06-E-507 For Scope Of Work. Replace Piping Hangers With Same Type And Material As Existing. See Specifications. Replace corroded conduit, wiring, junction boxes, call station lamp assemblies and associated supports in accordance with Specification Sections 16050, 16060, 16070, 16075, 16080, 16120, 16130, 16131, 16132, 16145 and 16525 and removal of debris and flammable

materials from electrical closets as indicated in the Project Drawings and as directed by Quality Control Engineer or the AR. The repaired area will not be measured separately for payment but shall be recorded on the as-built drawings. This item is paid lump sum (LS).

END OF SECTION