

**TECHNICAL SPECIFICATIONS
VOLUME I**

For:

**CONTRACT 1-14-C095: ARCHITECTURAL/ENGINEERING
TASK ORDER DESIGN SERVICES
RONALD REAGAN WASHINGTON NATIONAL AIRPORT,
WASHINGTON DULLES INTERNATIONAL AIRPORT
AND DULLES TOLL ROAD SYSTEM**

Task Order 01 IWTO DRYING BED UPGRADES

Prepared for:

METROPOLITAN WASHINGTON AIRPORTS AUTHORITY

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FINAL SUBMISSION

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SECTION 00 73 00 — SUPPLEMENTARY CONDITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Special Provisions, and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. The articles and paragraphs of this Section represent supplements or additions to the Contract Provisions or the Special Provisions.

1.3 WORK UNDER OTHER CONTRACTS

- A. During the period of this Project, the Authority anticipates that other construction contracts may be underway at or near the site of work of this Contract. A list of adjacent construction activities follows:

1.4 PERMITTING

- A. Comply with all requirements set forth in the Authority's "Building Codes Manual". This manual describes Building Codes organization, Building Code inspection process, Certificate of Occupancy requirements, and information regarding elevators, escalators, and moving walks. The Authority will file for and provide the construction permit.
- B. Comply with all requirements set forth in the Authority's "Building Codes Manual". This manual describes Building Codes organization, Construction permitting process, Building Code inspection process, Certificate of Occupancy requirements, and information regarding elevators, escalators, and moving walks.

1.5 MAINTENANCE OF PEDESTRIAN AND VEHICULAR TRAFFIC

- A. Maintain adequate pedestrian and vehicular traffic flow and safety along the service roads, sidewalks, parking lots and other roadways on Airport property. In addition, this requirement applies to crossroads, approaches, and entrances affected by or made necessary by the Work. Coordinate activities throughout the project in a manner that allows emergency access, without delays to emergency response vehicles, to all areas of the Project that are occupied by employees.
- B. Comply with requirements indicated in the Traffic Maintenance Plan provided in the contract documents. Obtain COTR's written approval prior to implementing any deviations from the provided plan.

- C. Prior to starting construction operations affecting pedestrian, vehicular, or aircraft traffic movement, submit and obtain the COTR's written approval of a Traffic Maintenance Plan. Develop plan in accordance with the safety requirements of the FAA, Airport Operations, and the Commonwealth of Virginia Department of Transportation's "*Manual of Uniform Traffic Control Devices*". Utilize the form indicated in the latest edition of the Virginia Department of Transportation's "*Virginia Work Area Protection Manual – Standards and Guidelines*".
- D. Provide and maintain temporary signage, "Jersey barriers," and such other traffic control devices or personnel as required complying with approved Traffic Maintenance Plan.
- E. Maintain the construction operations affecting pedestrian, vehicular, or aircraft traffic movement from the beginning of construction operations until final acceptance of the project. The maintenance shall constitute continuous and effective work prosecuted day by day with adequate equipment and forces to the end of project to ensure that roadways and structures are maintained in satisfactory condition at all times, including barricades and warning signs as necessary for performance of the work.
- F. Keep the portions of the project being used by public, pedestrian, aircraft, [mobile lounges] and vehicular traffic, whether it is through or local traffic, in such condition that traffic will be adequately accommodated. Remove snow and control all ice within the project boundaries. Removal of snow and ice for the benefit of the traveling public will be performed by the Authority. Bear all cost of maintenance work during construction and before the project receives a Certificate of Occupancy for constructing and maintaining approaches, crossings, intersections and other features as may be necessary.
- G. Keep the portions of the road and aircraft pavement surfaces being used by the public free from irregularities, obstructions, mud, dirt, snow, ice, and any characteristic that might present a hazard or annoyance to traffic in such condition that traffic will be adequately accommodated. Maintain a vacuum/sweeper and flusher truck at the site at all times to clean roadway and aircraft surfaces affected by construction traffic at the request of Airport Operations or the COTR.

1.6 AIRFIELD AND TERMINAL BUILDING OPERATIONAL REQUIREMENTS

- A. The Work, or a portion thereof, will be performed in proximity to the Air Operations Area (AOA), including, active runways, taxiways, and aprons. Normal airport operations will continue adjacent to the Work during all phases of the Project. These activities include:
 - 1. Aircraft movement on runways, taxiways, aprons; aircraft landing and takeoff operations.
 - 2. Aircraft parking, refueling and other aircraft servicing.
 - 3. Baggage handling.
 - 4. Routine aircraft maintenance.
 - 5. Apron maintenance, snow removal and ice control.
 - 6. Mobile lounge and Plane mate operations.
- B. The Work, or a portion thereof, will be performed [**within**] [**and**] [**nearby**] the public Terminal or Concourse buildings. Normal airport operations and public activities will continue adjacent to the Work during all phases of the Project. These include:

1. Passenger enplaning and deplaning.
 2. Passenger baggage deposit/retrieval.
 3. Passenger ticketing operations.
 4. Food/Concession services.
 5. Ground transportation arrivals/departures.
 6. Maintenance, custodial and support activities.
- C. Phase construction activities as necessary to accommodate all airport operations without disruption. Adhere to all current Airport Orders and Instructions (O & Is), Airport Bulletins, and Airport Advisories. The Authority will provide relevant Orders and Instructions to Offerors in the Solicitation Package. Bulletins and Advisories will be provided to the offeror by the Authority as they are issued.

1.7 TENANT OPERATIONAL REQUIREMENTS

- A. The Work of this Project will be performed in close proximity to tenant-occupied areas. Coordinate and conduct work activities in such fashion that public circulation, tenant operations, and access to the tenant spaces will not be impaired in any manner except as detailed on Contractor's Work Plans. COTR will review and approve in writing all Work Plans.

1.8 ENVIRONMENTAL PROTECTION

- A. Comply with all Federal, state and local laws and regulations controlling pollution of the environment. Take necessary precautions to prevent pollution of streams, rivers, lakes, ponds, and reservoirs with fuels, oils, bitumens, chemicals, or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter.
- B. Notify COTR immediately in the event that abnormalities, discolorations, odors, oil, or other signs of potential contamination by hazardous materials are encountered during excavation or other construction activities. Follow with written notice within 24 hours, indicating date, time, and location of potential contaminants encountered. The COTR will provide further direction to Contractor regarding disposition of materials encountered.
- C. All painted surfaces are assumed to contain lead-based paint. The Contractor shall maintain the necessary health and safety requirements for all personnel in accordance with OSHA regulations to work in these conditions. The removal and disposal of lead-based paint is part of this contract.
- D. Aircraft deicing fluids will be encountered in the water (including utility manholes) and in the soils. Concentrations of aircraft deicing fluids in water and soils will range from non-detect to saturation. Aircraft deicing fluids are propylene based Type I and Type IV fluids. The fluids emit an unpleasant odor when the breakdown (biodegradation) is occurring. Follow OSHA requirements while working in aircraft deicing impacted areas. Coordinate with the COTR for obtaining Material Safety Data Sheet (MSDS) for aircraft deicing fluids.
- E. Petroleum contaminated soils and water may be encountered during the construction of this project. Petroleum impacted soils range from saturated to 1.0 ppm. Petroleum impacted water

ranges from free product to “non - detect.” Maintain the necessary health and safety requirements for all personnel in accordance with OSHA regulations.

1. Do not use petroleum-contaminated soils as backfill around new piping or utilities. Transport petroleum contaminated soils to a location identified by the COTR. Place the contaminated soils on two layers of reinforced 6 mil plastic sheeting, install and maintain sediment and erosion controls, and adequately cover the stockpile to prevent water infiltration.

1.9 ARCHAEOLOGICAL AND HISTORICAL FINDINGS

- A. Notify immediately, through the COTR, the PMC Archaeology/Historic Preservation Coordinator if subsurface structural features, concentrations of artifacts, rubble, bone/shell, or burnt material are uncovered or otherwise discovered. Prompt reporting will avoid potentially severe problems resulting from the destruction of significant resources and may limit the impact on construction operations and schedules.

1.10 DAMAGES AND PRE-EXISTING CONDITIONS

- A. Be responsible for all damages caused by Contractor’s construction activities. Provide all labor, materials, etc. to return any damaged areas, systems or equipment to their original condition at no additional cost to the Authority.
- B. Perform a survey of pre-existing conditions in the vicinity of Contractor’s construction activities, utilizing photographs and other means as necessary to document existing damage or conditions. Submit two copies of this survey to the Contracting Officer within 21 calendar days after Notice-to-Proceed. This survey will assist in resolving any damage claims against the Contractor during and after construction.
- C. Preserve all roadways, pedestrian and directional signage. Deliver all signs removed and not required for reinstallation to the Authority as directed by the COTR.
- D. Replace or repair lost or damaged signs at no cost to the Authority.

1.11 SECURITY DURING CONSTRUCTION

- A. Maintain the integrity of the Airport Security fence. Maintain the integrity of doors and walls between public areas and Air Operations Area (AOA) at all times. Comply with Title 49 Code of Federal Regulations, Parts 1500, 1540, 1542 and 1544.
- B. Possession of and display of a proper and current Airport Identification Badge, issued by Airport Operations is required for all Contractor personnel passing into the AOA. Refer to "Airport Orders and Instructions" attached as part of the Contract for specific requirements. Security requirements have increased significantly at Washington Dulles International Airport and Ronald Reagan Washington National Airport. **[Contractor can expect up to two hours waiting time to clear construction vehicles into the AOA] [Contractor can expect possible short delays clearing construction vehicles into the AOA].** Offerors shall become intimately

familiar with all TSA and Authority security requirements. No increase in contract price will be provided to the Contractor should the contractor not be aware of any security procedure in place at time of submitting their offer that leads to increased time and inconvenience to accomplish the work.

- C. Pay all fines levied by the Transportation Security Administration for penalties resulting from security infractions perpetrated by or caused by Contractor's personnel or work forces of Contractor's subcontractors or suppliers.
- D. Establish and maintain the security of Contractor's staging areas, equipment and materials.
- E. Provide escort for delivery vehicles transporting materials and supplies to or from the Contractor's staging or work areas into the AOA, in accordance with requirements stated in "Airport Orders and Instructions" attached as part of the Contract.
- F. Do not park within 300 feet of a terminal building unless specifically authorized by Airport Operations.
- G. All workers in the sterile areas, which are defined as areas accessible to ticketed passengers only, may utilize tools in their work provided that:
 - 1. Tools are essential and necessary to the Work.
 - 2. Keep tools controlled at all times.
 - 3. Do not leave tools unattended.
 - 4. Store tools in locked boxes.
- H. No knives will be permitted in the sterile areas.
- I. When Work involves need for access to restricted areas under jurisdiction of U.S. Customs & Border Protection (CBP), secure necessary special security clearances to operate in the International Arrivals Building areas as prescribed by the U.S. Customs & Border Protection. Each company working in the CBP area shall apply for and obtain a bond from the CBP.
- J. No firearms or weapons of any type are allowed on the airport.
- K. No cartridge style nail guns, nor any tools that use a cartridge or any explosive charge, are allowed without prior written notification of COTR. Obtain written approval from the COTR before bringing such tools on the project.
- L. Conform to all Orders and Instructions pertaining to vehicle inspection.

1.12 MATERIAL HAULING

- A. Restrict deliveries and removal of bulk materials, supplies, waste soils and equipment to and from the Project site to the Authority-designated roads and haul routes indicated on the Drawings.

- B. Access and egress to and from the Airport for hauling operations shall be through the entrances indicated. Conduct hauling operations in accordance with the “Contractor Haul Route” plan. Access to and from the site may be performed on a 24/7 basis, subject to restrictions imposed by other requirements of the Contract Documents and as acceptable to the Authority.
- C. The designated haul routes for hauling operations will not require vehicles crossing and/or utilizing existing taxi lanes or taxiways. Under no conditions shall the Contractor plan use of taxiways and taxi lanes for hauling equipment. Haul routes for this project are as indicated.
- D. Schedule, phase, and sequence work operations to minimize the number and duration of taxiway closures. Submit a detailed Work Plan for Contractor’s entire operations to the COTR for approval prior to commencing work. Obtain written approval from the COTR of the Work Plan. Identify clearly on Work Plan each operation requiring coordination with Airport Operations.
 - 1. For taxiway closures of short duration, provide flagmen, with radio contact with the FAA Airport Traffic Control Tower and the Authority Ramp Control Tower, at taxiway crossing intersections. COTR will determine the number of flagmen required.
 - 2. For long-term taxiway closures, clearly mark, light, and barricade the taxiway closures and haul routes in accordance with FAA and Airport Operations requirements.
- E. Notify the COTR at least 72 hours in advance of his requirement for scheduled taxiway, taxi lane or roadway closures. Obtain the written approval of the Authority prior to closing or crossing a taxiway, taxi lane or roadway.
- F. Bear all costs associated with establishing, maintaining, signing, lighting and marking haul routes and taxiway crossings. These costs are considered incidental to the pay items of this Contract.
- G. Use load covers on all dump trucks. Load dump trucks so that no spillage occurs during transit on the State, municipal, or Airport roadways, taxiways, and aprons. Clean wheels of trucks leaving the Project construction site of all soil and rocks. Provide a truck washing rack on the Project site to minimize the tracking of soil onto paved surfaces.
- H. Be responsible for the cost of the immediate cleaning of earth tracking and spills on paved surfaces resulting from the Contractor's operations. Because of the potential for extreme damage to aircraft engines due to the ingestion of foreign objects, maintain on the project mechanical sweeper/vacuum (wet/dry) equipment with nylon brushes complete with operators. Maintain a water truck on site at all times in order to effectively control dust rising from construction activities.
- I. Provide sweeper/vacuum equipment with a usable hopper capacity of 6 cubic yards and with a regenerative air capacity of 15,000 CFM. Provide equipment with gutter brooms of poly brush material so as not to damage airfield pavement markings; a dust control system that includes an external spray system with front mounted spray bar, nozzles located at each gutter broom; and an internal spray system with nozzles in the internal air stream. Maintain the equipment in good working order throughout the project and replace the brooms and or spray systems, as necessary, to ensure proper sweeping and vacuuming of paved surfaces.

1.13 PORTABLE LIGHTING

- A. Portable lighting: If used for Contractor operations, aim and shield portable lighting at all times to eliminate glare that could impair runway, taxiway, apron, ground operations, and Airport Traffic Control Tower operations. Equip portable lighting with reflectors and glare shields to prevent spillover of light into operational areas.

1.14 RADIO COMMUNICATIONS

- A. Provide two-way radio communication between certain of the Contractor's personnel on the job site. Provide radios with a minimum of 5 watts transmitting power. Select the frequency utilized for these transmissions. Submit proposed frequencies to COTR for approval in writing by the COTR. Frequencies shall not conflict with or overlay any of the Airports radio frequencies.
- B. Provide, at a minimum, the following with radio equipment: The Project Superintendent, Foreman of all work groups physically separated from the general vicinity of the Project Superintendent, gate guards, and others who may be working in a separate and remote area. Provide two additional radios with the same frequencies to PMC for use by the COTR and the Lead Inspector.
- C. Provide two-way radios capable of operating on both the "Ground" and "Ramp" frequencies for work adjacent to or affecting taxiways, Mobile Lounge roads, or Mobile Lounge docking areas. Such radios shall be either a handheld programmable type capable of operating off of vehicle power and antenna or a vehicle-mounted type, which operates solely off of the vehicle's power, and antenna. Provide radios that provide a minimum of 3 watts transmitting power. Provide radios of sufficient power to communicate with the appropriate controller.
- D. Cellular telephones are an acceptable alternative at Ronald Reagan Washington National Airport. For information purposes the Authority currently uses the Nextel system.

1.15 SPECIAL AUTHORITY CONSULTANT

- A. The Contractor is hereby advised of the involvement of Parsons Management Consultants (PMC) as Program Management Support Services Consultant to the Authority for the capital construction programs at Ronald Reagan Washington National Airport and Washington Dulles International Airport. PMC will have a continuing role in this project by assisting the Authority in specialized areas.
 - 1. PMC will provide administrative support during design, solicitation, and construction.
 - 2. PMC will coordinate Contractor requests for technical information and receive, review and manage all Contractor submittals.
 - 3. PMC has reviewed technical submittals during design, including drawings, specifications, cost estimates, construction phasing plans, and technical reports.
 - 4. PMC will be responsible for review of technical submittals during construction, including selected shop drawings, certifications, test reports, calculations and samples.

5. PMC will conduct field inspections of the Work in progress and inspect for Substantial Completion and Final Acceptance. PMC inspection does not relieve Contractor of responsibilities of performing Contract required inspections as required by contract documents.

- B. All other contract management is the sole responsibility of the Authority.

1.16 SAFETY

- A. Comply with all requirements set forth in the most current edition of the Authority *Construction Safety Manual*". Offerors are provided with the most recent addition when obtaining contract documents prior to proposal. Requirements included in this Section are in addition to the Authority's *Construction Safety Manual*. Comply with all local, State and Federal requirements. Where conflicts or discrepancies exist between requirements, the more stringent requirement shall govern. For additional information see Division 01 Section "Quality Requirements".

- B. Contractor Safety Organization:

1. Safety Manager.

- a. Duties: Outlined in The Authority *Construction Safety Manual*.
- b. Qualifications: Outlined in The Authority *Construction Safety Manual*.

2. Safety Engineer.

- a. Duties: Outlined in The Authority *Construction Safety Manual*.
- b. Qualifications: Outlined in The Authority *Construction Safety Manual*.

- C. Submit the résumés of individuals proposed to serve in the role of Contractor's Safety Manager, Contractor's Safety Engineer to the COTR for approval in writing. In addition to indicating the qualifications in the Authority *Construction Safety Manual* résumés shall include but not be limited to such items as: work experience, education, safety and health training completed, memberships in professional associations, professional certifications, professional registrations and professional references confirming the qualifications and personal references of contacts for verification shall also be required.

- D. Provide safe and healthful working conditions on each operation at all times during execution the work of this Contract. Conduct the various operations connected with the Work so that they will not be injurious to safety or health. Comply with all provisions, regulations and recommendations issued pursuant to the Occupational Safety and Health Act of 1970 and the Construction Safety Act of 1969, as well as amendments to these laws. Comply with laws, rules and regulations of other authorities having jurisdiction, with regard to all matters relating to the safety and health of workers and the general public. Compliance with government requirements is mandated by law and considered only a minimum level of safety performance. Perform all work in accordance with best safe work practices recognized by the construction industry. Stop work whenever a work procedure or a condition at a work site is deemed unsafe by the either of the following individuals: COTR, Program Safety Manager (PSM), the

Contractor's Project Manager, the Contractor's Foreman, the Contractor's Safety Manager, or the Contractor's Safety Engineer(s).

- E. Provide a full-time on-site Contractor Safety Manager for the duration of this Contract. The Safety Manager shall be responsible for all safety and health requirements as included herein and as required by the Authority's Construction Safety Manual. Provide the services of at least one full-time on-site Contractor Safety Engineer per construction work shift with no other duties assigned who shall work under the direction of the Contractor Safety Manager.
- F. Provide a full-time on-site Contractor Safety Engineer for the duration of this Contract with no other duties assigned. The Safety Engineer shall be responsible for all safety and health requirements as included herein and as required by the Authority's Construction Safety Manual.
- G. The contractor shall submit the resumes of all proposed safety and health professionals who shall serve in the role of Contractor's Safety Manager and Contractor's Safety Engineer(s) to the COTR for approval. The resumes shall include, but not be limited to such items as: work experience, education, safety and health training completed, memberships in professional associations, professional certifications, professional registrations, and professional references confirming the qualifications shall also be required. Documentation confirming the qualifications and personal references of contacts for verification shall also be required.
- H. Comply with all requirements set forth in the Authority's "Construction Safety Manual." Provide during the Work the services of [Safety Manager(s) /]Safety Engineer(s) as outlined in the Authority's "Construction Safety Manual" and in Division 01 Section "Quality Requirements". The Safety Engineer shall undertake the duties and responsibilities as stated in the Authority's "Construction Safety Manual".
- I. Prior to start of construction activities in the Air Operations Area (AOA), the Contractor's Safety Manager and Safety Engineer(s) shall tour the AOA with the Authority Safety Program Manager.
- J. Flagmen Training: The Authority will sponsor Flagman training sessions. Contractor's personnel who will be assigned flagmen duties on the Airport for this project shall attend training sessions.
- K. Fire Safety: Conform to the following requirements:
 - 1. Obtain a permit to perform any welding, cutting, or hot work from the Office of the Authority Fire Marshal.
 - 2. Ensure adequate access to all construction areas for emergency response.
 - 3. Obtain a permit from the Office of the Authority Fire Marshal to store, handle, or use any hazardous material, including but not limited to fuels for equipment. Complete an application prior to issuance.
 - 4. Remove combustible debris from the site daily.
 - 5. Provide at least seven (7) days notice for any request for inspections, tests, permits, etc., required of personnel from the Office of the Authority Fire Marshal.
 - 6. Obtain a permit from the Office of the Authority Fire Marshal for the use, storage or handling of any explosives.

7. Provide to the Office of the Authority Fire Marshal a list of emergency contact numbers for the COTR and the Contractor prior to the commencement of Work.

- L. Submit Site-Specific Safety and Health Plans to COTR within 15 calendar days of Notice to Proceed and prior to the start of any construction activities. Prepare this plan using the Authority's Guidelines as defined in the Authority's "*Construction Safety Manual*" and as supplemented by these specifications for each and every work zone as shown on the drawings or as anticipated by the Contractor. COTR must approve the Site-Specific Safety Plan prior to the start of any work.

- M. Be responsible for the safe operation of all job site motor vehicles. Provide a "spotter" or flagman for all backing operations of construction vehicles with restricted rear vision.

- N. All motorized equipment and vehicles working on or entering MWAA construction project work areas shall be equipped with functional audible backup alarms.

- O. Crane Operators. On Airports Authority projects, Crane Operators shall be certified to operate the equipment by an approved independent certifying agency.

- P. For all airside projects attach a Safety Plan to the Safety Program. Include in the Safety Plan, to the extent applicable, provisions for the following:
 1. Scope of work performed by Contractor, including proposed duration of work.
 2. Possible safety problems (job hazard analysis program).
 3. Work control measures.
 4. Limitations on equipment height.
 5. Location of airport operational areas.
 6. Location of and access to stockpiled construction materials and equipment.
 7. Inspection requirements.
 8. Trenches and excavations, and cover requirements.
 9. Threshold marking and lighting.
 10. Closed runway marking.
 11. Vehicle operation and pedestrian access in airport movement areas.
 12. Construction site access and haul roads, includes maintenance of and keeping open ARFF access routes.
 13. Limitations on construction.
 14. Radio communications.
 15. Foreign object debris (FOD) control provisions.
 16. Hazardous materials (HAZMAT) management.
 17. Wildlife abatement.
 18. NOTAM issuance.
 19. Vehicle identification.
 20. Vehicle parking.
 21. Use of temporary visual aids.
 22. Obstacle-free zones (OFZ).
 23. Approach clearance to runways.
 24. Runway and taxiway safety areas.
 25. Procedures and equipment, such as barricades (identify type) for closing portions of the movement area.

26. Required compliance of contractor personnel.
27. Procedures for notification of aircraft rescue firefighting (ARFF) if deactivating water lines or fire hydrants, or if emergency access routes are rerouted or blocked.
28. Emergency notification for fire, medical, and police response.
29. Coordination of plan with an FAA airport certification safety inspector.

Q. Comply with sample safety plan as designated in the MWAAC Construction Safety Manual.

1.17 HEIGHT LIMITATION

- A. Prior to beginning any work coordinate with the COTR the height of all cranes, boom trucks, scaffolds or similar vehicles of construction. Properly mark all construction equipment with safety flags and warning lights in accordance with current FAA and Airport Operations requirements. Submit FAA Form 7460, provided by COTR, for all variations on approved crane heights.
 1. For all demolition and construction within the Airport, limit the height of Contractor's equipment to a maximum of 50 feet.

1.18 NOISE CONTROL

- A. The Authority recognizes and can tolerate a normal level of noise created by a majority of construction activity. However, in the interest of the Authority's neighbors, the maximum acceptable noise level between the hours of 5:00 pm and 7:00 am the following morning is limited to 55 decibels. During daytime hours of 7:00 am through 5:00 pm, the maximum acceptable noise level for sustained or repetitive noises is 72 decibels. Measure the noise level using an "A" scale at a point 4'-0" above ground at property line nearest noise source.
- B. Secure advance written approval from the COTR prior to scheduling any activity that is anticipated to produce a sustained or repetitive noise level higher than the decibel limits indicated above.
- C. In and around terminal facilities and buildings whose normal occupancy is from 7 a.m. to 7 p.m., perform work that causes noise that is disruptive to the airport's tenants or the traveling public between the hours of 11:00 pm and 5:00 am. Measure noise for this situation using an "A" scale at a point 4'-0" above ground at the closest point to airport tenants or the traveling public.

1.19 EXAMINATION OF PLANS, SPECIFICATIONS AND SITE OF WORK

- A. The offeror is expected to examine carefully the site of the proposed work, the proposal, plans, specifications, solicitation provisions, contract provisions, special provisions and contract forms before submitting a proposal. The submission of a proposal will be considered conclusive evidence that the offeror has made such examination and is satisfied as to the conditions to be encountered in performing the work as to the requirements of the Contract.

1.20 AIRPORT SECURITY/VEHICLE INSPECTION PROCEDURE

- A. The number of vehicular access points into secure areas at Ronald Reagan Washington National Airport has been reduced to an operational minimum. There is only one gate available for all vehicular traffic. Gate A.
- B. The following procedures will be utilized for all escorted vehicles and AOA approved vehicles with non-badged passengers seeking entry to the AOA:
 - 1. All vehicles are searched.
 - 2. Coordinate all vehicle deliveries with the COTR in advance. Provide the vehicle license plate number and expected delivery time for all vehicle deliveries. Contractor may compile the expected daily delivery schedule on one sheet for submission to the COTR.
 - 3. The vehicle operator shall have in his or her possession a commercial manifest, which identifies the contents of the vehicle and/or trailer.
 - 4. An escort from the company for whom the shipment is intended shall respond to the vehicle access gate and remain with the vehicle until the vehicle exits the secured area.
 - 5. A vehicle search will be conducted and once cleared; vehicles will be permitted escorted access to their delivery point.
 - 6. Contractors should expect minor delays up at Gate A as a result of these security provisions.
 - 7. Priority consideration may be offered to concrete trucks with resulting delays estimated to be 20 minutes. To receive priority consideration, schedule concrete deliveries with Airport Operations and COTR at time of batching.
- C. Prior approval from the Manager of Airport Operations or his/her designated representative is required for any exceptions to the above procedures other than those listed below.

1.21 WORK ADJACENT TO METRO

- A. Perform all work in accordance with the Washington Metropolitan Area Transit Authority (WMATA) "Adjacent Construction Design Manual," Revision NO. 1.
- B. Be responsible for obtaining any necessary permits from WMATA. Comply with WMATA regulations in connection with construction over, around, or within WMATA right-of-way.
- C. A WMATA inspector will be required while the Contractor is working over, around, or within WMATA right-of-way.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.

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SECTION 00 73 19 - HEALTH AND SAFETY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Special Provisions, Supplementary Conditions, and other Division 01 Specification Sections, apply to this Section.
- B. Requirements included in this Section are the minimum acceptable and are in addition to the Authority's Construction Safety Manual, as well as all Local, State, and Federal requirements. Where conflicts or discrepancies exist between requirements, the more stringent requirement shall govern.
- C. Related Work Described Elsewhere:
 - 1. Section V, "Solicitation Provisions."
 - 2. Section VII, "Contract Provisions."
 - 3. Section X, "Construction Safety Manual."

1.2 SUMMARY

- A. Provide safe and healthful working conditions on each operation at all times. Conduct the various operations connected with the Work so that they will not be injurious to safety or health. Comply with all provisions, regulations and recommendations issued pursuant to the Occupational Safety and Health Act of 1970, and the Construction Safety Act of 1969, as amended, and with laws, rules and regulations of other authorities having jurisdiction, with regard to all matters relating to the safety and health of workers and the general public. Compliance with government requirements is mandated by law and considered only a minimum level of safety performance. Perform all work in accordance with best safe work practices recognized by the construction industry.
- B. Stop work whenever a work procedure or a condition at a work site is deemed unsafe by the Contracting Officer's Technical Representative (COTR), the Program Safety Manager (PSM), the Contractor's Safety Manager, the Contractor's Safety Engineer(s), or the Contractor's Industrial Hygienist (IH).
- C. Prior to the start of construction activities in the Airport Operations Area (AOA), the Contractor's Safety Manager, Safety Engineers and Industrial Hygienist shall tour airside with the Program Safety Manager.
- D. Implement and conduct safety meetings, as indicated in the Authority's Construction Safety Manual, with all subcontractors on the job site and all subcontractors anticipated to be on the job site from the previous safety meeting to the next safety meeting. The purpose of the safety

meeting shall be safety coordination, review of safety procedures, and promoting safety awareness.

E. Fire Safety: Conform to the following requirements:

1. Ensure adequate access to all construction areas for emergency response.
2. Complete application and obtain a permit from the Office of the Authority Fire Marshal to store, handle, or use any hazardous material, including but not limited to fuels for equipment.
3. Perform all utility outages in accordance with the requirements of Division 01 Section "Summary."
4. Be responsible for developing a site specific Hearing Conservation and Respiratory Protection Programs for all employees who may be exposed to health hazard associated with tunnel operations. The Program Safety Manager must approve these programs prior to beginning work that may expose employees to health hazards associated with tunnel operations. All employees exposed to airborne contaminants and/or noise must, at a minimum, have an audiogram and pulmonary function test.

1.3 SAFETY AND HEALTH MANAGEMENT

A. The requirements and personnel are in addition to the requirements in Section "Supplementary Conditions".

B. Proposed Safety and Health Personnel

1. The Contractor shall provide a full-time on-site Contractor's Safety Manager for the duration of this Contract, who shall be responsible for all safety and health requirements as included herein and as required by the Authority's Construction Safety Manual. The Contractor shall also provide the services of at least one full-time on-site Contractor's Safety Engineer per construction work shift, one full-time on-site certified Industrial Hygienist and at least one full-time first aid attendant, who shall work under the direction of the Contractor's Safety Manager. The Contractor's Safety Manager, Safety Engineer(s) and First Aid Attendant(s) shall all have a current Red Cross First Aid Certificate.
2. The Contractor shall submit the résumés of all proposed safety and health professionals who shall serve in the role of Contractor's Safety Manager (CSM), Contractor's Safety Engineers (CSE), Contractor's Industrial Hygienist (IH) and all other Contractor's Site Supervision to the COTR for approval. The resumes shall include but not limited to such items as: work experience, education, safety and health training completed, memberships in professional associations, professional certifications, professional registrations, and professional references confirming the qualifications shall also be required. Documentation confirming the qualifications and personal references or contacts for verification shall also be required. The COTR or PSM may reject the persons proposed for failure to have adequate qualifications or other reasonable and lawful causes.
3. Approval of the COTR is required, if at any time the Contractor seeks to remove or discharge the Contractor's Safety Manager, Safety Engineer(s) and Industrial Hygienist.

C. Contractor's Safety Manager

1. The Contractor's Safety Manager shall be a full time on-site safety professional with a minimum of 10 years of experience managing safety programs on underground construction projects comparable to this Contract in size, scope and complexity (a CSP or CSM preferred). The Construction Safety Manager shall perform the duties and responsibilities as stated in the Authority's "Construction Safety Manual." The Construction Safety Manager shall be an OSHA authorized Outreach Trainer having passed the OSHA 500 Training Course in Occupational Safety and Health Standards for Construction Industry including any and all update training required to maintain a current active certification.
2. The Contractor's Safety Manager shall be knowledgeable of all applicable safety and health codes, statutes and ordinances as well as best safety practices recognized by the construction industry. The Contractor's Safety Manager shall be able to demonstrate knowledge and ability to ensure compliance with same. The Contractor's Safety Manager shall not be the project manager, project engineer, superintendent or anyone else working on the Project and shall perform no other duties except those related to safety and health as directed by the COTR. The primary duties of the Safety Manager are to set up and administer the safety and health programs, run safety training courses, and to verify compliance by all of the Contractor's employees and those of all subcontractors. When necessary the Safety Manager will be responsible for implementing any and all safety and health changes required by new legislation or as required by the COTR.

D. Contractor's Safety Engineer

1. The Contractor's Safety Engineer(s) (CSE) shall be full-time on-site safety professional with a minimum 5 years experience on underground construction, hired by the Contractor to manage only the safety efforts of construction. The Contractor's Safety Engineers must be familiar with the type of work to be performed under this contract, which is cut and cover construction and underground NATM and TBM tunneling operations. The CSE shall perform the duties and responsibilities as stated in the Authority's "Construction Safety Manual."
2. The Contractor's Safety Engineer(s) shall have, at a minimum, a certificate of completion, within the last two years, from either a 10-hour or 30-hour OSHA Training Course in the following areas; Hazardous Materials, Respiratory Protection and Permit-Required Confined Space Entry. Training shall be conducted by an instructor accredited to perform such instruction by the Occupational Safety and Health Administration
3. The CSEs shall not be the project manager, engineer, superintendent or anyone else working on the project and shall have no other duties except those related to safety, unless otherwise approved by the COTR.

E. Contractor's Industrial Hygienist

1. The Contractor's Industrial Hygienist (IH) shall have a minimum of 10 years experience in managing construction related environmental conditions, including but not limited to contaminated or hazardous materials as defined in Section "Supplementary Provisions." The Industrial Hygienist shall be certified by the American Board of Industrial Hygienist

(ABIH) and shall have received certification for taking and passing a 30-hour OSHA Training Course 521 - OSHA Guide to Voluntary Compliance in the Industrial Hygiene Area within the last two years. The Industrial Hygienist shall develop, implement and oversee the Contractors Environmental Response Plan and shall be responsible for ensuring compliance with the environmental requirements of the Authority and all local, state and Federal agencies. The Industrial Hygienist shall assist the Contractor's Safety Manager and Safety Engineers in training the Contractor and Subcontractor's personnel in recognizing and handling environmental problems.

F. Contractor's Site Supervision (Superintendents and Foremen)

1. Superintendents and Foremen shall have a minimum of 5 years experience in the supervision of underground and tunnel construction operations similar to the type of construction anticipated on this contract within the last 7 years.
2. In addition to the above, the Superintendents and Foremen employed by the Contractor on the Project shall have, at a minimum,
 - a. A certificate of completion from a 10-Hour OSHA Hazard Recognition Training Course within the past two years for the Notice-to-Proceed. An instructor accredited by the Occupational Safety and Health Administration to perform such instruction shall have conducted the course for which the certificate is offered.

G. Reference Codes, Standards and other Documents

1. OSHA - US Department of Labor, Occupational Safety and Health Administration, Construction Standards and Interpretations, 29 CFR Parts 1910 and 1926.
2. US Department of Labor, Occupational Safety and Health Act of 1970, as amended.
3. US Department of Labor, Construction Safety Act of 1969, as amended.
4. Virginia OSHA Rules and Regulations.
5. All other Federal, State and Local requirements and regulations in effect at the time of construction.
6. MSHA - US Department of Labor, Mine Safety and Health Administration, Federal Mine Safety and Health Act of 1977, as amended.

1.4 SUBMITTALS

- A. Submit Safety and Health Program to COTR within 15 calendar days of Notice to Proceed and prior to the start of any construction activities. COTR must approve the Contractor's Safety and Health Program prior to the start of any work.
- B. Submit Fire Risk Assessment to COTR prior to any and all underground construction.
- C. Submit résumés of the proposed Industrial Hygienist to COTR within 10 calendar days of Notice to Proceed.
- D. Submit qualifications of Contractor's Site Supervision to COTR within 15 calendar days of employment at the project.
- E. Submit Inspection reports by Contractor's Safety Manager to COTR weekly.

- F. Submit to COTR Weekly the following:
 - 1. Meeting Minutes and attendance sheets of Safety Training
 - 2. Weekly Safety Meetings and related communications by Contractors and Subcontractors.
- G. Submit disciplinary action notices to COTR weekly.
- H. Submit notices from public authorities to COTR as soon as possible but no later than 24 hours of receipt by Contractor.
- I. Submit material Safety Data Sheets (MSDS) for all substances to COTR as received by Contractor along with written Hazard Communication Program.
- J. Submit copy of Contractor's chemical inventory list to COTR and the Authority Fire Marshal as developed and updated.
- K. All equipment shall be inspected for possible safety problems and any safety problems found shall be corrected prior to piece of equipment being brought on to the project. All equipment shall be safety inspected monthly if not more often as directed by the COTR. Submit copies of these inspection reports to COTR within one week of the inspection.
- L. Submit copies of the latest annual inspections as required by OSHA 1926.550 (Subpart N) to the COTR immediately upon any crane being brought on to the job site and within one week of any annual inspections that occur while that crane is on the project.
- M. Submit a listing of all crane operators and their qualifications to the COTR for approval. Obtain approval in writing.

1.5 SAFETY PROGRAM ADMINISTRATION

- A. Roles and Responsibilities: The Contractor shall be directly responsible for establishing and implementing a project-specific Contractor Safety and Health Program for the protection of its workers, the workers of its Subcontractors, the COTR, Architect/Engineer, the Metropolitan Washington Airports Authority (the Authority) and the general public. The Contractor shall ensure that the necessary resources for an effective program, as set forth in the contract documents and specifications, are provided at all times during the course of the Work. The Contractor shall require that its Subcontractors comply with all requirements of the Work and of the Contractor Safety and Health Program. The Contractor shall include documentation of safety and health program implementation and accident experience as criteria for evaluating performance of its individual project managers and site supervisors.
 - 1. The Contractor's Project Manager shall:
 - a. Ensure the implementation and administration of the Contractor's Safety and Health Program.
 - b. Support the Contractor's Safety Manager with the resources and authority to enable him/her to effectively administer and manage his/her designated portion(s) of the project safety effort.

- c. Ensure that the Contractor's Safety Manager is assigned only work bearing directly on the safety and health of workers and members of the general public not activities which prevent the CSM from performing his/her primary function: safety inspections, training and enforcement. Although it may be appropriate for the Contractor's Safety Manager to participate in functions such as site security, insurance-related issues such as medical case management, general procurement, and similar functions, they shall not be considered safety related activities for purposes of these Specifications and they shall not be part of the CSM's primary responsibilities.
 - d. Attend scheduled safety and health meetings conducted by the Contractor pursuant to administration of the project safety effort.
 - e. Cooperate with the COTR and PSM in enforcement of the Safety and Health Program responsibilities as set forth in these Specifications.
2. The Contractor's Safety Manager shall:
- a. Administer and manage the Contractor's Safety and Health Program.
 - b. Cooperate with the COTR, PSM and OCWIP Safety Consultant in their administration, management and oversight of the Contractor's Project Safety and Health Program.
 - c. Attend scheduled safety and health meetings conducted by the Program Safety Manager.
 - d. Prior to the start of work, conduct a physical survey of the job site(s) and make a survey of the work to be performed by reviewing the drawings and conducting discussions as applicable with the necessary parties toward identification of and planning for hazard controls. These activities shall be documented and submitted as a Project Safety and Health Survey to the COTR and PSM for review.
 - e. At the initiation of the Work and throughout the course of the project, conduct and implement Job Hazard Analyses (JHAs) for operations deemed hazardous. The JHAs will identify potential hazards and actions required to control them. The JHAs will be submitted to the COTR and PSM for review.
 - f. Be physically at the Project job site on a full-time basis for 8 hours per working day with minimal exceptions.
 - g. Conduct physical inspections of the job site, equipment, materials and operations to detect and promptly eliminate unsafe acts and unsafe conditions. The frequency of the inspections shall be determined on the basis of site activities. Hazardous activities will require continuous inspection. In no case shall the above-described inspections be conducted less than once per shift.
 - h. Document in a uniform, established format the findings of each inspection, including the nature of hazards identified, the corrective actions taken, and the person(s) exposed or potentially exposed to the hazard(s).
 - i. Schedule and conduct safety orientations, meetings and hazard recognition training for all workers and visitors on the project.
 - j. Develop and implement a program to readily identify individuals (i.e. Hard Hat Decals) who have completed the required safety and hazard training.
 - k. Administer the disciplinary action policies and procedures set forth in the Contractor's Project Safety and Health Program.

- l. Post and maintain the required safety information at appropriate locations on the project, including, but not limited to emergency action information (phone numbers, means of egress, etc), hazard warnings, hazard communication information, and injury and illness data.
 - m. Conduct investigations of all accident events and near misses and document the findings of such investigations within 24 hours in accordance with applicable rules and regulations and the Contractor's Project Safety and Health Program.
 - n. Maintain written materials, such as codes, standards, references, hazard communication information, medical and exposure monitoring records and other safety and health program-related documents in an orderly manner at the project, readily available for use by the Contractor's personnel and review by the COTR and PSM.
 - o. Perform all safety and health-related tasks necessary to achieve the highest degree of safety that the nature of the Work permits.
 - p. Manage the trained Contractor's Safety Engineer(s) working on all shifts.
 - q. Implement and manage a hotwork permit program, making sure that it complies with the Authority's Fire Department rules and regulations.
 - r. Attend weekly walkthroughs with the COTR and PSM.
 - s. Attend project progress meetings as necessary or as required by the COTR.
 3. The Contractor's Safety Engineer(s) shall:
 - a. Be present on the project for all working periods particularly during tunnel operations.
 - b. Assist the Contractor's Safety Manager during the shift when both are present at the project and perform all the duties associated with safety normally performed by the Contractor's Safety Manager when the CSM is absent from the project.
 4. The Contractor's Site Supervisors (Superintendents and Foremen) shall:
 - a. Be directly responsible for ensuring the work is performed in a safe and healthful manner. They shall be knowledgeable of the hazards attendant to the work, aware of the necessary hazard controls and authorized to effect prompt action to control or eliminate them.
 - b. Assist the Contractor's project management and safety staff in the inspection of job sites, equipment and materials, attending and participating in the Contractor's safety meetings and training efforts, and enforcing safe work rules set forth in the Contractor's Project Safety and Health Program.
 - c. Ensure that each job has the necessary safety appliances and personal protective equipment.
 - d. Monitor and report to the Contractor's Safety Manager the safety performance of Subcontractors on the project to determine their level of compliance with the Contractor's Project Safety and Health Program.
 - e. Participate and cooperate fully with the COTR, PSM, OCWIP Safety Consultant and Contractor's Safety Manager in the investigation of accidents and remediation of hazards.

- f. Report all accidents immediately and near misses as promptly as conditions permit, with written follow up reports within 24 hours after the occurrence, to the COTR, PSM, OCWIP Safety Consultant and Contractor's Safety Manager.
5. Contractor's employees shall be required by the Contractor to:
 - a. Fully support the Contractor's Project Safety and Health Program by assisting the COTR, PSM and Contractor's Safety Manager in the inspection of the job site, equipment and materials to detect hazards and reporting unsafe acts and unsafe conditions immediately.
 - b. Attend and actively participate in all orientation, safety and health training safety meetings and other functions for communication of safety and health prescribed by the Contractor's Project Safety and Health Program.
 - c. Comply with the work rules set forth in the Contractor's Project Safety and Health Program or as further established as a part of ongoing safety training and/or job hazard analysis.
 - d. Report to the Contractor's Site Supervision any and all apparent unsafe acts or unsafe conditions.
 - e. Report any and all accidents, injuries, symptoms of illness and near miss events involving the worker to the Contractor's Site Supervision immediately or as promptly as conditions permit.
 - f. Make recommendations for safety and health protection(s) that the worker has, from his or her own experience, observed to be successful on other projects.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CONTRACTOR'S SAFETY AND HEALTH PROGRAM - GENERAL REQUIREMENTS

- A. This Section serves to outline the key elements for the Contractor's Safety and Health Program. This Section also includes a number of additional project specific requirements for the Contractor's Safety and Health Program. In addition, reference is made to the minimum requirements set forth in the "Construction Safety Manual."
- B. The Contractor's Safety and Health Program shall include as a framework for safety and health programming the following minimum basic elements:
 1. A statement of the Contractor's commitment to providing a safe and healthful project.
 2. A statement of the Contractor's responsibility for implementing its Safety and Health Program.
 3. Detailed procedures for:
 - a. Training of site supervision.
 - b. Safety and Health Project Orientation for workers.
 - c. Ongoing Safety and Health training for workers.

- d. Providing safety and health information to the general public.
4. Specific assignments of safety and health-related roles and responsibilities.
5. Safety and health inspections on the project.
6. Procedures for accident-related record keeping, investigation and surveillance.
7. A disciplinary action procedure.
8. Schedule of safety related meetings and training.
9. A set of general work rules addressing hazards common to all types of construction and a site-specific set of work rules addressing the hazards of the work at hand.
10. A list of required permits for specific construction operations.
11. An emergency action plan addressing all types of emergencies with which the Contractor may reasonably and predictably be confronted.
12. A procedure for identifying how and under what circumstances job hazard analyses shall be conducted.
13. Reporting formats for required reports and submissions.
14. Detailed site-specific procedures for conducting safe working conditions associated with:
 - a. Drilling.
 - b. NATM, TBM and/or other types of tunneling.
 - c. Compressed air and gases.
 - d. Concrete work.
 - e. Confined spaces/permit-required confined spaces.
 - f. Crane operations and maintenance.
 - g. Rigging operations, equipment inspection and testing.
 - h. Electrical hazards.
 - i. Excavation and excavation support.
 - j. Fall protection.
 - k. Fire protection and prevention.
 - l. First aid, CPR and blood borne pathogens.
 - m. Hand and power tools.
 - n. Hazard communication.
 - o. Housekeeping.
 - p. Scaffolding, ladders, and walking and working surfaces.
 - q. Lockout/Control of Energy Sources.
 - r. Materials handling and storage.
 - s. Mechanized equipment.
 - t. Construction health hazard monitoring.
 - u. Personal protective equipment and clothing.
 - v. Respiratory protection.
 - w. Sanitation.
 - x. Welding and cutting.
15. Detailed site-specific procedures shall, as a minimum, comply with the guidelines identified in the Section X "Construction Safety Manual." All detailed site-specific procedures shall include requirements for mandatory eye and head protection and adherence to the 6-foot fall protection requirements. Site-specific procedures shall require all chainsaws used on-site to be equipped with kickback guards/breaks and

- require all other power tools to be equipped with all protective features as provided by the manufacturer.
16. Hazardous material handling.
 17. A silica exposure plan to limit exposure of workers to silica dust. The plan shall include the applicable preventive measures recommended and contained in NIOSH ALERT: 1996 Publication 96-112 "Preventing Silicosis and Deaths in Construction Workers".
 18. All equipment, not just the underground tunneling equipment, shall be inspected on a regular basis (monthly if not more often as approved by the COTR) with copies of the inspection report being submitted to the COTR. The purpose of these inspections is to identify and document possible safety problems and repair these problems before someone is injured.
- C. For all airside projects, a Safety Plan shall be attached to the Safety Program. The Safety Plan should include, to the extent applicable, provisions for the following:
1. Scope of work to be performed, including proposed duration of work.
 2. Possible safety problems.
 3. Work control measures.
 4. Limitations on equipment height.
 5. Location of airport operational areas.
 6. Location of and access to stockpiled construction materials and equipment.
 7. Inspection requirements.
 8. Trenches and excavations, and cover requirements.
 9. Threshold marking and lighting.
 10. Closed runway marking.
 11. Vehicle operation and pedestrian access in airport movement areas.
 12. Construction site access and haul roads, includes maintenance of and keeping open ARFF access routes.
 13. Limitations on construction.
 14. Radio communications.
 15. Foreign object debris (FOD) control provisions.
 16. Hazardous materials (HAZMAT) management.
 17. Wildlife abatement.
 18. NOTAM issuance.
 19. Vehicle identification.
 20. Vehicle parking.
 21. Use of temporary visual aids.
 22. Obstacle-free zones (OFZ).
 23. Approach clearance to runways.
 24. Runway and taxiway safety areas.
 25. Procedures and equipment, such as barricades (identify type) for closing portions of the movement area.
 26. Required compliance of Contractor personnel.
 27. Procedures for notification of aircraft rescue fire fighting (ARFF) if deactivating water lines or fire hydrants, or if emergency access routes are rerouted or blocked.
 28. Emergency notification for fire, medical, and police response.
 29. The Safety Plans will be coordinated with the COTR and shall address all COTR concerns and review comments.

3.2 SPECIFIC CONTRACTOR'S PROJECT SAFETY AND HEALTH PROGRAM REQUIREMENTS

A. The Contractor's Project Safety and Health Program shall incorporate all basic elements of the construction project safety and health program set forth in Article 3.01 above, Section X "Construction Safety Manual", and the following project-specific program elements:

1. A written, project-specific Safety and Health Plan (Plan), incorporating job hazard analysis for tunneling and underground construction operations, encountering contaminated soil and water, detailed emergency action procedures and fire risk assessment shall be developed by the Contractor, for review by the COTR and PSM to point out deficiencies before the start of any underground construction. The Plan shall specifically address rescue operations, conditions affecting rescue operations, smoke venting procedures, back-up power supply and pumping systems, means of ingress and egress, communications, hotwork permitting procedures, and training, orientation and refresher training for workers, emergency responders and visitors.
2. A written fire risk assessment portion of the Plan shall detail potential fire hazards, means of dealing with those hazards, fire prevention, fire suppression and emergency evacuation measures that will be employed by the Contractor during the course of the Project. The fire risk assessment shall include documentation that the material selected for the ventilation system ducting is in compliance with the specifications. The fire risk assessment shall be prepared and stamped by a registered fire protection engineer in the Commonwealth of Virginia.
3. The Plan shall be updated as substantive changes in the underground work environment occur. The Authority's and local fire departments shall be provided with a copy of the most current Plan and advised of changes in the Plan as they are implemented. The fire departments will be requested to review and comment on the Plan and any changes that occur to the Plan.
4. The Contractor is required to send all project supervisory personnel to attend an Authority provide Orientation prior to the start of any work.
5. The Contractor's Safety Manager shall train all underground workers and the COTR and his staff members in the details of the Plan.
6. In accordance with local and state regulations a permit system shall be used for all hotwork performed on the project. The Contractor's Safety and Health Plan shall detail the permit system's procedures. The permit system shall be implemented and supervised by the Contractor's Safety Manager. The permits shall be made available for inspection by the Authority, the COTR and the local fire department(s). Open flames and fire shall be prohibited in all underground construction operations, except as permitted for welding, cutting and other hotwork operations pursuant to the Contractor's Hotwork Permit System. Smoking shall be allowed only in areas free of fire and explosion hazards. Readily visible signs prohibiting smoking and open flames shall be posted in areas having fire or explosion hazards.
7. The Contractor shall provide for each of his/her underground workers and for ten (10) of the COTR's staff personnel, NIOSH approved, oxygen-generating, self-rescuers.
8. The Contractor shall at all times, when work is being performed underground, provide rescue teams as set forth in Title 29 CFR, Part 1926.800 (g)(5), OSHA Rules and Regulations for Underground Construction. If the Contractor chooses to use the Authority's Fire Department as one of his OSHA rescue teams, then any training,

- equipment, or staffing required shall be solely the responsibility of the Contractor and the Authority's Fire Department. The Authority's fire officials shall retain responsibility for incident command during an emergency within the limits of the project.
9. Emergency medical services and ambulance service provided in connection with serious injuries or illnesses on the job site are included in the OCWIP.
 10. The Contractor in all cases shall request responses by the fire department(s) to Project-related emergencies involving members of the general public. The Contractor shall fully coordinate and cooperate with the Authority Fire and Rescue in its response to such emergencies.
 11. The Contractor shall fully coordinate and cooperate with the Authority's Risk Management and Authority Fire and Rescue in its response to such emergencies.
 12. The Contractor shall make underground work areas accessible for training and familiarization purposes a minimum of two eight-hour periods, yearly, as mutually agreed upon by the Contractor and fire department(s) or as directed by the Authority or COTR, and as appropriate to tunnel conditions. Two additional visits a year shall be on a not-to-interfere basis with tunnel construction, such as Sundays or other days in which mining or lining of the tunnel is not taking place. The Contractor shall provide all necessary support personnel to accomplish all these training and familiarization sessions.
 13. The Contractor shall make underground work areas accessible to the Authority's Fire Department official and/or his designee on a weekly basis during all working hours. The Authority's Fire Department official shall be accompanied by designated representatives of the COTR and/or Contractor to ensure immediate action on issues raised during the visits.
 14. The Contractor is required to obtain all permits required for the Contractor's use of chemicals, and is responsible to meet all Federal, State and Local requirements. The Contractor shall develop a written chemical safety plan to address all chemicals used during construction. This safety plan shall include detailed procedures to prevent chemical accidents to the maximum extent possible during chemical transport, transfer, storage, use and disposal. The chemical safety plan shall include emergency response procedures, which identify all potential chemical emergencies and the recommended emergency response action to be taken for each incident. These procedures shall consider all potential chemical emergencies including chemical spills, incompatible reactions, fires and human exposures. Procedures shall describe methods to contain and isolate the accident, including the required protective clothing, equipment, first aid and response methods. Conduct, using Contractor's staff emergency response training and drills to the extent necessary to control the specific chemicals used by the Contractor. The Contractor's emergency response procedures shall be coordinated with support action from the Authority's and local fire departments and hazardous material response teams, to provide for a comprehensive emergency response plan. This coordinated response shall be adequate to manage all chemical emergencies and provide for the health, safety and evacuation of all site personnel as well the community. The Authority's and local fire departments shall be provided with a copy of the most current plan and be requested to review and comment on the plan. At all times when chemicals are on site, the Contractor shall maintain a trained emergency response staff, equipment, protective clothing and supplies as needed to implement the chemical safety plan.
 15. The Contractor shall have at least one (1) employee on site at all times who is trained and qualified to administer first aid and cardiopulmonary resuscitation (CPR) for every 25 employees on site.

16. The Contractor shall comply with all requirements identified in OSHA regulation § 1926.50 relating to medical services and first aid.
17. The Contractor shall provide the on-site safety staff an appropriate office on the job site(s) to maintain safety records, up-to-date copies of all pertinent safety rules, regulations and governing legislation, material safety data sheets, and the site safety and health plan including information concerning foreseeable emergency conditions, location of emergency and telephone contacts for supportive action and for all required notifications.
18. No visitors will be allowed in tunnels without permission of the COTR.
19. The Contractor shall continuously monitor the air quality to assure that the air quality is in accordance with OSHA Standard 1910.120 and the approved safety and health plan.
20. Every location of underground construction shall have a check-in/check-out system that will ensure that the aboveground personnel can determine the identification of all underground personnel.
21. Oncoming shifts shall be informed of any hazardous occurrences or conditions that have affected or might affect employee safety, including but not limited to: liberation of gas; the encountering of petroleum/glycol impacted soils or water; equipment failures; earth or rock slides; cave-ins; flooding; fires; or explosions.
22. In situations where unassisted voice communication is inadequate, power-assisted means shall be used to provide communication among workers and support personnel.
23. Emergency equipment specified in the emergency plan shall be provided within 15 minutes of each portal or shaft entry. Inspections and workability tests of the equipment shall be made and documented monthly.
24. If there are less than twenty-five persons underground at any one time, provisions shall be made for at least one 5-person rescue team to be either on the job site or within 30 minutes travel time from the underground entry point. This rescue team may be provided by local emergency response services if approved by the COTR.
25. Provide a fully equipped first aid station and emergency transportation at each underground construction site, regardless of the number of persons employed.

3.3 ACCIDENT REPORTING, INVESTIGATION AND SURVEILLANCE

A. Accident Reporting

1. Accidents are defined for purposes of this Specification as: “Any unplanned event which results, or could have resulted, in an injury or illness to workers or the general public, property loss or damage to the environment.” The Contractor shall, as promptly as conditions permit, notify the COTR’s Safety Manager, the Authority’s Risk Management Department and the designated local Public Safety official of the nature and circumstances of the emergency. Provide such notice no later than 24 hours after the event. Report all accident events in accordance with the following:
 - a. The COTR’s Safety Manager will establish and disseminate to the Contractor all required accident reporting formats.
 - b. Ensure that all accidents involving scope of work on the project, including Subcontractors are reported in the established format to the COTR’s Safety Manager within twenty-four (24) hours of the event.

- c. Develop a monthly summary of accident information and submit to COTR's Safety Manager no later than the tenth calendar day of the following month.

B. Accident Investigation

1. Investigate all accident events, as defined above and that occur on those portions of the Project under the Contractor's control, in accordance with the contract documents and specifications.
 - a. Conduct a detailed investigation of any and all accidents.
 - b. Provide the COTR's Safety Manager and the Authority's Risk Management Department with a detailed investigative report for any and all accidents.
 - c. Fully cooperate with the Authority's Risk Management Department, COTR's Safety Manager and/or public authority having jurisdiction in the investigation of accidents.
 - d. Report accident investigations in a complete manner on the accident reporting format(s) designated by the COTR's Safety Manager.

C. Accident Surveillance

1. The Authority's OCWIP Safety Consultant and COTR's Safety Manager seek to collect accident information for purposes of identifying patterns, trends, performance and establishing appropriate policies and procedures related to protection of safety and health. To that end prepare and submit reports of accidents as detailed above.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.

END OF SECTION 00 73 19

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

1. Adjust list below to suit Project.
2. Work covered by the Contract Documents.
3. Type of the Contract.
4. Work phases.
5. Work under other contracts.
6. Products ordered in advance.
7. Authority-furnished products.
8. Use of premises.
9. The Authority's occupancy requirements.
10. Work restrictions.
11. Specification formats and conventions.

- B. Related Sections include the following:

1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of the Authority's facilities.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Project consists of for a Drying Bed to be located at the Industrial Waste Water Treatment Operation site at Ronald Reagan Washington National Airport (DCA).

1. Project Location: Ronald Reagan Washington National Airport.

- B. Architect/Engineer Identification: The Contract Documents, dated January 20, 2016 were prepared for Project by URS Corporation.

- C. The Work consists of upgrades to the existing Industrial Wastewater Treatment Operation (IWTO) at Ronald Reagan Washington National Airport. Upgrades include construction of a new concrete drying with a canopy and perimeter retaining wall, concrete dumpster pad, sand

trap / oil water separator, gravity sewer, water service, storm drainage, duplex submersible pump station, sewer force main, lighting and associated electrical.

1. The Work includes :
 - a. Site Civil
 - b. Site Utilities
 - c. Structure – Steel Canopy
 - d. Exterior Elements
 - e. Mechanical/Plumbing
 - f. Electrical
 - g. Site Equipment.
2. For additional requirements for the examination of plans, specifications, and Project site see Section "Supplementary Conditions."

1.4 TYPE OF CONTRACT

- A. Project will be constructed under a general construction contract.

1.5 WORK PHASES

- A. Conduct the Work in one (1) phase.
 1. Phase 1: Construction of all IWTO upgrades as described in Section 1.3(C).
- B. Work phasing indicated above is not intended to restrict Contractor to this specific phasing. Contractor may submit its own phasing schedule to COTR for review and written approval.
- C. Schedule the execution of the Work according to the phasing sequence indicated and to avoid interference with normal functions of the Airport.
- D. Before commencing Work of each phase, submit a schedule to COTR showing the sequence, the commencement and completion dates, and the move-out and move-in dates of personnel for the various phases of the Work.
- E. On completion, each phase of the Work shall be fully operational.

1.6 WORK UNDER OTHER CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.
- B. Preceding Work: Not applicable.
- C. Concurrent Work: Not applicable.

D. Future Work: Not applicable.

1.7 PRODUCTS ORDERED IN ADVANCE: Section not applicable.

1.8 AUTHORITY-FURNISHED PRODUCTS: Section not applicable.

1.9 USE OF PREMISES

A. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of site beyond areas in which the Work is indicated.

1. Limits: Confine constructions operations to existing ITWO fenced area and as shown by the Contract Drawings, Sheets GN02.0001 and GN03.0001.
2. Authority Occupancy: Allow for Authority occupancy of site and day-to-day use by tenants, air carriers, and the public.
3. Contractor shall have full use of premises for construction operations within the Contract Limit Lines indicated during construction period, during the hours indicated, and as directed by COTR. Contractor's use of premises is limited only by the Authority's right to perform work or to retain other contractors on portions of Project.
4. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to the Authority, the Authority's employees, tenants, air carriers, and emergency vehicles at all times. Do not use driveways and entrances for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Utilize areas designated for Contractor staging, storage, and parking, as indicated. For additional requirements, see Section "Supplementary Conditions."

C. Use of Existing Buildings: Maintain existing buildings in a weather tight condition throughout construction period. Repair damage caused by construction operations. Protect buildings and their occupants during construction period.

1. For additional requirements for airfield and terminal buildings, see Section "Supplementary Conditions."

1.10 OCCUPANCY REQUIREMENTS

A. Full Authority Occupancy: The Authority and/or its tenants will occupy site and existing building during entire construction period. Cooperate with COTR during construction operations to minimize conflicts and facilitate Authority usage, and perform the Work so as not to interfere with day-to-day Airport operations.

- B. Partial Authority Occupancy: The Authority reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work. Partial Authority occupancy requirements are as follows:
1. COTR will prepare and obtain a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Authority occupancy.
 2. Before partial Authority occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, the Authority will operate and maintain mechanical and electrical systems serving occupied portions of building.
 3. On occupancy, the Authority will assume responsibility for maintenance and custodial service for occupied portions of building.
- C. For additional requirements for tenant operational requirements, see Section "Supplementary Conditions."

1.11 CONTRACTOR HOURS OF OPERATION

- A. Contractor Working Hours: The Authority anticipates that the Contractor may be required to work multiple shifts to accomplish the work of this Contract within the established schedule. Contractor will be allowed and may be required by the nature of the Project to work 24 hours a day, seven days a week in the performance of the Work. Work is subject to restrictions of the Airport operational requirements. Notify the COTR 24-hours in advance of any change to the work schedule.

1.12 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: With the exception of Federal Aviation Administration (FAA) standard specifications and Virginia Department of Transportation standard specifications the Specifications are organized into Divisions and Sections using the 33-Division format using the CSI/CSC's "MasterFormat 2004" numbering system.
1. Section Identification: The Specifications use Section titles to help with cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete as all available Sections and Section numbers are not used and the CSI numbering system is not sequentially complete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Interpret words and meanings as appropriate. Infer words implied, but not stated, as the sense requires. Interpret singular words as plural, and

plural words as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are used in these Specifications. This imperative language is directed to the Contractor, unless specifically noted otherwise. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.13 MARKING UTILITY SERVICES

- A. Employ underground utilities location subcontractor to locate and mark the horizontal location of all utility lines, that might be impacted by construction activities, including but not limited to the following:
 1. Electric power lines.
 2. Natural gas lines.
 3. Sanitary Sewers.
 4. Storm Sewers.
 5. FAA communications, signal, and security lines.
 6. Runway lighting lines
 7. Water supply piping.
 8. 530 KHz AM radio line - Parking Lot Availability Notification System -buried cable parallel to the Airport access road. The system utilizes antennas on the Airport thus there are no buried cables for this system within the fenced portion of the Airport property.
 9. Fuel Lines.
 10. Telephone lines.
 11. Data lines.
 12. Underground Storage Tanks.
 13. High Temperature Hot Water (HTHW) and chilled water lines.
- B. Contact the Airport Communications System (ACS) Help Desk at (703) 417-8300 a minimum of 72 hours prior to starting activities that include but are not limited to location and marking of horizontal locations of telephone and telecommunications lines belonging to the Authority as part of the Airport Communication System. Contact the Airport Communications System (ACS) Help Desk a minimum of 72 hours prior to beginning operations, that include but are not limited to excavating, boring, pile-driving, digging or planting. Note the ACS does not locate utilities. Location is the responsibility of the Contractor's underground utilities location subcontractor. The Airport Communications System (ACS) is merely notified as indicated previously.
- C. Employ underground utilities location subcontractor to locate and mark the horizontal location of all utility lines that might be impacted by construction activities, including, but not limited to, the following:
 1. Electric power lines.

2. Natural gas lines.
 3. Sanitary Sewers.
 4. Storm Sewers.
 5. FAA communications, signal, and security lines.
 6. Runway lighting lines
 7. Water supply piping.
 8. Fuel Lines.
 9. Telephone lines.
 10. Data lines.
 11. Underground Storage Tanks.
 12. High Temperature Hot Water (HTHW) and chilled water lines.
 13. Dedicated Fire System (DFS) lines.
- D. Contact the Airport Communications System (ACS) Help Desk at (703) 417-8300 a minimum of 72 hours prior to starting activities that include but are not limited to location and marking of horizontal locations of telephone and telecommunications lines belonging to the Authority as part of the Airport Communication System. Contact the Airport Communications System (ACS) Help Desk a minimum of 72 hours prior to beginning operations, that include but are not limited to excavating, boring, pile-driving, digging or planting. Note the ACS does not locate utilities. Location is the responsibility of the Contractor's underground utilities location subcontractor. The Airport Communications System (ACS) is merely notified as indicated previously.
- E. The information in the Contract Documents concerning the type and location of underground utilities is neither guaranteed nor inclusive. The Contractor is responsible for determining the type and location of underground utilities, regardless of whether such utilities are indicated or not, so as to avoid damage thereto.
- F. Check and verify the horizontal and vertical location (coordinates and elevation) of all utility lines that may exist within the limits of new work, regardless of whether such utilities are indicated or not, by use of a Subsurface Utility Engineering company. Reconfirm such locations and verification of utilities discovered, regardless of whether such utilities are indicated or not, and submit to the COTR a dimensional survey with such notations.
- G. Dig test pits by hand shovel in the vicinity of the discovered utilities. Excavate test holes utilizing a vacuum excavator.
- H. Repair any damage to discovered utility lines due to construction operations at no expense to the Authority. The Authority will assist the Contractor by making available any known information.
- I. Submit to the COTR, for written approval, the name of the independent subsurface utility engineering company to be used.
- J. The individual who performs the utility detection and location work shall have as a minimum five (5) years of similar experience in the area of subsurface utility detection and location engineering.
- K. Submit to COTR the following:

1. List of utility detection equipment along with product information and data sheets that will be used specifically for this contract.
2. List of employee qualifications and résumés of those individuals who will be assigned specifically to this contract.
3. Within 60 calendar days of Notice to Proceed, a survey of all subsurface utility engineering results indicating the horizontal and vertical location, coordinates and elevation of all utilities.

1.14 UTILITY OUTAGES

- A. Prior to any utility outage/interruption, prepare a schedule of such outage. Include in outage schedule duration, identification of the service affected, temporary utility service to be provided, identification of available service alternative, and the action to be taken in any emergency. Apply for all outages of utility systems in writing. Fully coordinate outage requests with COTR. Obtain approval in writing by COTR. Schedule all outages at least three (3) weeks in advance with a 96-hour notification provided by the Contractor confirming date, time, and duration. Outages will normally be scheduled to occur between the hours of 11:00 pm and 5:30 am, Tuesday through Thursday.
- B. Provide a suction/pump truck during all sanitary sewer line outages to support the disabled lift stations. Transport sewage to alternate lift stations located on the Airport and dispose of in accordance with Airport procedures. Provide a suction/pump truck with a capacity of 3,000 gallons or greater.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

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SECTION 01 22 00 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Special Provisions, Supplementary Conditions, and other Division 01 Specification Sections apply to this Section.
- B. The Price Proposal Form can be found in Section III, "Schedule".

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for unit prices.
- B. Related Sections include the following:
 - 1. Division 01 Section "Measurement and Payment" for procedures for measurement and payment for unit-price items.

1.3 DEFINITIONS

- A. Unit price is an amount proposed by offerors, stated on the Schedule as a price per unit of measurement for materials or services added to or deducted from the Contract Price by appropriate modification according to the Contract Provision Payments. -Construction Contracts, Paragraph H, "Variation in Estimated Quantities," if estimated quantities of work required by the Contract Documents are increased or decreased.
- B. A unit price is an amount proposed by offerors and stated on the Schedule as a price per unit of measurement for materials or services. An estimate of the quantities of work to be done and materials to be furnished under these specifications is given in Section III, "Schedule." It is given only as a basis for comparison of proposals and the award of the Contract. The Authority does not expressly or by implication agree that the actual quantities involved will correspond exactly therewith; nor shall Contractor plead misunderstanding or deception because of such estimates of quantities, or of the character, location, or other conditions pertaining to the work. Payment to Contractor will be made only for the actual quantities of work performed or materials furnished according to the plans and specifications. Refer to "Contract Provisions", Section VII, Payments - Construction Contracts, Paragraph H, "Variation in Estimated Quantities."

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit. The sum of all extended unit prices in the Section III,

"Schedule," shall be deemed to include all work described in the Contract Documents including Drawings and Specifications.

- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections and in Division 01 Section "Measurement and Payment."
- C. The Authority reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at the Authority's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: Specification Sections referenced in the Schedule contain requirements for materials described under each unit price.
 - 1. The Price Proposal Form can be found in Section III, "Schedule," of the Contract Documents. If applicable, Specification Sections referenced in the Schedule contain requirements for materials and methods described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES (Not Used)

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.

END OF SECTION 01 22 00

SECTION 01 22 10 - MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Special Provisions, Supplementary Conditions, and other Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements governing methods of measurement and computations to be used in determination of quantities of material furnished and unit amount of Work performed under the Contract in order for Contractor to receive payment according to pre-established unit prices.
- B. At the discretion of the COTR, payment may be reduced for any Work which is not in full compliance with the Contract Documents or which has been damaged or repaired by Contractor. Such action may be used when the end product may have a reduced service life or less than desirable aesthetic characteristics.
- C. Descriptions of unit-price items are specified in Division 01 Section "Unit Prices."
- D. Descriptions of unit-price items are specified in Section III, "Schedule," of the Contract Provisions.

1.3 MEASUREMENT OF QUANTITIES

- A. All volumes or quantities used to determine unit-price payment will be measured by COTR, or by COTR's authorized representatives, using methods generally recognized as conforming to good engineering practice. Unless otherwise indicated, measurement shall be in U.S. Customary Units of Measurement.
- B. Unless otherwise indicated, longitudinal measurements for area computations will be made horizontally, and no deductions will be made for individual fixtures (or leave-outs) having an area of 9 sq. ft. or less. Unless otherwise indicated, transverse measurements for area computations will be the neat dimensions shown on Drawings.
 - 1. Structures will be measured according to neat lines shown on the plans or as altered to fit field conditions.
 - 2. Measure all Contract items measured by the linear foot, such as electrical ducts, conduits, pipe culverts, under drains, and similar items, parallel to the base of foundation on which such items are placed, unless otherwise indicated.
 - 3. In computing volumes of excavation, use the average end area method or other acceptable method.

- C. The thickness of plates and galvanized sheet used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing will be specified and measured in decimal fraction of inches.
- D. Haul materials, to be measured by volume in the hauling vehicle, in approved vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type acceptable to and approved in advance by COTR, provided that the body is of such shape that the actual contents may be readily and accurately determined. Load all vehicles to at least their water-level capacity. Level loads when the vehicles arrive at the point of delivery.
 - 1. When requested by Contractor and approved by COTR in writing, material specified to be measured by the cubic yard may be weighed, and such weights will be converted to cubic yards for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by COTR and agreed to by Contractor before such method of measurement of pay quantities is used.
 - 2. The term "ton" will mean the short ton consisting of 2000-lb avoirdupois. Weigh all materials, which are measured or proportioned by weights, on accurate, approved scales by competent, qualified personnel at locations designated by COTR.
 - a. If material is shipped by rail, the car weight may be accepted, provided that only the actual weight of material will be paid for. However, car weights will not be acceptable for material to be passed through mixing plants.
 - b. Weigh trucks used to haul material being paid for by weight empty daily at such times as COTR directs. Each truck shall bear a plainly legible identification mark.
- E. Measure bituminous materials by the gallon or ton. When measured by volume, measure such volumes at 60 deg F or measure corrected to the volume at 60 deg F, using ASTM D 1250 for asphalts or ASTM D 633 for tars.
 - 1. Net certified scale weights or weights based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when bituminous material has been lost from the car or the distributor, wasted, or otherwise not incorporated into the Work.
 - 2. When bituminous materials are shipped by truck or transport, net certified weights by volume, subject to correction for loss or foaming, may be used for computing quantities.
- F. Concrete will be measured by the cubic yard in place, unless otherwise indicated.
- G. The term "each" when used as an item of payment shall mean complete payment for the work described in the Contract.
 - 1. When a complete structure or structural unit is to be provided, and "each" is specified, as the unit of measurement, the unit will be construed to include all necessary fitting, accessories, and work incidental to the work item.
- H. Rental of equipment will be measured by time in hours of actual working time and necessary traveling time of the equipment within the limits of the Work. Special equipment ordered by COTR in connection with "force account work" will be measured as agreed in Contract Modification authorizing such force account work as provided in the Contract Documents.

- I. When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gage, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited Specifications, manufacturing tolerances established by the industries involved will be accepted.
- J. When estimated quantities for a specific portion of the Work are designated as the pay quantities in the Contract, they shall be the final quantities for which payment for such specific portion of the Work will be made, unless the dimensions of said portions of the Work shown on Drawings are revised by Contract Modification signed by the Contracting Officer.
 - 1. If revised dimensions result in an increase or decrease in quantities of such Work, final quantities for payment will be revised in the amount represented by the authorized changes in the dimensions.

1.4 SCALES

- A. Scales for weighing materials, which are required to be proportioned or measured and paid for by weight, shall be furnished, erected, and maintained by Contractor or be certified permanently installed commercial scales.
- B. Scales shall be accurate within one-half percent of the current weight throughout the range of use. Contractor shall have scales checked under the observation of the inspector before beginning Work and at such other times as requested. The intervals shall be uniform in spacing throughout the graduated or marked length of the beam or dial and shall not exceed one-tenth of 1 percent of the nominal rated capacity of the scale, but not less than 1 lb. The use of spring balances will not be permitted.
 - 1. Beams, dials, platforms, and other scale equipment shall be so arranged that the operator and the inspector can safely and conveniently view them.
 - 2. Scale installations shall have available 10 standard 50-lb weights for testing the weighing equipment or suitable weights and devices for other approved equipment.
 - 3. Scales must be tested for accuracy and serviced before use at a new site. Platform scales shall be installed and maintained with the platform level and rigid bulkheads at each end.
 - 4. Scales "overweighing" (indicating more than correct weight) will not be permitted to operate, and all materials received subsequent to the last previous correct weighing-accuracy test will be reduced by the percentage of error in excess of one-half of 1 percent.
 - 5. In the event inspection reveals the scales have been "under-weighing" (indicating less than correct weight), they shall be adjusted, and no additional payment to Contractor will be allowed for materials previously weighted and recorded.
- C. All costs in connection with furnishing, installing, certifying, testing, and maintaining scales; for furnishing check weights and scale house; and for all other items specified in this Section for the weighing of materials for proportioning or payment shall be included in the unit Contract prices for the various items of Project.

1.5 PAYMENT FOR MATERIALS ON HAND

- A. Partial payments may be made to the extent of the delivered cost of materials to be incorporated into the Work, provided that such materials meet the requirements of the Contract, Drawings, and Specifications and are delivered to acceptable sites on the Airport property or at other sites in the vicinity that are acceptable to COTR. Such delivered costs of stored or stockpiled materials may be included in the next partial payment application after the following conditions are met:
1. COTR accepts the manner in which the material has been stored at or on an approved site.
 2. Contractor provides COTR with acceptable evidence of quantity and quality of the materials.
 3. Contractor provides COTR with acceptable evidence that the material and transportation costs have been paid.
 4. Contractor provides the Authority legal title, free of liens or encumbrances of any kind, to the material so stored and stockpiled.
 5. Contractor provides the Authority evidence that the material so stored or stockpiled is insured against loss by damage to or disappearance of such materials at anytime before use in the Work.
 6. Contractor provides the Authority with manufacturer's installation and maintenance information.
- B. It is understood and agreed that the transfer of title and the Authority's payment for such stored or stockpiled materials shall in no way relieve Contractor of responsibilities for furnishing and placing such materials according to the requirements of the Contract Documents.
- C. In no case will the amount of partial payments of materials on hand exceed the Contract price for the materials or the Contract price for the Contract item in which the material is intended to be used.
- D. No partial payment will be made for living or perishable plant materials.
- E. Contractor bears all costs associated with the partial payment of stored or stockpiled materials according to the provisions of this Section.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.

END OF SECTION 01 22 10

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SECTION 01 29 00 – APPLICATION FOR PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Special Provisions, Supplementary Conditions, and other Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

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

- 1. Coordinate the Schedule of Values and Applications for Payment with Contract CPM Schedule, List of Subcontracts, and Submittal Log.

- B. Related Sections include the following:

- 1. Division 01 Section "Unit Prices" for administrative requirements governing use of unit prices.
 - 2. Division 01 Section "Measurement and Payment" for administrative requirements governing methods of measurement and determination of quantities of materials for use with unit prices.
 - 3. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.
 - 4. Division 01 Section "Project Closeout" for submittal of items required before final payment.
 - 5. Division 01 Section "Project Record Documents" for procedural requirements governing the submission of Project Record Documents.
 - 6. Division 01 Section "Operation and Maintenance Data" for submittal of items required before final payment.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Price to various portions of the Work and once accepted, to be used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

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

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - c. Contract CPM Schedule.
 - d. List of products.
 - e. List of principal suppliers and fabricators.
 2. Submit the Schedule of Values to Contracting Officer at earliest possible date, but no later than 21 calendar days after the date of the Notice to Proceed.
 - a. On projects requiring cost-loaded CPM Schedules, the accepted cost loading will satisfy the requirements for the Schedule of Values.
 3. Sub schedules: Where the Work is separated into phases requiring separately phased payments, provide sub schedules showing values correlated with each phase of payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.**
1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of COTR.
 - c. Name of Architect/Engineer.
 - d. The Authority's Project number.
 - e. Contractor's name and address.
 - f. Date of submittal.
 2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Contract Modifications (numbers) that affect value.
 - g. Dollar value.
 - 1) Percentage of the Contract Price to nearest one-hundredth percent, adjusted to total 100 percent.
 3. Provide a breakdown of the Contract Price in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for the following items. The value assigned to the total of these line items shall be 5 percent of the Contract Price:

- a. Testing and commissioning activities.
 - b. Operation and Maintenance manuals.
 - c. Punch list activities.
 - d. Project Record Documents.
 - e. Bonds and warranties.
 - f. Demonstration and training.
4. Round amounts to nearest whole dollar. Total shall equal the Contract Price.
 5. Provide a separate line item in the Schedule of Values for each part of the Work where Application for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between potential items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.
 6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 7. Each item in the Schedule of Values and Application for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. At COTR's option, temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense.
 8. Schedule Updating: Update and resubmit the Schedule of Values with the next Applications for Payment when Contract Modifications result in a change in the Contract Price.

1.5 APPLICATION FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Contracting Officer and paid for by the Authority.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: Application for Payment shall coincide with CPM schedule monthly update, or as otherwise indicated in the Agreement between the Authority and Contractor. The period covered by each Application for Payment starts on the day following the end of the preceding period and shall not exceed one calendar month, unless otherwise approved by COTR.
- C. Payment Application Forms: Use forms provided by the Contracting Officer, but supplied by COTR, for Application for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. The Authority will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Contract Modifications issued before last day of construction period covered by application.
- E. Transmittal: Submit one original and four copies of Application for Payment to the address indicated in the Section VII - Contract Provision, paragraph 04.B, each one signed and notarized. Include waivers of lien and similar attachments if required.
1. Transmit Applications for Payment with a transmittal form listing attachments and recording appropriate information about application in a manner acceptable to Contracting Officer.
- F. Waivers of Mechanic's Lien: With Final Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers.
1. The Authority reserves the right to designate which entities involved in the Work must submit waivers.
 2. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to the Authority.
- G. Initial Application for Payment: Administrative actions and submittals that shall precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Schedule of unit prices.
 5. Submittals Schedule (preliminary if not final).
 6. List of Contractor's staff assignments.
 7. List of Contractor's principal consultants.
 8. Copies of building permits.
 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 10. Initial progress report.
 11. Report of pre-construction conference.
 12. Performance and payment bonds.
 13. Initial settlement survey and damage report if required.
 14. Submittal and approval of Contractor Safety Plan.
 15. Subcontractor Payment Form: (Form J, "Contract Conditions," Section IX, "LDBE").
- H. Monthly Application for Payment: Administrative actions and submittals that shall accompany the submittal of Contractor's monthly Application for Payment include the following:
1. Subcontractor Payment Form.
 2. Monthly Progress Report, prepared according to requirements specified in Division 01 Section "Construction Progress Documentation."
 3. Evidence of payment for material on-site if reimbursement for such material is being requested.

4. Update of Contract Record Documents.
 - I. Application for Payment at Substantial Completion: After issuance of the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Price.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Authority occupancy of designated portions of the Work, if applicable.
 3. Advise COTR of change-over in security provisions.
 - J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Price.
 4. Evidence that claims have been settled.
 5. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when the Authority took possession of and assumed responsibility for corresponding elements of the Work.
 6. Final, liquidated damages settlement statement.
 7. Return of all Airport identification badges and keys.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.

END OF SECTION 01 29 00

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SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Special Provisions, Supplementary Conditions, and other Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.
2. Conservation.
3. Coordination drawings.
4. Administrative and supervisory personnel.
5. Project meetings.

- a. Pre-award conference.
- b. Pre-construction conference.
- c. Pre-installation conference.
- d. Progress meetings.
- e. Partnering meetings.

- B. Related Sections include the following:

1. Division 01 Section: "Execution" for the coordination of general installation and field-engineering services, including establishment of benchmarks and control points.
2. Division 01 Section "Project Closeout" for coordinating Contract closeout.

1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.

3. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, mechanical, electrical, and otherwise. Contractor is cautioned that, where specific dimensions are not indicated or where Drawings are schematic in nature, as with most Electrical and Mechanical Drawings, Contractor shall have sole responsibility to coordinate the work to meet this requirement. Prepare and submit Coordination Drawings to COTR for review and approval as provided in "Coordination Drawings" Paragraph in "Submittals" Article of this Section.
 4. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for COTR and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work and completion within the specified Contract duration. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
 2. Preparation of the Schedule of Values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Pre-installation conferences.
 7. Start-up, check-out, and final acceptance of systems.
 8. Project closeout activities.
 9. Protection of existing and new work.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other sections for disposition of salvaged materials that are designated as the Authority's property.
- E. Temporary Utility Outages: Comply with requirements in Division 01 Section "Summary."

1.4 SUBMITTALS

- A. Coordination Drawings: Before start of the Work, prepare Coordination Drawings for areas with limited space availability that necessitate maximum utilization of space for efficient installation of different components, and areas requiring coordination for installation of products and materials fabricated by separate entities.
1. Indicate relationship of components shown on separate Shop Drawings.

2. Indicate all dimensions provided on Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment, minimum clearance requirements, amounts of equipment and material to be installed, or other requirements. Provide alternate sketches for resolution of such conflicts to COTR for review. Minor dimension changes and difficult installations shall not be considered changes to the Contract.
 3. Indicate required installation sequences.
 4. Comply with requirements contained in Division 01 Section "Submittals."
 5. Prepare coordination drawings of involved trades in a scale of not less than 1/4 inch = 1 foot or larger for integration of different construction elements. Show sequences and relationships of separate components to avoid conflicts in use of space. Any Work installed prior to review of coordination drawings will be at the Contractor's risk and subsequent relocation require to avoid interference shall be made at no additional cost to the Authority.
- B. Key Personnel Names: At the pre-construction meeting, submit a list of Contractor's key personnel assignments. Key personnel shall include but not necessarily be limited to Project Manager, Project Superintendent, Safety Manager, Safety Engineer, Quality Control Manager, Project Scheduler, Soil Excavation Engineers, and other personnel in attendance at Project site along with alternates. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep the list current at all times.

1.5 REQUESTS FOR INFORMATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, prepare and submit an RFI in the form specified.
1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
1. Contract Name
 2. Contract Number
 3. Date.
 4. Name of Contractor.
 5. Name of Resident Engineer
 6. Name of Task Manager
 7. RFI number, numbered sequentially.
 8. Specification Section number and title and related paragraphs, as appropriate.

9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include drawings, descriptions, measurements, color photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
 - a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
- C. Hard-Copy RFIs:
1. Identify each page of attachments with the RFI number and sequential page number.
- D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
 2. RFI must be signed and scanned for electronic transmission.
 3. Hard-Copy RFI shall follow Software-Generated RFI for the record.
- E. COTR's Action: COTR will review each RFI, determine action required, and return it. Allow seven (7) calendar days for COTR's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or RFIs with numerous errors.
 2. COTR's action may include a request for additional information, in which case COTR's time for response will start again.
 3. COTR's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal.
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify COTR in writing within ten (10) days of receipt of the RFI response.
- F. On receipt of COTR's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify COTR within seven (7) days if Contractor disagrees with response.

- G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly prior to progress meeting for inclusion in progress meeting minutes. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name of COTR.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date COTR's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.6 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project Superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1.7 PROJECT MEETINGS

- A. Pre-award Conference:

1. General: At the request of the Contracting Officer, a pre-award conference with Contractor may be held before actual award of the Contract. The meeting will review Contractor's understanding of the Contract Documents, cost and pricing data, contractual requirements, and Contractor's capabilities, financial standing, and past experience prior to award.
 - a. Minutes: COTR will record and distribute meeting minutes to all attendees and all relevant parties.
2. Attendees: Contracting Officer, COTR, Authority Design Project Manager, Architect/Engineer, Contractor and its key personnel nominated for assignment to the Contract, and major subcontractors if so requested by the Contracting Officer. Concerned parties shall each be represented by persons thoroughly familiar with and authorized to conclude matters relating to the work described in the Contract Documents. The Contracting Officer will chair the pre-award meeting.
3. Agenda: Significant discussion items that could affect award include, but are not limited to, the following:
 - a. Provision and acceptability of payment and performance bonds.
 - b. LDBE/MBE/WBE/DBE participation.
 - c. Qualifications of key individuals.
 - d. Quality-control experience.
 - e. Percentage of work performed by own forces.

- f. Contractor's experience with similar work, including previous Authority contracts.
 - g. Scheduling capabilities of Contractor.
 - h. Financial standing of Contractor.
 - i. Mobilization plan.
 - j. Understanding of work described in the Contract Documents and the physical constraints associated with work at the Airport.
 - k. Equipment and manpower availability.
 - l. Cost and pricing data.
4. Representations and commitments made by Contractor or its subcontractors shall be construed as binding to the Contract.

B. Pre-construction Conference:

1. General: COTR will schedule pre-construction conference and organizational meeting with Contractor after the Contracting Officer issues a notice of intent to award, or actually awards the Contract. The meeting will review the parties' responsibilities and personnel assignments.
 - a. Minutes: COTR will record and distribute meeting minutes to all attendees and relevant parties.
2. Attendees: Contracting Officer, COTR, Architect/Engineer, and their sub-consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Airport security.
 - b. LBDE/MBE/WBE/DBE participation and certifications.
 - c. Authority-controlled wrap-up insurance program.
 - d. Airport Operations coordination.
 - e. Preliminary construction schedule.
 - f. Phasing.
 - g. Critical work sequencing.
 - h. Designation of key personnel.
 - i. Procedures for processing field decisions and Contract Modifications.
 - j. Procedures for processing Applications for Payment.
 - k. Distribution of the Contract Documents.
 - l. Authority Construction guidelines.
 - m. Submittal procedures.
 - n. Preparation of Record Documents.
 - o. Use of the premises.
 - p. Responsibility for temporary facilities and controls.
 - q. Parking availability.
 - r. Office, work, and storage areas.
 - s. Equipment deliveries and priorities.
 - t. Safety procedures.

- u. Quality-control requirements.
 - v. First aid.
 - w. Progress cleaning.
 - x. Working hours.
 - y. Authority Building Code requirements/permits.
4. Refer to Contract Provision "Pre-construction Requirements" for required submittals due at the pre-construction conference.
- C. Pre-installation Conferences:
- 1. General: COTR will conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.
 - a. Minutes: COTR will record and distribute meeting minutes.
 - 2. Attendees: Contractor, Installer, and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have proceeded, or will follow.
 - 3. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related Contract Modifications.
 - d. Purchases.
 - e. Deliveries.
 - f. Submittals.
 - g. Review of mockups.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Weather limitations.
 - l. Manufacturer's written recommendations.
 - m. Warranty requirements.
 - n. Compatibility of materials.
 - o. Acceptability of substrates.
 - p. Temporary facilities and controls.
 - q. Space and access limitations.
 - r. Governing regulations and permits.
 - s. Safety.
 - t. Testing and inspecting requirements.
 - u. Required performance results.
 - v. Recording requirements.
 - w. Protection of construction and personnel.
 - x. Review material selection.
 - y. Fabrication and installation procedures.
 - z. Coordination of involved trades.

4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Construction Manager will schedule and conduct a Project closeout conference, at a time convenient to Owner and Architect, but no later than 30 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for preparing sustainable design documentation.
 - e. Requirements for preparing operations and maintenance data.
 - f. Requirements for demonstration and training.
 - g. Preparation of Contractor's punch list.
 - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - i. Submittal procedures.
 - j. Coordination of separate contracts.
 - k. Owner's partial occupancy requirements.
 - l. Installation of Owner's furniture, fixtures, and equipment.
 - m. Responsibility for removing temporary facilities and controls.
 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Weekly Progress Meetings:
1. General: COTR will 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 special pre-installation meetings. Additionally, discussions will address administrative and technical issues of concern, determining resolutions, and development of deadlines for resolution within allowable time frames.
 - a. Minutes: COTR will record and distribute meeting minutes.
 2. Attendees: As may be required by COTR, in addition to representatives of the Authority and Contractor, each subcontractor, supplier, Contractor's Project Scheduler, and other entities concerned with current progress or involved in planning, coordination, or

- performance of future activities. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Safety and Security.
 - 2) Interface requirements.
 - 3) Time.
 - 4) Sequence of operations.
 - 5) Status of submittals.
 - 6) Deliveries.
 - 7) Off-site fabrication.
 - 8) Storage Areas
 - 9) Access.
 - 10) Site utilization.
 - 11) Requests for information.
 - 12) Submittals.
 - 13) Noncompliance notices.
 - 14) Temporary facilities and controls.
 - 15) Work hours.
 - 16) Resource allocation.
 - 17) Hazards and risks.
 - 18) Progress cleaning.
 - 19) Quality and work standards.
 - 20) Contract Modifications.
 - 21) Documentation of information for payment requests.
 - 22) Preparation of Record Documents.
 4. Submit at the weekly progress meeting, a two-week look-ahead schedule. This schedule shall include a three-week period, one week showing actual progress from the previous week and two weeks showing planned work for the two weeks after the meeting date. Include in the schedule all activities in sufficient detail as approved by COTR. A two-week look-ahead schedule form will be distributed at the pre-construction conference. Submit a list of subcontractors identifying dates of when subcontractors will be on-site or off-site. A form for this information will be provided by COTR.
 5. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

F. Schedule Update Meetings:

1. Conduct schedule update meetings before submittal of Contractor's Application for Payment. Determine where each activity is, in relation to Contractor's CPM Schedule. Ensure the incorporation of all changes made to the sequence of work and all change notices issued by the Contracting Officer. Submit the narrative and information specified in Division 01 Section "Construction Progress Documentation" if applicable.
2. Attendees: COTR, Contractor's Project manager or superintendent, the Contractor's Project Scheduler, and the Authority's representative.
3. Submit the updated schedule, as bilaterally agreed on, along with the Application for Payment.
4. Present delay claims for discussion and, when possible, resolution.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.

END OF SECTION 01 31 00

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Special Provisions, Supplementary Conditions, and other Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for various CPM schedules and reports required for proper performance of the Work.
- B. All costs incurred by Contractor to correctly implement and update the schedule shall be borne by Contractor and are part of this Contract.
- C. Schedules required include the following:
 - 1. Contract Construction Progress Schedule in CPM format and related narrative and cash flow projection curves.
 - 2. Submittals Schedule.
 - 3. Schedule of Tests and Inspections.
 - 4. Record, As-Built CPM Schedule.
- D. Reports required include the following:
 - 1. Daily Construction Reports.
 - 2. Material Location Reports.
 - 3. Field Correction Reports.
 - 4. Special Reports.
 - 5. Monthly Progress Reports.
 - 6. Contractor Quality Control Reports.
- E. Related Sections include the following:
 - 1. Division 01 Section "Application for Payment" for Schedule of Values.
 - 2. Division 01 Section "Project Management and Coordination" for Project meeting minutes.
 - 3. Division 01 Section "Quality Requirements" for test and inspection reports.
 - 4. Division 01 Section "Product Requirements" for Product List.

1.3 DEFINITIONS

- A. Activity: The fundamental unit of work in a Project plan and schedule. Each activity has defined geographical boundaries and a detailed estimate of resources required to construct the task. Each activity is assigned a unique description, activity number, activity codes, and dollar value.
- B. CPM Network: The structure of the schedule. The network is the representation that defines the construction logic in terms of all the activities with their logical dependencies.
- C. Contract CPM Schedule: A cost-loaded CPM schedule covering the entire Contract Duration from the Notice to Proceed through Final Acceptance of the Work.
- D. Contract Duration/Time: The total time, in calendar days identified in Section III, "Schedule," representing the duration necessary for completion of all physical and administrative requirements under this Contract and any authorized extension thereof.
- E. Critical Path: The critical path is the longest connected chain of interdependent activities in a CPM network that impacts the completion of the Project.
- F. Excusable Delay: An unforeseeable delay, beyond the control of Contractor, experienced due to no fault or negligence by Contractor, its subcontractors, or suppliers.
- G. Predecessor Activity: An activity that precedes another activity in the network.
- H. Cost Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities shall equal the total Contract Price, unless otherwise approved by COTR.
- I. Successor Activity: An activity that follows another activity in the network.
- J. Total Float: The amount of time an activity can be delayed from its earliest start date without delaying the end of Project.
 - 1. Float time is not for the exclusive use or benefit of either the Authority or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

1.4 PLANNING

- A. The total Contract Duration and intermediate milestones if applicable, as indicated in Section III, "Schedule," are the Contract requirements.
- B. Contractor shall prepare a practical work plan to complete the Work within the Contract Duration, and complete those portions of work relating to each intermediate milestone date and other Contract requirements. Contractor shall generate a computerized cost-loaded CPM schedule in Precedence Diagram Method (PDM) format for the Work.

- C. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of COTR approval of the Schedule.
- D. Failure of Contractor to comply with requirements of this Section may be considered cause for withholding progress payments or termination for default.

1.5 SUBMITTALS

- A. General: Contractor shall provide all schedule submittals on computer disk media as well as tabular printouts, resource curves and histograms, and 24-by-36-inch time-scaled logic diagrams. The latest version of Primavera P3 or SureTrak scheduling software shall be used. All costs incurred by Contractor to correctly implement, computerize and update the CPM Schedule shall be borne by Contractor and are included in the Contract Price. The number of copies of each submittal shall be as described in this Section or as may be requested by COTR.
- B. Contract CPM Schedule: The Contract CPM Schedule and its related narrative as described in this Section shall be submitted along with the projected cash-flow curve as early as practicable after the Notice to Proceed, but in no event later than 30 calendar days after the Notice to Proceed. Within 15 calendar days, COTR will respond with approval or direction to change and Contractor shall resubmit within 10 calendar days, if required.
- C. Daily Progress Report: Submit duplicate copies to COTR by noon on the day following the date of actual progress.
- D. Monthly Progress Report: All components of the Monthly Progress Report described in this Section shall be submitted as attachments to Contractor's monthly Application for Payment.
- E. Record As-Built CPM Schedule: A Record CPM Schedule accurately reflecting actual progress of Work shall be submitted, as part of this Contract's Record Documents. All activities shall have actual dates that are true and accurate.
- F. Qualification Data: For Project Scheduler.

1.6 QUALITY ASSURANCE

- A. Project Scheduler Qualifications: Minimum of two years experience and not less than one project of similar size and scope, with capability to produce CPM reports and diagrams within 24 hours of COTR's request. Project Scheduler is classified as one of Contractor's key personnel.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PROJECT SCHEDULER

- A. Engage a project scheduler, either as Contractor's employee or as Contractor's consultant, to provide planning, evaluation, and reporting using CPM scheduling, and to prepare required schedules.
 - 1. Project Scheduler shall be an active participant at all meetings related to Project progress, alleged delays, and time impact.

3.2 CONTRACT CPM SCHEDULE

- A. Scheduling Requirements: The Contract CPM Schedule shall be a computerized cost-loaded, time-scaled CPM Schedule in PDM format that includes the following:
 - 1. The order, sequence, and interdependence of all significant work items including mobilization, demobilization, testing and commissioning, construction, procurement, fabrication, and delivery of critical or special materials and equipment; utility interruption coordination; submittals and approvals of critical Samples, Shop Drawings, procedures, or other reasonable requirements that may be requested by COTR.
 - 2. Work by the Authority, or utility agencies, and other third parties that may affect or be affected by Contractor's activities.
 - 3. Adequate referencing of all work items to identify subcontractors or other performing parties.
 - 4. Activity Coding may be provided by the COTR to establish minimum requirements for structure and values for the first 5 code fields.
 - 5. Activity durations not in excess of 14 calendar days, except nonconstruction activities such as procurement and fabrication. Activities shall be broken down in the level of detail prescribed by COTR.
 - 6. Activities that are cost loaded to show the direct costs required to perform the Work, including work by subcontractors.
 - 7. A narrative that explains the basis for Contractor's determination of construction logic, estimated durations, cost allocations, estimated quantities and production rates, hours per shift, workdays per week, and types, numbers, and capacities of major construction equipment to be used. A listing of nonworking days and holidays incorporated into the schedule shall be provided.
- B. Critical Path Activities: The Contract CPM Schedule shall be prepared to include the data for the total Contract and the critical path activities shall be identified, including critical paths for interim completion dates. Scheduled start or completion dates imposed on the schedule by Contractor shall be consistent with Contract milestone dates. Milestone dates shall be the scheduled dates specified in Section III, "Schedule," if applicable, and shall be prominently identified. The Contract CPM Schedule shall accurately show all as-built activities completed from the issuance of the Notice to Proceed up to the submittal of this schedule.

C. Assignment of Costs to Activities for Progress Payments:

1. Contractor shall assign cost to construction activities on the Contract CPM Schedule. Costs shall not be assigned to submittal activities unless specified otherwise but may, with COTR's approval, be assigned to fabrication and delivery activities. Costs shall be assigned to testing and commissioning activities, O&M manuals, punchlist activities, and Project Record Documents.
2. Each activity cost shall reflect an accurate value subject to approval by COTR.
3. The total cost assigned to activities shall equal the total Contract Price.
4. Activities shall be cost coded as directed by COTR.

D. Required Submittals: On a monthly basis, Contractor shall submit five copies of each of the following components of the Contract CPM Schedule:

1. A time-scaled plot of the schedule network in PDM format showing logic ties for all activities including submittals and procurement activities.
2. Computer-generated CPM Schedule Reports that contain the following data for each work item: activity identification number, description, resource loading, duration, early start and early finish calendar dates, late start and late finish calendar dates, and total float in calendar days. The reports shall also show the logic ties of successor and predecessor work items. The reports shall be sorted as follows, or other sorts as required by COTR:
 - a. By activity identification.
 - b. By total float x early start.
 - c. By early start x early finish x total float.
3. The narrative described in Subparagraph 3.2-A-6 above.
4. A cash-flow report showing monthly expenditures projected over the life of the Contract. A cumulative cash-flow curve based on early and late schedule events shall also be submitted. These reports shall be derived from the Contract CPM Schedule.

3.3 DAILY CONSTRUCTION REPORTS

A. Prepare a daily construction report, recording the following information concerning events at the site, coordinate with requirements in Division 01 Section "Quality Requirements," and submit duplicate copies to COTR by noon of the day following day of actual progress:

1. List of subcontractors (by trade group) at the site.
2. List of separate contractors at the site.
3. Approximate count of personnel (by trade group) at the site.
4. Equipment (by trade group) at the site.
5. High and low temperatures, general weather conditions.
6. Accidents (refer to accident reports).
7. Meetings and significant decisions.
8. Unusual events (refer to special reports).
9. Stoppages, delays, shortages, losses.
10. Meter readings and similar recordings.
11. Emergency procedures.

12. Orders and requests of governing authorities.
13. Change Notices/Directives and Contract Modifications received, implemented.
14. Services connected, disconnected.
15. Equipment or system tests and startups.
16. Partial Completions, occupancies.
17. Substantial Completions authorized.
18. Material deliveries.

3.4 MATERIAL LOCATION REPORTS

- A. At weekly intervals, prepare a comprehensive list of materials delivered to and stored at the site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for all materials or items of equipment being fabricated or stored away from the building site. Submit copies of list to COTR at weekly intervals.

3.5 FIELD CORRECTION REPORT

- A. When the need to take corrective action that requires a departure from the Contract Documents arises, prepare a detailed report including a statement describing the problem and recommended changes. Indicate reasons the Contract Documents cannot be followed. Submit a copy to COTR immediately.

3.6 SPECIAL REPORTS

- A. When an event of unusual or significant nature occurs at the site, prepare and submit a special report. List the chain of events, persons participating, response by Contractor's personnel, an evaluation of the results or effects, and similar pertinent information. Advise COTR in advance when such events are known or predictable.
 1. Include tabular CPM reports, time-scaled logic diagrams, resource curves and histograms, and narratives as requested by COTR.
- B. Submit special reports directly to COTR within seven calendar days of an occurrence. Submit a copy to other parties affected by the occurrence.

3.7 MONTHLY PROGRESS REPORTING

- A. General: Approval of Contractor's monthly Application for Payment shall be contingent, among other factors, on the submittal of a satisfactory monthly schedule update.
- B. Monthly Schedule Update Meetings: Monthly schedule updates shall be the product of joint review meetings between Contractor, COTR, and major active subcontractors. The joint review shall focus on actual progress for the preceding month, planned progress for the upcoming month supported by a Contractor-prepared Four-Week Look-Ahead Schedule, impact to schedule if any due to change notices issued, adverse weather, and any effected changes to the

Construction CPM Schedule. The agreed on progress, and changes, if any, shall be incorporated into the schedule update to be submitted. The update shall always represent the actual history of accomplishment of all activities, and will form the basis for Contractor's Application for Payment. Contractor's delay claims shall be presented for discussion and, when possible, resolution.

- C. Required Submittals: On a monthly basis, Contractor shall submit two copies in electronic format of the updated CPM schedule and five copies of each of the following components of the Monthly Progress Report:
1. A monthly progress narrative, the content of which shall be prescribed by COTR, but shall include as a minimum a description of overall progress for the preceding month, a critical path analysis, a discussion of problems encountered and proposed solution thereof, delays experienced and proposed recovery measures, a monthly reconciliation of weather impact, the status and impact of contract modifications, documentation of any logic changes, and any other changes made to the schedule since the previous monthly update.
 2. CPM schedule reports listing completed activities, activities in progress, and remaining activities in the format requested by COTR. For each activity, Contractor shall provide those details identified in Subparagraph 3.2-D-2.
 3. Monthly and cumulative cash-flow curves that show actual vs. planned cash-flow status.
 4. Documentation of delivered material in the form of paid invoices or other evidence that Contractor has clear title for the material delivered.
- D. If critical activities of the schedule are delayed and such delay is not excusable as defined in this Section, the remaining sequence of activities and/or duration thereof shall be adjusted by Contractor through such measures as additional manpower, additional shifts, or the implementation of concurrent operations until the schedule produced indicates Work will be completed on schedule. Except as provided elsewhere in the Contract, all costs incurred by Contractor to recover from inexcusable delays shall be borne by Contractor.
- E. The monthly schedule update shall form the basis for Contractor's Application for Payment. The progress payment for an activity shall be based on its agreed on percentage of completion. On unit-priced contracts, the approval of Contractor's monthly requisition is contingent on the submittal of a satisfactory monthly schedule update; however, the basis of payment will be the actual measurement of COTR-accepted, in-place units of work.

3.8 DELAYS AND REQUESTS FOR EXTENSION OF TIME

- A. The determination for an extension of the Contract Time will be made by the Contracting Officer according to the Contract Provision "Default."
- B. Contractor acknowledges and agrees that delays in activities, irrespective of the party causing the delay, which according to the computer mathematical analysis do not affect any critical activity or milestone dates on the CPM network at the time of the delay, shall not become the basis for an extension of the Contract Time. The only basis for any extension of time will be the demonstrated impact of an excusable delay on the critical path. In demonstrating such

impact, Contractor shall provide adequate detail as required by the Contract, and Contractor shall prove that:

1. An event occurred.
2. Contractor was not responsible for the event in that the event was beyond the control of Contractor, and was without fault or negligence of Contractor, subcontractor, or supplier, and the event was unforeseeable.
3. The event was the type for which an excuse is granted according to the "Default" provision of this Contract.
4. Activities on the critical path of the Work were delayed.
5. The event in fact caused the delay of the Work.
6. The requested additional time is an appropriate and reasonable extension of the Contract Time, given the actual delay encountered.

C. Time Extensions for Unusually Severe Weather:

1. If unusually severe weather conditions are the basis for a request for an extension of the Contract Time, such request shall be documented by data substantiating that weather conditions were abnormal for the period of time and could not have been reasonably anticipated, and that weather conditions had an adverse effect on the critical activities of the scheduled construction.
2. The schedule of anticipated adverse weather below will constitute the base line for monthly (or a prorated portion thereof) weather/time evaluation by the Contracting Officer. On issuance of the Notice to Proceed and continuing throughout the Contract on a monthly basis, actual adverse weather days will be recorded by Contractor on a calendar day basis (include weekends and holidays) and compared to the monthly anticipated adverse weather days set forth below.
 - a. For purposes of this clause, the term "actual adverse weather days" shall include days that can be demonstrated to have been impacted by adverse weather.
 - b. Monthly Anticipated Adverse Weather Calendar Days:
 - 1) January - 7.
 - 2) February - 5.
 - 3) March - 6.
 - 4) April - 6.
 - 5) May - 8.
 - 6) June - 6.
 - 7) July - 6.
 - 8) August - 7.
 - 9) September - 5.
 - 10) October - 5.
 - 11) November - 5.
 - 12) December - 6.
 - c. The number of actual adverse weather days shall be calculated chronologically from the first to the last day in each month. Contractor shall not be entitled to any claim for time extension based on adverse weather unless the number of actual adverse weather days exceeds the number of anticipated adverse weather days, and

unless such adverse weather days prevent work for 50 percent or more of Contractor's workday. In preparing the Contract Schedule, Contractor shall reflect the above anticipated adverse weather days on all weather-dependent activities. Weather-caused delays shall not result in any additional compensation to Contractor.

3. On days where adverse weather is encountered, Contractor shall list all critical activities under progress and shall indicate the impact adverse weather had, if any, on the progress of such activities. This information shall be presented at the end of the adverse weather day to COTR or its authorized representative for its review and approval.
4. If Contractor is found eligible for an extension of the Contract Time, the Contracting Officer will issue a modification extending the time for Contract completion. The extension of time will be made on a calendar day basis.

D. Required Submittals:

1. Provide time-impact analysis that illustrates impact during update period in which event occurred, that event has been mitigated to greatest possible extent, and that event still impacts overall completion of Project.
2. Include with request, two copies of submittal of impacted schedule, in electronic format, and photocopies of all relevant documents that support the claim.
3. Submit all required items within the following time periods:
 - a. 10 calendar days of event occurrence.
 - b. 10 calendar days of Contractor's knowledge of impact.
 - c. 14 calendar days of written request by COTR.
4. Expiration of time periods without submittal shall constitute forfeiture of rights for these specific impacts.

3.9 RECORD SCHEDULE

- A. After all Contract work items are complete, and as a condition of final payment, Contractor shall submit three copies of a Record, As-Built CPM Schedule showing actual start and finish dates for all work activities and milestones, based on the accepted monthly updates. These schedule submittals shall be in tabular and in time-scaled PDM plot formats.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.

END OF SECTION 01 32 00

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SECTION 01 32 33 - PHOTOGRAPHIC AND VIDEO RECORDING DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Special Provisions, Supplementary Conditions, and other Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Preconstruction photographs and video recordings.
 - 2. Photographic and video recordings of key construction activities.
 - 3. Daily and monthly construction photographs and video recordings.
 - 4. Video recording of Demonstration and Training
 - 5. Final Completion construction photographs.
- B. Related Sections include the following:
 - 1. Division 01 Section 01 "Submittals" for submitting construction photographs.
 - 2. Division 01 Section 01 "Quality Requirements" for photographic and video-recording of daily site activities and key construction activities.
 - 3. Division 01 Section 01 "Project Closeout" for submitting photographic documentation as Project Record Documents at Project closeout.
 - 4. Division 01 Section 01 "Demonstration and Training" for submitting videotapes of demonstration of equipment and training of Authority's personnel.

1.3 SUBMITTALS

- A. Qualification Data: Submit the name, position, qualifications, and sample photos and videos taken by individuals proposed to be assigned responsibility for photographic and video recording documentation.
- B. Quality Control Plan: Include the processes, procedures and requirements for photographic and video recording documentation in the Quality Control Plan.
- C. File Naming Convention: Submit the proposed file naming convention for photographs and video recordings.
- D. File Delivery and Storage Format: Submit the proposed file delivery and storage format and method for photographs and video recordings. The photographic and video recording storage

format is to be capable of sorting or searching based on: date of the photograph or recording; the location of the work; and the work activity.

E. Key Plan: Submit a key plan including a description of each work area with notation for location and direction of photographs and video recordings. Indicate elevation or story of construction.

F. Digital Photographs:

1. Submit all digital photographic image files within five (5) business days of taking photographs via Unifier, or other delivery and storage format as approved by the COTR.
2. Monthly Submittal: Each month, submit two copies of a DVD containing all photographic documentation for the month and a copy of the updated tracking log for photographs.
3. Required photographic documentation: The minimum requirements for photographic documentation is:
 - a. Pre-construction conditions for each work area
 - b. Key construction activities
 - c. Daily progress of the work with focus on critical activities
 - d. Conditions at the time of final completion or portion thereof.

G. Video Recordings:

1. Submit all video recording documentation within five (5) business days of taking video recordings via two (2) copies of a DVD, or other delivery and storage format as approved by the COTR.
2. Monthly Submittal: Each month, submit an updated log documenting all video recordings, to include: the date of the video recording; the location; the work activity; the video recorder's name; and the Contractor's name and contract number.
3. Required video recording documentation: The minimum requirements for video recording documentation is:
 - a. Pre-construction conditions for each work area
 - b. Key construction activities
 - c. Weekly progress of the work with focus on critical activities
 - d. Demonstration and training provided for the Airports Authority operations and maintenance personnel.
 - e. Conditions at the time of final completion for each Construction task order or portion thereof.

H. Consolidated File of Photographic and Video Recordings at Final Completion: The Contractor shall catalog and provide a complete set of all photographs and video recordings upon final completion.

1.4 USAGE RIGHTS

A. Transfer copyright usage rights from the photographers and video recorders to the Airports Authority for unlimited reproduction of photographic and video recording documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC AND VIDEO RECORDING DOCUMENTATION

A. Digital Images:

1. Digital Camera: Minimum sensor resolution of eight (8) megapixels.
2. Format: Provide color images in JPG format with minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped.
3. Date and Time Stamp: Each photographic is to be date and time stamped to show when the photograph was created.
4. File Name: Each photograph file is to be named with reference to:
 - a. Date the photograph was created
 - b. Location
 - c. Work area and activity
 - d. Name of the photographer
 - e. Name of the Contractor and contract number.
5. Tracking log: Develop and maintain a tracking log for all photographs.

B. Video Recordings:

1. Provide high-resolution, color, digital video recordings in DVD format, or other delivery and storage format as approved by the COTR.
2. Narrative: Provide verbal, narrative description to accompany the video recording.
3. Organization and Identification: On each DVD, provide a label printed directly on the DVD with the following information:
 - a. Date video recording was recorded.
 - b. Location
 - c. Work activity
 - d. Duration of the recording in minutes and seconds
 - e. Name of the video recorder
 - f. Name of the Contractor and contract number
4. Tracking log: Develop and maintain a tracking log for all video recordings, to include: the date of the video recording; the location; work activity; the video recorder's name; and the Contractor's name and contract number.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. The Quality Control Manager shall be responsible for the provision of the required photographic and video recording documentation. The processes, procedures and requirements for photographic and video recording documentation shall be detailed in the Quality Control Plan. The requirements, status and work planning for provision of the required photographic and video recording documentation shall be provided to the Airports Authority during the regularly scheduled Quality Control briefings. Key construction activities that require

photographic and or video recording are to be identified and reviewed at the Quality Control briefings with the Airports Authority.

- B. Key Construction Activities: Key construction activities to be documented using photographs and or video recording include, but are not limited to activities such as: foundations; structural steel; concrete placement; plumbing; electrical wiring and equipment; glass and curtain-walls; roofing and waterproofing; maintenance of traffic; temporary facilities; and other activities of major significance.

3.2 PHOTOGRAPHIC DOCUMENTATION

- A. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
- B. Preconstruction Photographs: Before starting mobilization, demolition or construction, take color photographs of each work area and surrounding properties from a variety of vantage points.
 - 1. Provide a minimum of twenty (20) photographs to show existing conditions at each work area before starting the work.
 - 2. Provide a minimum of twenty (20) photographs of existing buildings and facilities adjacent to the work area to accurately record the physical conditions before starting work.
- C. Photographs of Key Construction Activities: Provide a minimum of twenty (20) photographs for each key construction activity showing all aspects of the work.
- D. Daily Site Photographs: Provide a minimum of ten (10) site photographs daily to illustrate the status and progress of work activities with focus on critical activities.
- E. Monthly Construction Photographs: Provide a minimum of twenty (20) site photographs to illustrate the overall status and progress of the work.
- F. Final Completion Construction Photographs:
 - 1. Provide a minimum of twenty (20) photographs upon Final Completion or portion thereof to show final conditions.
 - 2. Provide a minimum of twenty (20) photographs of existing buildings and facilities adjacent to the work area to accurately record the physical conditions upon completion of the work.

3.3 VIDEO RECORDINGS - GENERAL

- A. Recording: Use a tripod-mounted and or a handheld video recorder to document site conditions, progress, status of work, key construction activities, and demonstration and training. Display continuous running time, and date and time stamp each recording. At the start of each video recording, record the date, time, the location, the work activity, the person performing the video recording, the name of the Contractor, the contract number, and the weather conditions to include the temperature reading at the jobsite.

- B. Narration: Describe scenes on video recording by audio narration as the video recording is recorded. Include a description of items being viewed, recent events, and planned activities. Describe the vantage point, indicating location, direction (by compass point), and elevation or story of construction.

3.4 VIDEO RECORDINGS

- A. Preconstruction Video Recording: Before starting mobilization, demolition or construction record video for each work site and surrounding facilities from a variety of vantage points.
 - 1. Show existing conditions adjacent to the work site before starting the work.
 - 2. Show existing buildings either on or adjoining the jobsite to accurately record the physical conditions prior to the start of demolition and construction.
- B. Video Recording of Key Construction Activities: Provide a video recording for each key construction activity showing all aspects of the work.
- C. Weekly Video Recording: Provide a weekly video recording to illustrate the status and progress of work activities with focus on critical activities.
- D. Video Recording for Demonstration and Training: Provide video recording of the demonstration and training of the Airports Authority's operations and maintenance personnel as required by Specification Section 01 79 00.
- E. Final Completion Video Recording: Provide a video recording upon Final Completion or portion thereof to show final conditions of the completed work, the adjacent buildings and facilities, and any adjacent work that is in progress.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.

END OF SECTION 01 32 33

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SECTION 01 33 00 - SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Special Provisions, Supplementary Conditions, and other Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.
- B. Related Sections include the following:
 - 1. Division 01 Section "Project Closeout" for submitting warranties.
 - 2. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 3. Divisions 02 through 33 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires COTR's responsive action.
- B. Informational Submittals: Written information that does not require COTR's approval. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

- A. General: COTR will provide electronic copies of CADD electronic files of the drawings for Contractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that requires sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

- a. Without change to the Contract Duration, COTR reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Contractor's Responsibilities: Contractor is responsible for the scheduling and submission of all submittals. Submit to COTR all required Submittals. The COTR will forward submittals to the appropriate parties for review.
- E. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on COTR's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including re-submittals.
1. Initial Review: Allow 15 calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. COTR will advise Contractor when a submittal processed must be delayed for coordination. Allow an additional 45 calendar days for submittals related to fire-protection systems.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Re-submittal Review: Allow 15 calendar days for review of each re-submittal.
 4. Sequential Review: Where sequential review of submittals by COTR, or other parties is indicated, allow 21 calendar days for initial review of each submittal.
 5. No extension of the Contract Time will be authorized because of failure to transmit submittals to COTR enough in advance of the Work to permit processing. Processing of incomplete or unacceptable submissions by COTR shall not reduce the number of calendar days specified above for COTR's review. Resubmissions shall be treated the same as initial submissions relative to review time.
 6. Notations on submittals that increase the Contract cost or time of completion shall be brought to COTR's attention before proceeding with the Work.
- F. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by COTR and Architect.
 3. Include the following information on label for processing and recording action taken:
 - a. Contract name and number.
 - b. Date.
 - c. Name and address of Architect/Engineer.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor, if applicable.
 - f. Name and address of supplier, if applicable.
 - g. Name of manufacturer, if applicable.
 - h. Submittal number or other unique identifier, including revision identifier.

- 1) Submittal number shall use Specification Section number followed by a dash and then a sequential number (e.g., 061000-001 or 070150.19-001). Re-submittals shall include an alphabetic suffix after another dash (e.g., 061000-001-A or 070150.19-001-A).
 - i. Alphanumeric project Identifier. Identifier is shown on the Project Drawings cover sheet.
 - j. Number and title of appropriate Specification Section.
 - k. Drawing number and detail references, as appropriate.
 - l. Location(s) where product is to be installed, as appropriate.
 - m. Transmittal number.
 - n. Allow 15 calendar days for processing each re-submittal.
- G. Resubmissions: Re-submittal procedure shall follow the same procedures and same number as the initial submittal with the following exceptions:
1. Transmittal shall contain the same information as the first transmittal and the submission number shall indicate second, third, etc., submission. The drawing number/description shall be identical to the initial submission and the date shall be the revised date for that submission.
 2. No new material shall be included on the same transmittal for a resubmission.
 3. COTR rejection shall not warrant a claim by Contractor for additional time or cost.
- H. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals. Where significant deviations from the Contract requirements exist, follow the guidelines set forth in Division 01 Section "Product Requirements" for substitutions.
- I. Additional Copies: Unless additional copies are required for final submittal, and unless COTR observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
1. Additional copies submitted for Operations and Maintenance manuals will be marked with action taken and will be returned.
- J. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal from Contractor to COTR using the approved transmittal form provided by COTR. COTR will return submittals, without review, received from sources other than Contractor.
1. Transmittal Form: Use transmittal forms and follow other submittal procedures according to information provided to Contractor at the preconstruction meeting.
- K. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, and authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
1. Bear all costs incurred for such reproduction and distribution. Prints of all reviewed Shop Drawings may be made from transparencies that carry the appropriate review stamps.

- L. Use for Construction: Use only final submittals with mark indicating "approved" by COTR in connection with construction.

1.5 SUBMITTAL LOG

- A. Prepare a log that contains a complete listing of all submittals required by Contract. Submit the log at the preconstruction meeting along with Contractor's construction schedule specified in Division 01 Section "Construction Progress Documentation." Organize the submittal log by Section number. Assign each submittal a sequential number for identification and tracking purposes.
 - 1. Coordinate the submittal log with Division 01 Section "Construction Progress Documentation." The submittal log shall be submitted for COTR's review. Include the following information:
 - a. Title of submittal/description.
 - b. Submittal number (sequential).
 - c. Scheduled date for the first submittal.
 - d. Drawing number, if applicable.
 - e. Applicable Section number.
 - f. Name of subcontractor/vendor.
 - g. Scheduled date of COTR's final release or approval.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operating and maintenance manuals.

- k. Compliance with recognized trade association standards.
 - l. Compliance with recognized testing agency standards.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
4. Submit Product Data before or concurrent with Samples.
 5. Number of Copies: Submit six copies, in addition to the number of copies to be returned to Contractor. Provide one additional copy for submittals related to fire-protection system.
 6. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 - m. Relationship to adjoining construction clearly indicated.
 - n. Seal and signature of professional engineer if specified.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
 3. Number of Copies: Submit one reproducible transparency and two black-line prints of each submittal. Provide one additional black-line print for items related to fire-protection systems. COTR will return the marked up reproducible transparency for Contractor's distribution.
 - a. Both the reproducible transparency and the prints shall bear Contractor's approval stamp on each sheet.
- D. Coordination Drawings:
1. Coordination Drawings are Shop Drawings prepared by Contractor that detail the relationship and integration of different construction elements that require careful

- coordination during fabrication or installation. Preparation of Coordination Drawings is specified in Division 01 Section "Project Management and Coordination."
2. Submit Coordination Drawings for integration of different construction elements. Show sequences and relationships of separate components to avoid conflicts in use of space.
- E. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of appropriate Specification Section.
 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as the Authority's property, are the property of Contractor.
 4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit three full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. COTR will return submittal with options selected.
 5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. COTR will retain two Sample sets; remainder will be returned.

- 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- F. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product.
 2. Number and name of room or space.
 3. Location within room or space.
 4. Number of Copies: Submit three copies of product schedule or list, unless otherwise indicated. COTR will return two copies.
 - a. Mark up and retain one returned copy as a Project Record Document.
- G. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation."
- H. Application for Payment: Comply with requirements in Division 01 Section "Application for Payment."
- I. Schedule of Values: Comply with requirements in Division 01 Section "Application for Payment."
- J. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.
- K. Contractor Warranty Letter: Comply with requirements in Contract Provision "Warranty of Construction." Provide the dates of warranty coverage and provide point of contact information for warranty service.
- L. Special Warranty Letters: Provide dates of warranty coverage and provide point of contact information for warranty service for special warranties required in Division 02 through 33 Sections.
- 2.2 INFORMATIONAL SUBMITTALS
- A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit four copies of each submittal, unless otherwise indicated. COTR will not return copies.
 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. An officer shall sign certificates and certifications or other individual authorized to sign documents on behalf of that entity.
 3. Test and Inspection Reports: Comply with requirements in Division 01 Section "Quality Requirements."
- B. Contractor's Construction Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation."
- C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of Architects and Owners, and other information specified.
- D. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
- H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.
- I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- J. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.
- K. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- L. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.

- M. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- N. Research/Evaluation Reports: Prepare written evidence from a model code organization acceptable to the Authority that product complies with USBC. Include the following information:
1. Name of evaluation organization.
 2. Date of evaluation.
 3. Time period when report is in effect.
 4. Product and manufacturers' names.
 5. Description of product.
 6. Test procedures and results.
 7. Limitations of use.
- O. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 01 Section "Operation and Maintenance Data."
- P. Design Data: Prepare written and graphic information, including, but are not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- Q. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
1. Preparation of substrates.
 2. Required substrate tolerances.
 3. Sequence of installation or erection.
 4. Required installation tolerances.
 5. Required adjustments.
 6. Recommendations for cleaning and protection.
- R. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.

5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement on whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- S. Bonds: Prepare written information indicating current status of bonding coverage. Include name of entity covered by insurance or bond, limits of the coverage, amounts of deductibles, if any and term of coverage.
- T. Manufacturers' warranties.
- U. Construction Photographs and Videotapes: Comply with requirements in Division 01 Section "Photographic Documentation."
- V. Material Safety Data Sheets: Submit information directly to COTR.

2.3 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.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to COTR.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to COTR.
1. In checking Shop Drawings and Product Data, verify all dimensions and field conditions and check and coordinate Shop Drawings and Product Data of any Section or trade with the requirements of other sections or trades as related thereto, as required for proper and complete installation of the Work.

- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents, which shall include dimensions, clearances, compatibility, and coordination with Shop Drawings and Product Data submitted for other work.
- C. If Contractor has not checked the submittals carefully, even though stamped as checked and approved, submittals shall be returned to Contractor for proper checking before further processing or review by COTR regardless of any urgency claimed by Contractor. In such a situation, Contractor will be responsible for any resulting delays to the scheduled Contract completion. Furthermore, Contracting Officer may hold Contractor responsible for increased Authority costs resulting from Contractor's failure to comply with the requirements set forth herein.

3.2 COTR'S ACTION

- A. General: COTR will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. COTR Responsibilities: The review of Shop Drawings and other submittals by COTR will be for general conformance with the Contract only, and the review shall not be interpreted as a checking of detailed dimensions, quantities, or approval of deviations from the Contract Documents. COTR review shall not relieve Contractor of its responsibility for accuracy of Shop Drawings nor for the furnishing and installation of materials or equipment according to the Contract requirements.
 - 1. Approval of Shop Drawings or other submittals is not to be interpreted as approval of a substitute material. Approval of substitutions will be accomplished according to requirements set forth in Division 01 Section "Product Requirements."
- C. Action Submittals: COTR will review each submittal, make marks to indicate corrections or modifications required, and return it. COTR will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows. Do not permit submittals marked "Revise and Resubmit" or "Rejected" to be used at Project site, or elsewhere where Work is in progress.
 - 1. Approved: Means fabrication/installation may be undertaken. Approval does not authorize changes to the Contract Price or the Contract Time.
 - 2. Approved as Corrected: Same as "Approved," providing Contractor complies with corrections noted on submittal. Resubmission required only if Contractor is unable to comply with noted corrections.
 - 3. Revise and Resubmit: Fabrication and/or installation may not be undertaken. Make appropriate revisions and resubmit, limiting corrections to items marked.
 - 4. Rejected: Submittal does not comply with requirements. Fabrication and/or installation may not be undertaken. Prepare a new submittal according to requirements and submit without delay.

- D. Informational Submittals: COTR will review each submittal and will not return it, or will reject and return it, if it does not comply with requirements. COTR will forward each submittal to appropriate party.
- E. Partial submittals are not acceptable, will be considered non-responsive, and will be returned without review.
- F. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.

END OF SECTION 01 33 00

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and Contract Provisions, Special Provisions, Supplementary Conditions, and other Division 01 Specification Sections apply to this Section.
- B. Related Sections:
 - 1. Division 01 Section "Submittals" for process required to submit the Contractor's Quality Control Plan.
 - 2. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
 - 3. Division 01 "Project Management and Coordination"
 - 4. Division 01 Section "Operation And Maintenance Data"
 - 5. Division 01 Section "Project Closeout"
 - 6. Division 01 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
 - 7. Divisions 02 through 33 Sections for specific test and inspection requirements.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Administrative and procedural requirements for Contractor to provide and maintain an effective Quality-Control Program that complies with this Section and with requirements of the "Contract Provisions," Section VII, "Inspection of Construction and Final Inspection and Acceptance."
 - 2. Establish a QC Program that consists of the following:
 - a. QC Organization
 - b. QC Plan
 - c. QC Plan Meeting
 - d. Coordination and Mutual Understanding Meeting
 - e. QC meetings
 - f. Phases of Control\
 - g. Submittal review and approval
 - h. Operation & Maintenance data and Warranty receipt verification prior to product delivery
 - i. Material verification at delivery
 - j. Testing, completion inspections, and QC certifications and documentation necessary to provide materials, equipment, workmanship, fabrication, construction and operations that comply with the requirements of this Contract.

3. Contractor is not responsible for Special Inspections according to requirements of the current Virginia Uniform Statewide Building Code (USBC). The Authority's agent shall provide these Special Inspection services. Special Inspections coordination should be discussed at weekly progress meetings and scheduled dates for Special Inspections carried on the two-week look ahead. Contractor shall be responsible for coordination of and notification to the Authority for the following Special Inspections.
 - a. Special inspections are required for, but are not necessarily limited to, the following:
 - 1) Steel construction.
 - 2) Concrete construction.
 - 3) Masonry construction.
 - 4) Foundation systems including concrete footings of buildings three stories or less in height which are fully supported on earth or rock.
 - 5) Prepared fill requirements.
4. Specific quality-control requirements for individual construction activities are specified in the Sections that require those activities. Requirements in those Sections may also cover production of standard products.
5. Schedule of Values: Contractor shall include all test and inspection activities in its CPM and establish a Schedule of Values for all quality test and inspection activities; and all required reports, and procedures required in the Contract on a Section-by-Section basis. Additionally, Contractor shall include a pay line item specifically for CQC activities and QCM position(s) required by the General Conditions. CQC activities shall be reported per Division 01 Section "Applications for Payment."
6. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of its responsibilities for compliance with the Contract Document requirements.
7. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
8. The provisions of this Section shall not limit requirements for Contractor to provide quality-control services required by the Authority or other agencies having jurisdiction.

1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
 1. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
 - a. ASTM C 1077 Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation latest edition.

- b. ASTM D 3666 Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials latest edition.
- c. ASTM D 3740 Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction latest edition.
- d. ASTM E 329 Agencies engaged in the Testing and/or Inspection of Materials Used in Construction latest edition. ASTM E 543 Agencies Performing Nondestructive Testing latest edition.
- e. ASTM E 543 Agencies performing Nondestructive Testing latest edition.

2. METROPOLITAN WASHINGTON AIRPORT AUTHORITY

- a. *Construction Safety Manual*, most current edition

1.4 DEFINITIONS

- A. Quality: Conformance to the requirements established by the contract specifications and drawings.
- B. Control: To guide and have influence over.
- C. Contractor Quality Control (CQC): The construction contractor's system to manage, control, and document their own, their supplier's, and their subcontractor's activities to comply with the contract requirements.
- D. Contracting Officers Technical Representative (COTR). Primary on-site representative of the Contracting Officer for technical matters. Duties and responsibilities of the COTR will be transmitted to the contractor via letter from the Contracting Officer.
- E. Quality-Assurance Services: Activities, actions, and procedures performed by the Authority before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirement. Additionally, the Authority fulfills its responsibility to be certain that the CQC is functioning and the specified end product is achieved.
- F. Mockups: Full-size, physical example assemblies that are constructed on site to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects or details and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work shall be judged. Mockups supersede samples in the approval and acceptance of the Work. Construct mockups away from the work. Do not use mockups as part of the work.
- G. Definable Feature of Work: A definable feature of work (DFOW) is a task, which is separate and distinct from other tasks, has the same control requirements and work crews.
- H. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of 10 projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having

jurisdiction. Specific experience requirements enumerated in these specifications supersede this requirement.

1.5 CONFLICTING REQUIREMENTS

- A. General: If compliance with two standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the COTR for a decision before proceeding. This paragraph refers to industry and government standards. In case of a difference between drawings and the specifications, the specifications shall govern.

1.6 SUBMITTALS

- A. Submit the following in accordance with Division 01 Section, "Submittals."
 - 1. Action Submittals.
 - a. Quality Control (QC) Plan.
- B. NOTE: Coordinate the submittal requirement dates with the submittal dates in Division 01 Section "Construction Progress Documentation".
- C. Submit a QC plan within 20 calendar days after receipt of Notice to Proceed. The QC Plan shall include a preliminary submittal of the list of definable features of work that shall cover the first 90 calendar days of construction.
 - 1. Submit at this time résumés of key personnel to be assigned to this contract and the limits of their authority. Show how this project management structure fits into the Contractor's corporate management structure.
- D. Any approval by the COTR of the QC Plan shall be treated as "accepted, predicated upon successful implementation." Stop work if the QC Plan becomes disapproved. The exception is the work authorized in the paragraph entitled "Preliminary Work Authorized Prior to Approval," shall stop.

1.7 INFORMATION FOR THE CONTRACTING OFFICER

- A. Provide a sample copy set of report forms to the Contracting Officer during the Pre-Construction Conference. The report forms shall consist of the Quality Control Daily Report, Preparatory Phase Report, Initial Phase Report, and Project Quality Control Monthly Summary. These forms may be edited to support the project. Other reports referenced below may be in formats customarily used by the Contractor, Testing Laboratories, etc. and shall contain the information required by this specification.
- B. Deliver the following listed items to the COTR at the times specified:

1. Quality Control Daily Report: Original and 6 copies, by 12:00 noon the next working day after each day that work is performed.
2. Superintendent's Daily Report: Original and 6, by 12:00 noon the next working day after each day that work is performed, attached to the Quality Control Daily Report.
3. Material Receiving Inspection Report: Original and 6 copies, by 12:00 noon the next working day after each day that work is performed, attached to the Quality Control Daily Report.
4. Preparatory Phase Report: Original attached to the original Quality Control Daily Report and 1 copy attached to each copy of the Quality Control Daily Report.
5. Initial Phase Report: Original attached to the original Quality Control Daily Report and 1 copy attached to each copy of the Quality Control Daily Report.
6. QC specialist Reports: Originals and 6 copies, by 12:00 noon the next working day after each day that work is performed, attached to the Quality Control Daily Report.
7. Field Test Reports: 2 copies, within 2 working days after the test is performed, do not attach to the Quality Control Daily Report.
8. Monthly Summary Report of Tests: 2 copies, do not attach to a Quality Control Daily Report.
9. Project Quality Control Monthly Summary Report: 2 copies, do not attach to a Quality Control Daily Report.
10. Inspection Log and Signoff Sheets: one copy, submitted daily within 1 day of the inspection.
11. Testing Plan and Log: 2 copies, submitted within 2 working days of the end of the month.
12. Deficiency List: 2 copies, submitted to the COTR weekly.
13. Monthly Deficiency Report: 2 copies within two working days of the end of the month.
14. QC Meeting Minutes: 2 copies, within 2 working days after the meeting.
15. QC Certifications: As required by paragraph entitled "QC Certifications."

1.8 QC PROGRAM REQUIREMENTS

- A. Establish and maintain a QC Program as described in this Section. The QC Program consists of but is not limited to the following:
1. QC Organization.
 2. QC Plan.
 3. QC Plan Meeting.
 4. Coordination and Mutual Understanding Meeting
 5. QC meetings.
 6. Phases of Control.
 7. Submittal review and approval.
 8. Operations and Maintenance data.
 9. Warranty receipt verification prior to product delivery.
 10. Material verification at delivery.
 11. Testing.
 12. Completion inspections.
 13. QC certifications and documentation necessary to provide materials, equipment, workmanship, fabrication, construction and operations that comply with the requirements of this Contract.

14. The QC Program shall cover on-site and off-site work and shall be keyed to the work sequence.
15. No work or testing may be performed unless the QCM or a pre-approved alternate is on the work site.
16. The QCM shall report to an officer of the firm and shall not be subordinate to the Project Superintendent or the Project Manager.
17. Quality Control Manager is the primary individual responsible for quality control. The QCM, Project Superintendent and Project Manager shall be responsible for the quality of work on the job. Project Superintendent shall be held responsible for the quality of production.

B. Preliminary Work Authorized Prior to Approval

1. The only work that is authorized to proceed prior to the approval of the QC Plan is mobilization of storage and office trailers, temporary utilities, and surveying.

C. Approval

1. Approval of the QC Plan is required prior to the start of any construction. The Contracting Officer reserves the right to require changes in the QC Plan and operations as necessary, including but not limited to removal of personnel, to ensure the specified quality of work. The Contracting Officer reserves the right to interview any member of the QC organization at any time in order to verify the submitted qualifications. All QC organization personnel shall be subject to acceptance by the Contracting Officer. The Contracting Officer may require the removal of any individual for non-compliance with quality requirements specified in the contract.

D. Notification of Changes

1. Notify the COTR, in writing, of any proposed change, including changes in the QC organization personnel, a minimum of seven calendar days prior to a proposed change. Proposed changes shall be subject to acceptance by the Contracting Officer.

1.9 QC ORGANIZATION

A. Staffing Levels: Provide sufficient qualified quality-control personnel to monitor each work activity at all times. Scheduling and coordinating of all inspections and testing shall match the type and pace of work activity.

1. In cases where multiple trades, disciplines, or subcontractors are on site at same time, each activity shall be tested and inspected by personnel skilled in that portion of the work.
2. In cases where multiple shifts are employed, the quality-control staff shall be increased as required to monitor the work on each shift.

B. The following positions are key personnel as defined by the Authority in this and other Division 01 Specification Sections.

1. Project Manager

- a. To enhance the effectiveness of the Quality Control Organization Project Manager shall be intimately involved in Quality Control. To this end, the Project manager shall have successfully completed the Army Corps of Engineers/NAVFAC Contractor Quality Control Course (details in Paragraph “Construction Quality Management Training” below).
 - b. Qualifications: Fifteen years of experience, with six years of project management experience on major underground projects of similar size, type, and complexity to this Project in which the individual had overall project responsibility.
2. Project Superintendent
 - a. Qualifications: Fifteen years of experience, with five years experience in a supervisory role coordinating various trades at multiple work areas.
3. Quality Control Manager (QCM)
 - a. Duties
 - 1) Provide a QCM at the work site to implement and manage the QC Program. In addition to implementing and managing the QC Program, the QCM may perform the duties of project superintendent. The QCM is required to attend the QC Plan Meeting, attend the Coordination and Mutual Understanding Meeting, conduct the QC meetings, perform the Phases Control, perform submittal review and approval, ensure testing is performed and provide QC certifications and documentation required in this contract. The QCM is responsible for managing and coordinating the Phases Control and documentation performed by Testing Laboratory personnel and any other inspection and testing personnel required by this Contract.
 - 2) Provide a QCM at the work site to implement and manage the QC Program. The only duties and responsibilities of the QCM are to manage and implement the QC Program on this contract. The QCM shall not be designated as the safety competent person as defined by Construction Safety manual. The QCM is required to attend the QC Plan Meeting, attend the Coordination and Mutual Understanding Meeting, conduct the QC meetings, perform the Phases Control perform submittal review and approval, ensure testing is performed and provide QC certifications and documentation required in this contract. The QCM is responsible for managing and coordinating the Phases Control and documentation performed by Testing Laboratory personnel and any other inspection and testing personnel required by this Contract.
 - b. Qualifications
 - 1) An individual with a minimum of 5 years experience as a superintendent, inspector, An individual with a minimum of 5 years experience as a superintendent, inspector, QCM, project manager, project engineer or construction manager on similar size and type construction contracts which

included the major trades that are part of this Contract. The individual shall be familiar with the requirements of the Construction Safety Manual, and have experience in the areas of hazard identification and safety compliance. The QCM shall be interviewed and approved by COTR.

- 2) A graduate of a four year ABET accredited college program in one of the following disciplines: Engineering, Architecture, Construction Management, Engineering Technology, with a minimum of 10 years' experience as a superintendent, QCM, project manager, project engineer or construction manager on similar size and type construction contracts which included the major trades that are part of this Contract. The individual shall be familiar with the requirements of the Authority Construction Safety Manual, and have experience in the areas of hazard identification and safety compliance. The QCM shall be interviewed and approved by COTR.

c. Construction Quality Management Training

- 1) In addition to the above experience and education requirements, the QCM shall have completed the course entitled "Construction Quality Management for Contractors." If the QCM does not have a current certification, they shall obtain the CQM course certification within 60 - calendar days of award. This short course is periodically offered in alternate months by: (1) the Maryland Chapter, Associated General Contractors (AGC), 410-321-7870; agcmd@aol.com and by (2) the Virginia Chapter, Associated Builders and Contractors (ABC), 703-968-6205, joanna@abdva.org; mervin@abc.org. The training uses Army Corps of Engineers course content. The course is facilitated by instructors from Army Corps of Engineers, North Atlantic Division, Baltimore District, and by instructors from the Naval Facilities Engineering Command, Engineering Field Activity Chesapeake.

4. Alternate QCM Duties and Qualifications

- a. Designate an alternate for the QCM at the work site to serve in the event of the designated QCM's absence. The period of absence may not exceed two weeks at one time, and not more than 30 workdays during a calendar year. The qualification requirements for the Alternate QCM shall be the same as for the QCM.

5. Assistant QCM Duties and Qualifications

- a. Provide an assistant to the QCM at the work site to perform the Phases Control, perform submittal review, ensure testing is performed, and prepare QC certifications and documentation required by this Contract. The qualification requirements for the Assistant QCM shall be a graduate of a four year ABET accredited college program in one of the following disciplines: Engineering, Architecture, Construction Management, Engineering Technology, with a minimum of 3 years' experience. The individual shall be familiar with the requirements of the Authority Safety Manual Construction Safety Manual, and have experience in the areas of hazard identification and safety compliance.]

- b. Provide an assistant to the QCM at the work site to perform the Phases Control, perform submittal review, ensure testing is performed, and prepare QC certifications and documentation required by this Contract. The Assistant QCM shall be on the work site during supplemental work shifts and shall perform the duties of the QCM during such supplemental shift work. The qualification requirements for the Assistant QCM shall be a graduate of a four year ABET accredited college program in one of the following disciplines: Engineering, Architecture, Construction Management, Engineering Technology, with a minimum of 5 years' experience. The individual shall be familiar with the requirements of the Authority Construction Safety Manual, and have experience in the areas of hazard identification and safety compliance.
6. QC Specialists Duties and Qualifications
 - a. Provide a separate QC specialist at the work site for each of the areas of responsibilities, specified below, who shall assist and report to the QCM and who shall have no duties other than the assigned quality control duties. QC specialists are required to attend the Coordination and Mutual Understanding Meeting, QC meetings, and be physically present at the construction site to perform the Phases Control and prepare documentation for each definable feature of work in their area of responsibility.
7. Registered Fire Protection Engineer
 - a. Registered Fire Protection Engineer (FPE) shall be an independent third party hired directly by the Contractor as an integral part of the prime construction Contractor's Quality Control Organization. The Registered FPE shall have no business relationships (owner, partner, operating officer, distributor, salesman, or technical representative) with any subcontractors involved with this project; or with any fire protection equipment device manufacturers, suppliers or installers for any such equipment provided as part of this project. The Registered FPE shall be responsible for review, approval, and coordination of all fire protection system material submittals, calculations, shop drawings, etc. The Fire Protection Engineer shall be a registered Professional Engineer in the Commonwealth of Virginia who has had a minimum of 10 years experience as a fire protection engineer.
8. Submittal Reviewer (s) Duties and Qualifications
 - a. Provide one Submittal Reviewer(s), other than the QCM, qualified in the discipline(s) being reviewed, to review and certify that the submittals meet the requirements of this Contract prior to certification or approval by the QCM.
 - b. An individual with 10 years of construction experience shall review each submittal.
 - c. A registered architect or professional engineer shall review each submittal.
9. QC Assistant

- a. Provide a full time Administrative Assistant at the work site whose primary duty shall be to assist the QCM in processing and maintaining files for submittals, preparing and publishing reports and meeting minutes. After primary duties are accomplished, other duties may be assigned provided the duties do not interfere with primary duties.
10. Erosion and Sediment Control Inspector
- a. The Erosion and Sediment Control Inspector shall be responsible for inspecting the erosion and sediment controls, reporting requirements, and for ensuring conformance with the approved Storm Water Pollution Prevention Plan (SPPP). The Erosion and Sediment Control Inspector may have other duties, however, the designated individual shall be familiar with the requirements set forth in the Virginia Erosion and Sediment Control Handbook.
11. Project Engineer/Scheduler
- a. Qualifications: Refer to Division 01 Section "Construction Progress Documentation".
12. Professional Engineer with Geotechnical Specialty
- a. Qualifications:
 - 1) Registered Professional Engineer. Registration shall be with the Commonwealth of Virginia.
 - 2) Minimum of five years of experience with observation and evaluation of temporary excavation support system installations; survey data; excavations in soil and rock; soil and rock sub grades; installation of instrumentation in and/or on rock; and instrumentation data.
13. Support of Excavation Installer
- a. Qualifications: Specialized experience in the installation of excavation support systems including soil nails, rock bolts, rock-anchors, micropiles, and instrumentation systems for monitoring excavation support performance.
14. Professional Land Surveyor
- a. Qualifications: Registered Professional Land Surveyor licensed to practice in the Commonwealth of Virginia.
15. Professional Geologist
- a. Qualifications: Minimum of five years of experience in providing evaluation and analysis of survey and geotechnical information; and in the design and development of instrumentation and monitoring programs.
16. Instrumentation Engineer

a. Qualifications

- 1) Registered to practice engineering in the Commonwealth of Virginia
- 2) Minimum of ten years experience in providing design and development of instrumentation and monitoring programs that are similar to those indicated for this Project in material, design and extent. Refer to Division 31 "Earthwork".

1.10 QC PLAN MEETING

- A. Within 10 calendar days of notice of award and prior to submission of the QC plan, meet with the COTR to discuss the QC plan requirements of this Contract. The purpose of this meeting is to communicate expectations and facilitate understanding of the QC plan requirements prior to plan development and submission.

1.11 QUALITY CONTROL (QC) PLAN

- A. Provide, for approval by the COTR, a QC plan submitted in a 3-ring binder with pages numbered sequentially that covers both on-site and off-site work and includes but may not necessarily be limited to the following:

- B. A table of contents listing the major sections identified with tabs in the following order:

1. QC ORGANIZATION
2. PERSONNEL MATRIX
3. NAMES AND QUALIFICATIONS
4. DUTIES, RESPONSIBILITY AND AUTHORITY OF QC PERSONNEL
5. APPOINTMENT LETTERS
6. OUTSIDE ORGANIZATIONS INCLUDING BOCA INSPECTION COMPANIES
7. TESTING LABORATORY INFORMATION AND CERTIFICATIONS
8. TESTING PLAN AND LOG
9. SUBMITTAL PROCEDURES AND INITIAL SUBMITTAL REGISTER
10. LIST OF DEFINABLE FEATURES
11. PROCEDURES FOR PERFORMING THE PHASES OF CONTROL
12. SPECIAL INSPECTIONS
13. DOCUMENTATION PROCEDURES
14. PROCEDURES TO COMPLETE REWORK ITEMS
15. PROCEDURES FOR COMPLETION INSPECTION
16. FORMS
17. ATTACHMENTS

- C. A chart showing the QC organizational structure.

- D. A personnel matrix showing for each Section of the specification who shall review and approve submittals, who shall perform and document the Phases Control, and who shall perform and document the testing.

- E. Names and qualifications, in résumé format, for each person in the QC organization. Include the CQM course certifications for the QCM and Alternate QCM as required by the paragraphs entitled "Construction Quality Management Training" and "Alternate QCM Duties and Qualifications".
- F. Duties, responsibilities and authority of each person in the QC organization.
- G. Letters signed by an officer of the firm appointing the QCM and Alternate QCM and stating that they are responsible for implementing and managing the QC Program as described in this contract. Include in this letter the responsibility of the QCM and Alternate QCM to implement and manage the three phases of quality control, and their authority to stop work that is not in compliance with the contract. The QCM shall issue letters of direction to all other QC specialists outlining their duties, authorities, and responsibilities. Copies of the letters shall be included in the QC plan.
- H. A listing of outside organizations such as, architectural and consulting engineering firms that will be employed by the Contractor and a description of the services these firms will provide.
- I. Testing laboratory information required by the paragraphs entitled "Accreditation Requirements" or "Construction Materials Testing Laboratory Requirements", as applicable.
- J. A Testing Plan and Log that includes the tests required, referenced by the specification paragraph number requiring the test, the frequency, the desired results and the person responsible for each test and shall be identified as a scheduled (CPM) activity.
- K. Procedures for reviewing, approving and managing submittals. Provide the name(s) of the person(s) in the QC organization authorized to review and certify submittals prior to approval. Provide the initial submittal of the Submittal Register as specified in Section entitled "Submittals."
- L. List of definable features of work. The list shall be cross-referenced to the contractor's Construction Schedule and the specification sections. For projects requiring a Progress Chart, the list of definable features of work shall include but not be limited to all items of work on the schedule. For projects requiring a Network Analysis Schedule, the list of definable features of work shall include but not be limited to all critical path activities. Include a chart of common deficiencies for the Definable Feature of work. Detail the control procedures that shall be employed to eliminate this common deficiency.
- M. Procedures for Performing the Phases of Control. The contractor shall develop a plan for incorporating each of the control phases into the work. The plan shall detail who shall be responsible for scheduling the phases, conducting the phase as well as documenting the phase. The use of project specific forms may be helpful. However, the entire plans and specifications establish the quality and not just the checklists. The Preparatory and Initial Phases and meetings shall be conducted with a view towards obtaining quality construction by planning ahead and identifying potential problems for each definable feature of work.
- N. Include all activities for which this specification requires QC specialists or Specialty Inspection Personnel, and for any specific definable features of work as identified in the QC Plan.
- O. Documentation procedures, including proposed report formats.

- P. Procedures to identify, record, track and complete rework items.
- Q. Procedures for Identifying and Documenting the Completion Inspection process. Include in these procedures the responsible party for punch out inspection, pre-final inspection, and final acceptance inspection.
- R. A complete set of report forms to be utilized on this project.
- S. All applicable subcontractors and suppliers Quality Control Plans complete with Contactor's CQC planned involvement.

1.12 COORDINATION AND MUTUAL UNDERSTANDING MEETING

- A. After submission of the QC Plan, and prior to the start of any physical construction, meet with the COTR to present the QC Program required by this Contract. The purpose of this meeting is to develop a mutual understanding of the QC details, including documentation, administration for on-site and off-site work, and the coordination of the Contractor's management, production and QC personnel. At the meeting, the Contractor shall be required to explain in detail how Phases Control shall be implemented for each definable feature of work. As a minimum, the Contractor's personnel required to attend shall include an officer of the firm, the project manager, project superintendent, QCM, Alternate QCM and subcontractor representatives. Each subcontractor who shall be assigned QC responsibilities shall have a principal of the firm at the meeting. Minutes of the meeting shall be prepared by the QCM and signed by the Contractor. The Contractor shall provide a copy of the signed minutes to all attendees.

1.13 QC MEETINGS

- A. After the start of construction, the QCM shall conduct weekly QC meetings at the work site with the project superintendent and QC specialists. The QCM shall prepare the minutes of the meeting and provide a copy to the COTR within 2 working days after the meeting. The COTR may attend these meetings. The QCM shall notify the COTR at least 48 hours in advance of each meeting. These meetings shall be scheduled to precede or follow the regular weekly progress meeting. As a minimum, the following shall be accomplished at each meeting:
 - 1. Review the minutes of the previous meeting
 - 2. Review the schedule and the status of work:
 - a. Work or testing accomplished since last meeting
 - b. Rework items identified since last meeting
 - c. Rework items completed since last meeting;
 - 3. Review the status of submittals, O & M data and Warranty Manuals:
 - a. Submittals, O & M data and Warranties reviewed and approved since last meeting
 - b. Submittals, O & M data and Warranties required in the near future;

4. Review the work to be accomplished in the next two (2) weeks and documentation required:
 - a. Establish completion dates for rework items
 - b. Update the schedule showing planned and actual dates of the preparatory, initial and follow-up phases, including testing and any other inspection required by this contract
 - c. Discuss construction methods and the approach that shall be used to provide quality construction by planning ahead and identifying potential problems for each definable feature of work
 - d. Discuss status of off-site work or testing
 - e. Documentation required;
 - f. Discuss upcoming Activity Hazard Analyses.
5. Resolve QC and production problems, assist in resolving Request for Information issues;
6. Address items that may require revising the QC plan:
 - a. Changes in QC organization personnel
 - b. Changes in procedures.
7. Review health and safety plan

1.14 PHASES OF CONTROL

- A. The Phases of Control shall adequately cover both on-site and off-site work and shall include the following for each definable feature of work.
- B. Material Receiving Inspection: Contractor shall establish a formal material receiving inspection program to verify material compliance to approved Shop Drawings, approved submittals, and the contract plans and specifications.
- C. Preparatory Phase: Notify the COTR at least 2 workdays in advance of each preparatory phase. This phase shall include a meeting conducted by the QCM and attended by the QC specialists, the superintendent, and the foreman responsible for the definable feature. Document the results of the preparatory phase actions in the daily Quality Control Daily Report and in the Preparatory Phase Report. As a minimum the following should be covered prior to beginning work on each definable feature of work:
 1. Review each paragraph of the applicable specification sections.
 2. Review the project drawings.
 3. Verify that appropriate shop drawings, O & M data, Warranties, and submittals for materials and equipment have been submitted and approved. Verify receipt of approved factory test results, when required.
 4. Establish control to be utilized to assure work complies with the contract plans and specifications.
 5. Review the testing plan and ensure that provisions have been made to provide the required QC testing.
 6. Examine the work area to ensure that the required preliminary work has been completed.

7. Examine the required materials, equipment and sample work to ensure that they are on hand and conform to the approved shop drawings and submitted data.
 8. Discuss construction methods, construction tolerances, workmanship standards, and the approach that shall be used to provide quality construction by planning ahead and identifying potential problems for each definable feature of work.
 9. Review the safety plan and appropriate activity hazard analysis to ensure that applicable safety requirements are met, and that required Material Safety Data Sheets (MSDS) are submitted.
- D. Initial Phase: Notify the COTR at least 2 workdays in advance of each initial phase. When construction crews are ready to start work on a definable feature of work, conduct the initial phase with the QC Specialists, the superintendent, and the foreman responsible for that definable feature of work. Observe the initial segment of the definable feature of work to ensure that the work complies with Contract requirements. Document the results of the initial phase in the daily Quality Control Daily Report and in the Initial Phase Report. Repeat the initial phase for each new crew to work on-site, or when acceptable levels of specified quality are not being met. As a minimum the following should be covered for each definable feature of work:
1. Ensure controls established during Preparatory Phase are adequate to allow work to proceed in compliance with the plans and specifications.
 2. Establish the quality of workmanship required.
 3. Resolve conflicts.
 4. Ensure that testing is performed by the approved laboratory.
 5. Check work procedures for compliance with the Safety Plan and the appropriate activity hazard analysis to ensure that applicable safety requirements are met.
- E. Follow-Up Phase: Perform the following for on-going work daily, or more frequently as necessary until the completion of each definable feature of work and document in the daily Quality Control Daily Report:
1. Ensure the work is in compliance with Contract requirements.
 2. Maintain the quality of workmanship required.
 3. Ensure that testing is performed by the approved laboratory.
 4. Ensure that rework items are being corrected.
 5. Perform safety inspections.
- F. Code-Required Inspections:
1. Comply with current edition approved by the Commonwealth of Virginia of the USBC, "Special Inspections" or other agencies having jurisdiction. Special Inspections are to be performed by the Authority's agent. Perform and document all tests, inspections, notifications to the Authority, coordination with the Authority's agent and other activities listed in the USBC or other agencies having jurisdiction.
 2. Notice to COTR: Notify COTR, in writing, at least 48 hours in advance of all code-required inspections. COTR should be apprised in advance of every preparatory and initial inspection. All preparatory, initial, and follow-up inspections shall be made a matter of record in Contractor's quality-control documentation.

G. Additional Preparatory and Initial Phases

1. Additional Preparatory and Initial Phases shall be conducted on the same definable features of work if the quality of on-going work is unacceptable, if there are changes in the applicable QC organization, if there are changes in the on-site production supervision or work crew, if work on a definable feature is resumed after substantial period of inactivity, or if other problems develop as directed by the COTR in writing.

H. Notification of Phases of Control for Off-Site Work

1. On determination by COTR that an item shall require surveillance by the Authority at the point of production, manufacture, or shipment, Contractor shall be notified, in writing, of such determination. Contractor shall furnish to COTR three copies of all purchase orders or subcontracts, for all tiers of subcontractors or suppliers for each item. In addition, copies of documented quality-control operations, tests, and inspections shall be made available to the Authority's representative at the point of production, manufacture, or shipment. The CQC shall notify the COTR at least two weeks prior to the start of the preparatory and initial phases.

1.15 SUBMITTAL REVIEW AND APPROVAL

- A. Procedures for submission, review and approval of submittals are described in Division 01 Section "Submittals".

1.16 TESTING

- A. Except as stated otherwise in the technical specification sections, perform sampling and testing required under this Contract.
- B. Independent Testing Laboratory: When tests are required by civil, electrical, USBC and other codes in effect, a corporately and financially independent testing organization that can function as an unbiased testing authority, professionally independent of manufacturers, suppliers, and installers of equipment, or systems evaluated by the testing organization shall be contracted by the Contractor to perform the contractually required tests. The various types of independent laboratories and their requirements are listed below:
- C. Accreditation Requirements: Construction materials testing laboratories performing work for Authority construction contracts shall be accredited by one of the laboratory accreditation authorities. The laboratory's scope of accreditation shall include the ASTM standards listed in the paragraph titled "Construction Materials Testing Laboratory Requirements" as appropriate to the testing field. The policy applies to the specific laboratory performing the actual testing, not just the "Corporate Office".
- D. Electrical testing of components, equipment and systems: The testing firm shall be regularly engaged in the testing of electrical equipment, devices, installations, and systems. The testing firm shall have at least five years experience in the testing of electrical equipment of the type, rating, and voltage used on this Project. The testing laboratories shall be a current full-member

company of the International Electrical Testing Association (<http://www.neta.org/>). This independent testing firm shall perform duties as required under the terms of this Contract.

- E. **Structural and Pipe Welding:** An independent testing firm shall perform all structural and pipe welding examinations as required by this Contract. The inspectors employed by the firm shall hold current certification as an AWS Certified Welding Inspector (CWI) for visual weld examinations and ASNT-TC-1A Certification for nondestructive examination of welds. ASNT-TC-1A certifications shall be by an ASNT-TC-1A ACCP Level III.

- F. **Construction Materials Testing Laboratory Requirements:** Provide an independent construction material testing laboratory accredited by an acceptable laboratory accreditation authority to perform sampling and tests required by this Contract. Testing laboratories that have obtained accreditation by an acceptable laboratory accreditation authority listed in the paragraph entitled "Laboratory Accreditation Authorities" submit with the Quality Control Plan, a copy of the Certificate of Accreditation and Scope of Accreditation. The scope of the laboratory's accreditation shall include the test methods required by the Contract. On-site testing facilities shall submit a certified statement by the Supervising Professional Engineer, licensed in the Commonwealth of Virginia, as meeting the requirements of the following minimum ASTM standards listed below as appropriate to the testing field.
 - 1. Laboratories engaged in testing of construction materials shall meet the requirements of ASTM E 329.
 - 2. Laboratories engaged in testing of concrete and concrete aggregates shall meet the requirements of ASTM C 1077.
 - 3. Laboratories engaged in testing of bituminous paving materials shall meet the requirements of ASTM D 3666.
 - 4. Laboratories engaged in testing of soil and rock, as used in engineering design and construction, shall meet the requirements of ASTM D 3740.
 - 5. Laboratories engaged in nondestructive testing (NDT) shall meet the requirements of ASTM E 543.
 - 6. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA.

- G. **Laboratory Accreditation Authorities:** Laboratory Accreditation Authorities are the National Voluntary Laboratory Accreditation Program (NVLAP) administered by the National Institute of Standards and Technology, the American Association of State Highway and Transportation Officials (AASHTO) program, ICBO Evaluation Service, Inc. (ICBO ES), and the American Association for Laboratory Accreditation (A2LA) program and the Washington Area Council of Engineering Laboratories (WACEL). Furnish to the COTR, a copy of the current Certificate of Accreditation and Scope of Accreditation. The scope of the laboratory's accreditation shall include the test methods required by the Contract.

- H. **Capability Check:** The COTR retains the right to check laboratory equipment in the proposed laboratory and the laboratory technician's testing procedures, techniques, and other items pertinent to testing, for compliance with the standards set forth in this Contract.

- I. **Capability Recheck:** If non-conformities are discovered during the capability check or any succeeding recheck, Contractor shall be assessed a charge of \$750.00 to reimburse the

Authority for each recheck of the laboratory or the checking of a subsequently selected laboratory. These charges shall be deducted from the total amount due Contractor.

- J. Test Results: Cite applicable Contract requirements, tests or analytical procedures used. Provide actual results and include a statement that the item tested or analyzed conforms or fails to conform to specified requirements. If the item fails to conform, notify COTR immediately. Conspicuously stamp the cover sheet for each report in large red letters "CONFORMS" or "DOES NOT CONFORM" to the specification requirements, whichever is applicable. A testing laboratory representative authorized to sign certified test reports shall sign test results. Furnish the signed reports, certifications, and other documentation to the COTR via the QCM. Furnish a summary report of field tests at the end of each month
- K. Test Reports and Monthly Summary Report of Tests:
 - 1. The QCM shall furnish the signed reports, certifications, and a summary report of field tests at the end of each month to the COTR.
- L. Control and Verification Tests: Control tests are those tests made for Contractor under the Quality Control Plan to assist Contractor in maintaining control of his operations. As described above, Contractor shall procure the services of an independent commercial laboratory to perform the required control tests. The Specifications contain the minimum of the following:
 - 1. Testing criteria
 - 2. Frequency of testing
 - 3. Procedures
 - 4. Methods of construction
 - 5. Number of control tests to be made for each phase of the Work.
 - 6. Notify COTR a minimum of 24 hours in advance of the time samples shall be taken by Contractor for quality control testing. COTR shall then notify its own testing laboratory contractor so that verification test samples may be taken.
- M. Check Tests: Contractor shall furnish to COTR the quantities of materials to be used for check testing as required in the Specifications. Check testing shall be performed by the Authority at an independent laboratory at no cost to Contractor. No direct payment shall be made to Contractor for the furnishing of materials used for check testing.
- N. Staffing: All laboratory personnel shall work under the supervision of a Professional Engineer licensed in the Commonwealth of Virginia.

1.17 QC CERTIFICATIONS

- A. Quality Control Daily Report Certification
 - 1. Each Quality Control Daily Report shall contain the following statement:
 - a. "On behalf of (Name of Contractor), I certify that this report and the Inspector's Daily Reports are complete and correct, and that all materials and equipment used, as well as work performed during this reporting period are in compliance with

Drawings, Specifications, and Contract provisions, except as noted in this report or attached reports.”

B. Application for Payment Certification

1. Refer to Division 01 Section "Application for Payment" for address to which the Applications shall be sent.

C. Completion Certification:

1. Upon completion of work under this Contract, the QCM shall furnish a certificate to the Contracting Officer attesting that "the work has been completed, inspected, tested and is in compliance with the Contract."

1.18 COMPLETION INSPECTIONS

- A. Punch-Out Inspection: Near the completion of all work or any increment thereof established by a completion time stated in the Contract Clause entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the QCM shall conduct an inspection of the work and develop a "punch list" of items which do not conform to the approved drawings and specifications. Include in the punch list any remaining items on the "Rework Items List" which were not corrected prior to the Punch-Out Inspection. The punch list shall include the estimated date by which the deficiencies will be corrected. A copy of the punch list shall be provided to the COTR. The QCM or staff shall make follow-on inspections to ascertain that all deficiencies have been corrected. Once this is accomplished the Contractor shall notify the COTR that the facility is ready for the Authority "Pre-Final Inspection."
- B. Pre-Final Inspection: The Authority will perform this inspection to verify that the facility is complete and ready to be occupied. An Authority "Pre-Final Punch List" may be developed as a result of this inspection. The QCM shall ensure that all items on this list are corrected prior to notifying the Authority that a "Final" inspection with the customer can be scheduled. Any items noted on the "Pre-Final" inspection shall be corrected in timely manner and shall be accomplished before the contract completion date for the work or any particular increment thereof if the project is divided into increments by separate completion dates.
- C. Final Acceptance Inspection: The QCM, the QC specialists, the superintendent or other primary contractor management personnel shall be in attendance at this inspection. The COTR will be in attendance at this inspection. Additional Authority personnel may be in attendance. The Contracting Officer based upon results of the "Pre-Final" inspection will formally schedule the final acceptance inspection. Notice shall be given to the COTR at least 14 calendar days prior to the final inspection stating that all specific items previously identified to the Contractor, as being unacceptable, along with all the remaining work performed under the contract, shall be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection shall be cause for the Contracting Officer to bill the Contractor for the Authority's additional inspection cost in accordance with the clause in the Contract Provisions entitled "Inspection of Construction." When the Contracting Officer takes possession of partially completed work, it shall be in accordance with clause in the Contract Provisions entitled "Use and Possession Prior to Completion".

1.19 DOCUMENTATION

- A. Contractor shall maintain current quality control records, on approved forms, of all control activities, production, tests and inspections performed. These records shall include factual evidence that required tests or inspections have been performed, including type and number of tests or inspections involved; results of tests or inspections; nature of defects, causes for rejection, etc.; proposed remedial action; and corrective actions taken. These records shall cover both conforming and defective or deficient features (non-conforming) and shall include a statement that all supplies and materials incorporated into the Work are in full compliance with terms of the Contract. Legible copies of these records shall be furnished to COTR daily. The records shall cover all work placed subsequent to the previously furnished records and shall be verified by Contractor's QCM. Contractor shall document tests and inspections as specified in the technical provisions of the Specifications, and these records shall be available for review by COTR throughout the life of the Contract.
- B. Maintain current and complete records of on-site and off-site QC Program operations and activities. Establish and maintain the following in a series of 3 ring binders. Binders shall be divided and tabbed as shown below. These binders shall be readily available to the Authority's Quality Assurance Team during normal business hours.
1. All completed Preparatory and Initial Phase Reports, arranged by specification Section.
 2. All milestone inspections, arranged by Activity/Event Number.
 3. A current up-to-date copy of the Testing Plan and Log with supporting field test reports, arranged by specification section.
 4. Copies of all contract modifications, arranged in numerical order. Also include documentation that modified work was accomplished.
 5. A current, up-to-date copy, of the Deficiency List.
- C. Report Forms - The contractor shall design all forms to be used in the Quality Control Program. A copy of all forms shall be included with the Quality Control Plan. The forms shall be designed to assist in the control of the quality. The following minimum requirements are listed for specific reports:
1. Quality Control Daily Report: Reports are required for each day that work is performed and for every seven consecutive calendar days of no work and on the last day of a no-work period. Account for each calendar day throughout the life of the Contract. The reporting of work shall be identified by terminology consistent with the construction schedule. Quality Control Daily Reports are to be prepared, signed and dated by the QCM and shall contain the following information:
 - a. Date of report, report number, Contract Number, and Contract Title.
 - b. Identify Schedule Activity No., Submittal # and list equipment/material received each day that is incorporated into the job.
 - c. Indicate if Preparatory Phase work was performed today (Yes/No checkboxes).
 - d. If Preparatory Phase work was performed today (including on-site and off-site work), identify its Schedule Activity Number and Definable Feature of Work. The Index number is a cross reference to the Preparatory Phase Checklist. An example of the Index number is: 0025-P01, where "0025" is the Quality Control Daily Report Number, "P" indicates Preparatory Phase, and "01" is the Preparatory Phase

- Checklist number(s) for this date. Each entry in this Section shall be accompanied with a corresponding Preparatory Phase Checklist.
- e. Indicate if Initial Phase work was performed today (Yes/No checkboxes).
 - f. If Initial Phase work was performed today (including on-site and off-site work), identify its Schedule Activity Number and Definable Feature of Work. The Index Number is a cross reference to the Initial Phase Checklist. An example of the Index Number is: 0025-I01, where "0025" is the Quality Control Daily Report Number, "I" indicates Initial Phase, and "01" is the Initial Phase Checklist number(s) for this date. Each entry in this Section shall be accompanied with a corresponding Initial Phase Checklist.
 - g. Results of the Follow-up Phase inspections held today (including on-site and off-site work), including Schedule Activity Number, location of definable feature of work, Specification Sections, etc. Indicate in the report for this definable feature of work that the work complies with the Contract as approved in the Initial Phase, work complies with safety requirements, and that required testing has been performed. Include a list of who performed the tests.
 - h. List the rework items identified, but not corrected by close of business, along with its associated Schedule Activity Number.
 - i. List the rework items corrected from the rework items list along with the corrective action taken and its associated Schedule Activity Number.
 - j. Include a "remarks" section in this report that shall contain pertinent information including but not limited to:
 - 1) Directions received.
 - 2) Quality control problem areas.
 - 3) Deviations from the QC plan.
 - 4) Construction deficiencies encountered.
 - 5) QC meetings held,.
 - 6) Acknowledgement that record drawings, specifications, O & M data, and Warranty Manuals, have been updated.
 - 7) Corrective direction given by the QC Organization and corrective action taken by the Contractor.
 - 8) For each remark given, identify the Schedule Activity Number that is associated with the remark.
 - k. Quality Control Daily Report certification, signature and date.
2. Preparatory Phase Report: Each Definable Feature of Work that is in the Preparatory Phase shall have this report filled out for it. The report shall be identified by terminology consistent with the construction schedule. Attach this report to the Quality Control Daily Report of the same date.
- a. Specification Section, date of report, and Contract number shall be filled out. Duplicate this information in the header of the second page of the report.
 - b. Definable Feature of Work, Schedule Activity Number and Index Number entry and format shall match entry in the Preparatory Phase section of the Quality Control Daily Report. Duplicate this information in the header of the second page of the report.

- c. Personnel Present: Indicate the number of hours of advance notice that was given to the COTR and indicate (Yes/No checkboxes) whether or not the COTR was notified. Indicate the Names of Preparatory Phase Meeting attendees, their position and their company affiliation.
 - d. Submittals: Indicate if submittals have been approved (Yes/No checkboxes), if no indicate what has not been submitted. Are materials on hand (Yes/No checkboxes) and if not, what items are missing. Check delivered material/equipment against approved submittals and comment as required.
 - e. Material Storage: Indicate if materials/equipment is stored properly (Yes/No checkboxes) and if not, what action is/was taken.
 - f. Specifications: Review and comment on Specification Paragraphs that describe the material/equipment, procedure for accomplishing the work and clarify any differences.
 - g. Preliminary Work & Permits: Ensure preliminary work is in accordance with the contract documents and necessary permits are on file, if not, describe the action taken.
 - h. Testing: Identify who performs tests, the frequency, and where tests are to occur. Review the testing plan, report abnormalities, and if the test facilities have been approved.
 - i. Discuss Control Procedures that shall be employed to consistently obtain the required specified quality.
 - j. Safety: Indicate if the activity hazard analysis has been approved (Yes/No checkboxes) and comment on the review of the applicable portions of the Construction Safety Manual.
 - k. Meeting Comments: Note comments and remarks during the Preparatory Phase Meeting that was not addressed in previous sections of this checklist.
 - l. Other Items or Remarks: Note any other remarks or items that were a result of the Preparatory Phase.
 - m. QCM shall sign and date the report.
3. Initial Phase Report: Complete this report for each Definable Feature of Work that is in the Initial Phase. The report shall be identified by terminology consistent with the construction schedule. Attach this report to the Quality Control Daily Report of the same date.
- a. Specification Section, date of report, and Contract number shall be entered.
 - b. Definable Feature of Work, Schedule Activity Number and Index Number entry and format shall match entry in the Initial Phase section of the Quality Control Daily Report.
 - c. Personnel Present: Indicate the number of hours of advance notice that was given to the COTR and indicate (Yes/No checkboxes) whether or not the COTR was notified. Indicate the Names of Initial Phase Meeting attendees, their position and company/Authority they are with.
 - d. Control Procedures: Comment on control procedures identified at Preparatory Phase of Control and assurance that work is in accordance with plans, specifications and submittals. Control procedures not producing the required compliance shall be adjusted until the procedures consistently obtain the required quality.

- e. Preliminary Work: Ensure preliminary work being placed is in compliance and if not, what action is/was taken.
 - f. Workmanship: Identify where initial work is located; if a sample panel is required (Yes/No checkboxes); is the initial work the sample (Yes/No checkboxes); and if Yes, describe the panel location and precautions taken to preserve the sample.
 - g. Resolution: Comment on any differences and the resolutions reached.
 - h. Check Safety: Comment on the safety review of the job conditions.
 - i. Other: Note any other remarks or items that were a result of the Initial Phase.
 - j. QCM shall sign and date the report.
- D. Reports from the QC Specialist(s): Reports are required for each day that work is performed in their area of responsibility. QC specialist reports shall include the same documentation requirements as the Quality Control Daily Report for their area of responsibility. QC specialist reports are to be prepared, signed and dated by the QC specialists and shall be attached to the Quality Control Daily Report prepared for the same day.
- E. Testing Log: As tests are performed, the QCM shall record on the "Testing Log" the date the test was conducted, the date the test results were forwarded to the COTR, remarks and acknowledgement that an accredited or Contracting Officer approved testing laboratory was used. Forward a copy of the updated "Testing Plan and Log" on the last day of each month. Do not attach to the Quality Control Daily Report.
- F. Deficiency Log: The QCM shall maintain a list of work that does not comply with the Contract, identifying what items need to be reworked, the date the item was originally discovered, the date the item shall be corrected by, and the date the item was corrected. There is no requirement to report a rework item that is corrected the same day it is discovered. Provide a copy of the deficiency log to the COTR at the weekly progress meeting. The Contractor shall be responsible for including on this list items needing rework including those identified by the COTR.
- G. Special Inspection Control Log: Contractor shall maintain a Special Inspection Control Log chronologically recording each Special test and inspection performed under the USBC, or other agencies having jurisdiction on-site, including the nature of the test or inspection, the date performed, the results, causes for rejection, corrective action taken, and dates of subsequent tests and final acceptance.
- H. Test Reports: Contractor shall be responsible for establishing a system that shall record all tests results. Information on test designation, location, date of test, specification requirements, results and retest results, causes for rejection and recommended remedial actions shall be documented. A copy of the test results shall be sent directly from the Agency performing the testing services to COTR. A copy of any failing report shall be sent immediately. All test reports shall be reviewed and signed by a professional engineer, licensed in the Commonwealth of Virginia.
- I. Signoff Sheets: Contractor shall be responsible for establishing a system of signoff sheets certifying that all work required before the construction or startup of critical work elements has been constructed and installed according to the plans and specifications.

- J. Monthly Deficiency Report: Contractor shall submit a monthly deficiency report to COTR identifying all substandard tests and inspections taken during the month including the nature of the test or inspection, location and nature of defects, causes for rejection, and remedial actions taken or proposed for any open items on prior deficiency reports including the date scheduled for resolution of the item.
- K. Record Drawings: The QCM is required to ensure the record drawings, required by Division 01 Section "Project Record Documents," are kept current on a daily basis and marked to show deviations which have been made from the construction drawings. Ensure each deviation has been identified with the appropriate modifying documentation (e.g. CN No., Modification No., Request for Information No., etc.). The QCM or QC specialist assigned to an area of responsibility shall initial each deviation and each revision. Upon completion of work, the QCM shall furnish a certificate attesting to the accuracy of the record drawings prior to submission to the COTR.
- L. Operation, Maintenance, and Warranty Manuals: The QCM shall ensure that the Operation and Maintenance data required by Division 01 Section "Operation and Maintenance Data" and the Warranties specified in Division 01 Section "Project Closeout" are inserted on a daily basis in the appropriate sections of the approved formatted manuals after they have been approved by the COTR.
- M. Materials Receiving Inspection Report: Contractor shall establish a formal materials receiving inspection program to verify material compliance to approved Shop Drawings, approved submittals, and the contract plans and specifications.

1.20 NOTIFICATION ON NON-COMPLIANCE

- A. The COTR will notify the Contractor of any detected non-compliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may:
 - 1. Issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall make no part of the time lost due to such stop orders the subject of a claim for extension of time for excess costs or damages.
 - 2. Repair, replace or otherwise remedy the defective work at the Contractor's expense. Cost incurred by the Authority to correct defective work shall be deducted from the total amount due the Contractor.
 - 3. Withhold an amount from the payment due the Contractor as may be deemed necessary at the discretion of the Contracting Officer.
 - 4. Terminate the Contractor's right to proceed for Default after providing required notice.
- B. In cases where implementation of the Quality Control Program does not comply with the Contractor's Quality Control Plan or the contract provisions. Or Contractor fails to properly operate and maintain an effective Quality Control Program, the Contracting Officer may:
 - 1. Order the Contractor to replace ineffective or unqualified Quality Control Personnel or subcontractors.

2. Issue an order stopping all or part of the work until acceptable personnel are on site and a new Quality Control Plan is approved by the COTR. The Contractor shall make no part of the time lost due to such stop orders the subject of claim for extension of time for excess costs or damages.
 3. Take a credit from the contract for Quality Control Activities not performed.
 4. Terminate the Contractors right to proceed for Default after providing required notice.
- C. The Contractor shall maintain a detailed record of every non-compliance and corrective action taken.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.

END OF SECTION 01 40 00

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SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Special Provisions, Supplementary Conditions, and other Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section defines many of the terms used elsewhere in the Construction Documents and lists complete names and telephone numbers for many of the associations and agencies identified elsewhere in the Construction Documents by their acronym.
- B. Abbreviations, where not defined in the Contract Documents, will be interpreted by the Contracting Officer to mean the normal construction industry terminology.
- C. Plural words will be interpreted as singular and singular words will be interpreted as plural where applicable for context of the Contract Documents.

1.3 DEFINITIONS

- A. General: Basic Contract definitions are included in Sections I and II of the Authority Solicitation Offer and Award. Certain terms used in the Contract Documents are defined generally in this Article. Definitions and explanations contained in this Section are not necessarily either complete or exclusive, but are general for the Work to the extent that they may not be stated more explicitly in another element of the Contract Documents.
- B. Approve: The term "approved," where used in regard to COTR's action on Contractor's submittals, applications, and requests, is limited to COTR's duties and responsibilities as delegated by the Contracting Officer in the Contract and Special Provisions.
- C. Architect/Engineer: For the purpose of this Project, the "Design Professional of Record." To distinguish from the Contracting Officer and Contracting Officer's Technical Representative (COTR).
- D. Authority: Metropolitan Washington Airports Authority
- E. Award: The acceptance, by the Authority, of the successful offeror's proposal.
- F. Award Date: The date on which the Authority gives notice of acceptance to the successful offeror.

- G. AOA (or A.O.A.): Air Operations Area. The area of the Airport used or intended to be used for landing, taking off, surface maneuvering, loading, unloading, or servicing aircraft. This security area requires security badging. Workers in this area are required to obtain and display an AOA photo I.D. credential. Drivers in this area are required to obtain an Airport Vehicle Operator's Permit for the Air Operations Area.
- H. Beneficial Use: Use by the Authority prior to 100 percent completion and final acceptance.
- I. Contract Documents: Documents containing requirements of the Work. These include all Contract provisions and attachments made thereto or referenced therein.
- J. Contract Provisions: The administrative and procedural requirements starting at Award Date and ending at Final Acceptance, as provided for in Section VII, "Contract Provisions."
- K. Contract Time or Duration (Time Limit): The number of calendar days established in Section III, "Schedule," indicating the time allowed for the completion of all physical and administrative work contemplated in the Contract, including any authorized extensions thereto.
- L. Contracting Officer's Technical Representative (COTR): The Contracting Officer's designated representative, as defined in Section VII, "Contract Provisions."
- M. Contractor: Individual, partnership, corporation or joint venture under Contract to the Authority for performance of prescribed Work.
- N. Drawings: Erection/installation/construction plans, or any other supplementary plans or similar graphic data, illustrating work to be performed that are provided to Contractor as part of the Contract Documents.
- O. Directed: A command or instruction by the Authority. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- P. Final Acceptance: Refer to Division 01 Section "Project Closeout."
- Q. "Indicated": Requirements expressed by graphic representations or in written form on drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- R. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- S. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- T. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- U. "Provide": Furnish and install, complete and ready for the intended use.

- V. "Installer": Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades people of the corresponding generic name.
 - W. "Experienced": When used with an entity, "experienced" means having successfully completed a minimum of ten previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
 - X. "Project Site": Space available for performing construction activities. The extent of Project site is indicated.
 - Y. Punch list Work: Minor corrective actions required to achieve "Final Acceptance." Occurs after "Substantial Completion" of the Work in strict compliance with quality-control requirements.
 - Z. Roadway: General term denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way.
 - AA. Special Provisions: For the purpose of this Contract, the directions and requirements provided for in Section VI of the Contract Documents.
 - BB. Shop Drawings: Refer to Division 01 Section "Submittals."
 - CC. Specifications: General term comprising all directions, provisions and requirements contained herein, together with any other contractual requirements such as may be added or adopted as the Contract Provisions, Special Provisions, or Supplementary Conditions, all of which are necessary for the proper performance of the Contract.
 - DD. Substantial Completion: Refer to Division 01 Section "Project Closeout."
 - EE. Factory-Authorized Service Representative: An authorized representative of a manufacturer who is trained and approved by the manufacturer to inspect and approve the installation of manufacturer's products and that are similar in material, design, and extent to those indicated for this Project and who is authorized by the manufacturer to confirm the issuance of appropriate warranties.
- 1.4 INDUSTRY STANDARDS
- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.
- C. Conflicting Requirements: Refer to Division 01 Section "Quality Requirements" for additional information regarding conflicting requirements.
1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to COTR for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on Project shall be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available on request.
- E. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
CFR	Code of Federal Regulations Available from Government Printing Office www.access.gpo.gov/nara/cfr	(888) 293-6498 (202) 512-1530
CRD	Handbook for Concrete and Cement Available from Army Corps of Engineers Waterways Experiment Station www.wes.army.mil	(601) 634-2355
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point www.dodssp.daps.mil	(215) 697-6257
DSCC	Defense Supply Center Columbus (See FS)	
FED-STD	Federal Standard (See FS)	

FS	Federal Specification Available from Department of Defense Single Stock Point. www.dodssp.daps.mil	(215) 697-6257
	Available from General Services Administration www.fss.gsa.gov	(202) 501-1021
	Available from National Institute of Building Sciences www.nibs.org	(202) 289-7800
FTMS	Federal Test Method Standard (See FS)	
ICC-ES	ICC Evaluation Service, Inc. www.icc-es.org	(800) 423-6587
MIL	See MILSPEC	
MS MIL	See MILSPEC	
MILSPEC	Military Specification and Standards Available from Department of Defense Single Stock Point www.dodssp.daps.mil	(215) 697-6257
MUTCD	Manual on Uniform Traffic Control Devices Department of Transportation Federal Highway Administration (See FHA. Located in Paragraph Federal Government Agencies").	
UFAS	Uniform Federal Accessibility Standards Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080

1.5 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc. (The) www.aluminum.org	(202) 862-5100
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216) 241-7333

AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials http://www.transportation.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists (The) www.aatcc.org	(919) 549-8141
ABMA	American Bearing Manufacturers Association www.abma-dc.org	(202) 367-1155
ACI	ACI International (American Concrete Institute) www.aci-int.org	(248) 848-3700
ACPA	American Concrete Pipe Association http://www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530
AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118
AHA	American Hardboard Association (Now part of CPA)	
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955
AI	Asphalt Institute http://www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction	(800) 644-2400

	www.aisc.org	(312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction http://www.aitc-glulam.org	(303) 792-9559
ALCA	Associated Landscape Contractors of America www.alca.org	(800) 395-2522 (703) 736-9666
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts Http://www.aosaseed.com	(505) 522-1437
APA	APA - The Engineered Wood Association http://www.apawood.org	(253) 565-6600
APA	Architectural Precast Association http://www.archprecast.org	(239) 454-6989
API	American Petroleum Institute www.api.org	(202) 682-8000
ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association http://www.asphaltroofing.org	(202) 207-0917
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International (The American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (212) 591-7722

ASSE	American Society of Sanitary Engineering http://www.asphaltroofing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9585
AWCI	AWCI International (Association of the Wall and Ceiling Industries International) www.awci.org	(703) 534-8300
AWCMA	American Window Covering Manufacturers Association (See WCSC)	
AWI	Architectural Woodwork Institute www.awinet.org	(800) 449-8811 (703) 733-0600
AWPA	American Wood-Preservers' Association www.awpa.com	(334) 874-9800
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association http://www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
BICSI	BICSI www.bicsi.org	(813) 979-1991
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International) www.bifma.com	(616) 285-3963
BISSC	Baking Industry Sanitation Standards Committee www.bissc.com	(773) 761-4100
CCC	Carpet Cushion Council http://www.asphaltroofing.org	(203) 637-1312
CCFSS	Center for Cold-Formed Steel Structures http://www.asphaltroofing.org	(573) 341-4471

CDA	Copper Development Association Inc. www.copper.org	(800) 232-3282 (212) 251-7200
CFFA	Chemical Fabrics & Film Association, Inc. http://www.asphaltroofing.org	(216) 241-7333
CGA	Compressed Gas Association www.cganet.com	(703) 788-2700
CGSB	Canadian General Standards Board http://www.asphaltroofing.org	(800) 665-2472 (819) 956-0425
CIMA	Cellulose Insulation Manufacturers Association http://www.asphaltroofing.org	(888) 881-2462 (937) 222-2462
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute http://www.asphaltroofing.org	(301) 596-2583
CPA	Composite Panel Association www.pbmdf.com	(301) 670-0604
CPPA	Corrugated Polyethylene Pipe Association http://www.cppa-info.org	(800) 510-2772 (202) 462-9607
CRI	Carpet & Rug Institute (The) http://www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
CSA	CSA International (Formerly: IAS - International Approval Services) http://www.csa-international.org	(800) 463-6727 (416) 747-4000
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
CSSB	Cedar Shake & Shingle Bureau http://www.cedarbureau.org	(604) 820-7700

CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute) www.cti.org	(281) 583-4087
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500
EIMA	EIFS Industry Members Association http://www.eima.com/	(800) 294-3462 (770) 968-7945
EJCDC	Engineers Joint Contract Documents Committee www.asce.org	(800) 548-2723 (703) 295-6300
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040
ESD	ESD Association www.esda.org	(315) 339-6937
FCI	Fluid Controls Institute http://www.asphaltroofing.org	(216) 241-7333
FMG	FM Global (Formerly: FM - Factory Mutual System) www.fmglobal.com	(401) 275-3000
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc. www.floridarroof.com	(407) 671-3772
FSA	Fluid Sealing Association www.fluidsealing.com	(610) 971-4850
FSC	Forest Stewardship Council www.fscoax.org	52 951 5146905
GA	Gypsum Association www.gypsum.org	(202) 289-5440
GANNA	Glass Association of North America www.glasswebsite.com	(785) 271-0208
GS	Green Seal www.greenseal.org	(202) 872-6400
GSI	Geosynthetic Institute	(610) 522-8440

	www.geosynthetic-institute.org	
HI	Hydraulic Institute www.pumps.org	(888) 786-7744 (973) 267-9700
HI	Hydronics Institute www.gamanet.org	(908) 464-8200
HMMA	Hollow Metal Manufacturers Association (See NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
IAS	International Approval Services (See CSA)	
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(770) 830-0369
ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830
IEC	International Electrotechnical Commission www.iec.ch	41 22 919 02 11
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000
IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234
IGMA	Insulating Glass Manufacturers Alliance (The) www.igmaonline.org	(613) 233-1510
ILI	Indiana Limestone Institute of America, Inc. www.iliai.com	(812) 275-4426
ISO	International Organization for Standardization www.iso.ch	41 22 749 01 11
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(702) 567-8150

ITS	Intertek www.intertek.com	(800) 345-3851 (607) 753-6711
ITU	International Telecommunication Union www.itu.int/home	41 22 730 51 11
KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690
LMA	Laminating Materials Association www.lma.org	(201) 664-2700
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864 (847) 577-7200
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333
MFMA	Maple Flooring Manufacturers Association www.maplefloor.org	(847) 480-9138
MFMA	Metal Framing Manufacturers Association www.metalframingmfg.org	(312) 644-6610
MH	Material Handling Industry of America (See MHIA)	
MHIA	Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(312) 332-0405
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(281) 228-6200
NADCA	National Air Duct Cleaners Association	(202) 737-2926

	www.nadca.com	
NAIMA	North American Insulation Manufacturers Association (The) www.naima.org	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCPI	National Clay Pipe Institute www.ncpi.org	(262) 248-9094
NCTA	National Cable & Telecommunications Association www.ncta.com	(202) 775-3550
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association http://www.necanet.org/	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(303) 697-8441
NFPA	NFPA www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776
NGA	National Glass Association www.glass.org	(703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818

NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	National Oak Flooring Manufacturers Association www.nofma.org	(901) 526-5016
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSSGA	National Stone, Sand & Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo & Mosaic Association, Inc. www.ntma.com	(800) 323-9736 (540) 751-0930
NTRMA	National Tile Roofing Manufacturers Association (See RTI)	
NWWDA	National Wood Window and Door Association (See WDMA)	
OPL	Omega Point Laboratories, Inc. www.opl.com	(800) 966-5253 (210) 635-8100
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDCA	Painting & Decorating Contractors of America www.pdca.com	(800) 332-7322 (314) 514-7322
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (978) 557-0720
PGI	PVC Geomembrane Institute Website Unavailable	(217) 333-3929
PTI	Post-Tensioning Institute www.post-tensioning.org	(602) 870-7540
RCSC	Research Council on Structural Connections www.boltcouncil.org	(800) 644-2400 (312) 670-2400

RFCI	Resilient Floor Covering Institute www.rfci.com	(301) 340-8580
RIS	Redwood Inspection Service calredwood.org	(888) 225-7339 (415) 382-0662
RTI	Roof Tile Institute (Formerly: NTRMA - National Tile Roofing Manufacturers Association) www.ntrma.org	(312) 670-4177
SAE	SAE International www.sae.org	(724) 776-4841
SDI	Steel Deck Institute www.sdi.org	(847) 462-1930
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association www.sefalabs.com	(516) 294-5424
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SIA	Security Industry Association www.sefalabs.com	(703) 683-2075
SIGMA	Sealed Insulating Glass Manufacturers Association (See IGMA)	
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMA	Screen Manufacturers Association www.smacentral.org	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacentral.org	(703) 803-2980
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division)	(800) 523-6154

	www.sprayfoam.org	
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611
SPI/SPFD	Society of the Plastics Industry, Inc. (The) Spray Polyurethane Foam Division (See SPFA)	
SPRI	SPRI (Single Ply Roofing Institute) www.spri.org	(781) 647-7026
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
STI	Steel Tank Institute www.steeltank.com	(847) 438-8265
SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333
SWRI	Sealant, Waterproofing, & Restoration Institute www.swrionline.org	(816) 472-7974
TCA	Tile Council of America, Inc. www.tileusa.com	(864) 646-8453
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org	(703) 907-7700
TMS	The Masonry Society www.masonrysociety.org	(303) 939-9700
TPI	Truss Plate Institute, Inc. www.tpinst.org	(608) 833-5900
TPI	Turfgrass Producers International www.turfgrassod.org	(800) 405-8873 (847) 705-9898
UL	Underwriters Laboratories Inc. www.ul.com	(800) 285-4476 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902

USGBC	U.S. Green Building Council www.usgbc.org	(202) 828-7422
WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 (202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association (See WCSC)	
WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Association) www.windowcoverings.org	(800) 506-4636 (212) 661-4261
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (847) 299-5200
WMMPA	Wood Moulding & Millwork Producers Association www.wmmpa.com	(800) 550-7889 (530) 661-9591

- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICBO	International Conference of Building Officials (See ICC)	
ICBO ES	ICBO Evaluation Service, Inc. (See ICC-ES)	
ICC	International Code Council (Formerly: CABO - Council of American Building Officials) www.iccsafe.org	(703) 931-4533
ICC-ES	ICC Evaluation Service, Inc. www.icc-es.org	(800) 423-6587 (562) 699-0543

- C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE	Army Corps of Engineers www.usace.army.mil	
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-0990
DOC	Department of Commerce www.doc.gov	(202) 482-2000
EPA	Environmental Protection Agency www.epa.gov	(202) 260-2090
FAA	Federal Aviation Administration www.faa.gov	(202) 366-4000
FCC	Federal Communications Commission www.fcc.gov	(202) 225-5322
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
FHA	Federal Highway Administration www.fhwa.dot.gov	(410) 962-0093
GSA	General Services Administration www.gsa.gov	(202) 708-5082
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley Laboratory National Laboratory www.lbl.gov	(510) 486-4000
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999
PBS	Public Building Service (See GSA)	

PHS	Office of Public Health and Science phs.os.dhhs.gov	(202) 690 7694
TRB	Transportation Research Board www.nas.edu/trb	(202) 334-2934
TSA	Transportation Security Administration www.tsa.gov/public/index.jsp	1(866)-289-9673
USDA	Department of Agriculture www.usda.gov	(202) 720-2791
USPS	United States Postal Service www.usps.com	(202) 268-2000

D. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

DCR	Virginia Department of Conservation and Recreation http://www.dcr.state.va.us	(804) 786-1712
VDH	Virginia Department of Health Culpepper District www.vdh.state.va.us	(540) 829-7340
USBC	The Virginia Statewide Building Code (USBC) The Commonwealth of Virginia – Uniform Statewide Building Code	(804) 371- 7160
VDHCD	Virginia Department of Housing and Community Development Division of Building and Fire Regulation 501 North 2nd Street Richmond, VA 23219-1321	
VDOT	Virginia Department of Transportation www.virginiadot.org	(703) 383-8368
VDEQ	Virginia Department of Environmental Quality www.deq.state.va.us	1-800-592-5482

1.6 GOVERNING REGULATIONS/AUTHORITIES

- A. Contact authorities having jurisdiction directly for information and decisions having a bearing on the work. Names and addresses are subject to change; they are believed to be but are not assured to be accurate and up to date as of the date of the Contract Documents.
- B. Codes: The contractor shall adhere to all applicable portions of code standards and specifications in the construction of the work. Unless otherwise noted (reference Division 01 Section “Quality Requirements”), the Authority will review the Contractor’s submittals and construction of the work for code compliance. The Authority’s acceptance of completed construction does not relieve the Contractor from strict compliance with all applicable regulations and codes.
 - 1. Definition: The Metropolitan Washington Airports Authority has a “building department” recognized by the Commonwealth of Virginia. This department is charged with enforcing the Virginia Uniform Statewide Building Code (VUSBC). Where the words “code official”, “department having jurisdiction” or “agency having jurisdiction” is referenced in any code, including the VUSBC or its adopted model codes (ICC), those terms shall mean the Authority Building Official and/or his designated representative.
 - 2. Standards that influence the construction of the project include, but are not limited to, all applicable federal and Commonwealth laws, all applicable codes, rules, regulations and standards applicable to this project.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - CONTRACTOR’S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section “Quality Requirements” for requirements for Contractor Quality Control Program.

END OF SECTION 01 42 00

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and Contract Provisions, Special Provisions, Supplementary Conditions, and other Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, security, and protection facilities for Contractor staging area.

- B. Temporary utilities include, but are not limited to, the following:

1. Sewers and drainage.
2. Water service and distribution.
3. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
4. Heating and cooling facilities.
5. Ventilation.
6. Electric power service.
7. Telephone and other communication services.

- C. Support facilities include, but are not limited to, the following:

1. Temporary roads and paving.
2. Dewatering facilities and drains.
3. Project identification and temporary signs.
4. Waste disposal facilities.
5. Field offices.
6. Storage and fabrication sheds.
7. Lifts and hoists.
8. Temporary elevator usage.
9. Temporary stairs.
10. Construction aids and miscellaneous services and facilities.
11. COTR trailer.

- D. Security and protection facilities include, but are not limited to, the following:

1. Environmental protection.
2. Storm water control.
3. Tree and plant protection.
4. Pest control.
5. Site enclosure fence.
6. Security enclosure and lockup.

7. Barricades, warning signs, and lights.
8. Covered walkways.
9. Temporary enclosures.
10. Temporary partitions.
11. Fire protection.

E. Related Sections include the following:

1. Division 01 Section "Submittals" for procedures for submitting copies of implementation and termination schedule and utility reports.
2. Division 31 Section "Termite Control" for pest control.
3. Divisions 02 through 33 Sections for temporary heat, ventilation, and humidity requirements for products used in those Sections.

1.3 DEFINITIONS

- A. Permanent Enclosure: As determined by COTR, permanent or temporary roofing is complete, insulated, and weather tight; exterior walls are insulated and weather tight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

- A. General: Temporary utilities are available from the Authority at no charge unless otherwise noted. Provide necessary labor and materials to connect to the Authority's utilities at points designated by COTR and extend utilities to trailers, offices, sheds, etc.
1. Provide COTR approved meters for water, natural gas, electricity, and each other utility used for Project. Supply utilities to Subcontractors' temporary facilities through Contractor's meters. The requirement to provide meters for utilities does not imply that the Contractor will be charged for these utilities, except under provisions outlined in this and other Sections.
 2. Report consumption of each utility to COTR each month. Contractor is expected to consume reasonable amounts of each utility. Should Contractor, in COTR's opinion, use excessive amounts of any utility or waste a utility, Contractor may be required to pay for temporary utilities.
- B. Allow other entities to use temporary services and facilities without cost, including, but are not limited to, the following:
1. The Authority's construction forces.
 2. Occupants of Project.
 3. COTR.
 4. Architect/Engineer.
 5. Testing agencies.
 6. Personnel of authorities having jurisdiction.

1.5 SUBMITTALS

- A. Shop Drawings: Submit to COTR, for the Authority's review and approval, site plans indicating all temporary facilities, support and security; utility connections and traffic flows. Provide detailed drawings of utility connections and special facilities.
- B. Temporary Utility Reports: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities at both staging area and the Project site. Make all structures weather proof when heated and air-conditioned. Should Contractor, in COTR's opinion fail to keep the heated and cooled structures sealed and weather proof, Contractor may be required to pay for temporary utilities.
- C. Implementation and Termination Schedule: Within 15 calendar days of date established for submittal of Contractor's first Construction Schedule, submit a schedule indicating implementation and termination of each temporary utility.
- D. Samples for Verification: For protective wall treatment for temporary partitions as follows:
 - 1. Protective Wall Covering: 24 inches square, mounted on gypsum wallboard with moldings and butt joints. Include 12-inch-long samples of inside and outside corner moldings.
 - 2. Bumper Guards: 12 inches long including fastening devices and showing end treatment.
 - 3. Corner Guards: 8 inches long, in full-size profile of each type.

1.6 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, that include but are not limited to, the following:
 - 1. Building Code requirements.
 - 2. Health and safety regulations.
 - 3. Police and Fire Department regulations.
 - 4. Environmental protection regulations.
 - 5. ADA Compliance: All temporary facilities shall be ADA compliant.
- B. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.
 - 1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
 - 2. Electrical Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electrical service. Install service to comply with NFPA 70.
- C. Tests and Inspections: Arrange for the Authority's Building Codes/Environmental Department to test and inspect each temporary utility before use. Coordinate with the Authority's Building Codes/Environmental Department for requirements for certifications, permits, and inspections.
 - 1. Obtain permits from the Authority's Building Codes/Environmental Department for temporary construction and temporary utilities.

- D. Fire-retardant and Flame Spread Requirements: Unless otherwise noted, fire – retardant treat all wood and wood composition products utilized in the Project and preservative treat all wood utilized on the exterior of any building. Preservative treat all wood utilized on other items indicated or specified with preservative treatment. Provide lumber and plywood with an Underwriters’ Laboratory (UL) stamp certifying a value of 25 or less flame spread and a value of 200 or less smoke development. Fire retardant lumber shall not be ripped or milled.

1.7 PROJECT CONDITIONS

- A. Temporary Utilities: At earliest feasible time, when acceptable to COTR, change over from use of temporary service to use of permanent service.
 - 1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before the Authority's acceptance, regardless of previously assigned responsibilities.
- B. Conditions of Use: The following conditions apply to use of temporary services, permanent services, and facilities by all parties engaged in the Work:
 - 1. Keep temporary services and facilities clean and neat.
 - 2. Relocate temporary services and facilities as required by progress of the Work.
 - 3. Take necessary fire-prevention measures.
 - 4. Do not overload facilities.
 - 5. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

1.8 CONTRACTOR PERSONNEL PARKING

- A. The Contractor's personnel will be allowed to park their personal vehicles in staging areas or in areas designated by COTR. Such designated parking areas are not necessarily fenced or otherwise protected, and temporary fencing for such parking areas is a requirement of this Contract.
- B. Display a Vehicle special, non-transferable parking permit available from the Authority on all vehicles parked in such area. Each employee will be required to obtain and pay for their own parking permit and shall be responsible for fines for not displaying permit or for parking in other than designated contractor parking areas. The COTR will provide application forms and explain method of obtaining parking permits at the Pre-Construction Conference.
- C. Contractor is limited to the construction area as defined in the contract documents the parking and staging of both company-owned and personal vehicles will be limited to the construction area as defined in the contract documents. There is no other area available for contractor parking at Ronald Reagan Washington National Airport. Contractors are allowed to use “Employee Only” shuttle busses. Control and enforce these limitations for all personnel including Subcontractor's personnel.

- D. If off-airport parking or storage of materials and equipment is required, Contractor will be responsible for the maintenance, security, safety, and operation of these facilities off-airport parking or storage of materials and equipment is required. . This cost will be considered part of the Contractor's general conditions. Transportation of materials, equipment, and personnel to the Work site is the responsibility of the Contractor.
- E. Contractor is responsible for busing his employees from the off airport parking lot to the Contractor's Staging areas or work areas.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by COTR. Provide materials suitable for use intended.
- B. Pavement: Comply with VDOT Section 315 Asphalt Concrete Paving and VDOT Section 316, Hydraulic Cement Concrete Pavement.
- C. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36.
- D. Paint: Comply with requirements in section 09 96 00, High Performance Coatings.
- E. Tarpaulins: Fire-resistive labeled with flame-spread index of 15 or less.
- F. Water: Potable.
- G. Temporary Fuel Tanks: For requirements for temporary fuel tanks see Division 31 Section "Storm Water Pollution Protection Plan." Comply with applicable safety and environmental regulations for temporary surface fuel tanks. Location and installation of tanks will be subject to review and approval of COTR and the Authority's Fire Marshal.

2.2 EQUIPMENT

- A. General: Provide new equipment suitable for use intended. If acceptable to COTR, undamaged, previously used equipment in serviceable condition may be used.
- B. Field Offices: Mobile units with lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading, and provided with proper tie-downs.
- C. Self-Contained Toilet Units: Single-occupant units of chemical, aerated re-circulation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

- D. Drinking-Water Fixtures: Containerized or bottled-water drinking-water units], including paper cup supply.
 - 1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F.
- E. Heating Equipment: Unless COTR authorizes use of permanent heating system, provide temporary heating units with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.
- F. Electrical Outlets: Properly configured, NEMA-polarized outlets that will prevent insertion of 110v or 120v plugs into higher-voltage outlets, and equipped with ground-fault circuit interrupters with reset button.
- G. Power Distribution System Circuits: Where permitted, overhead, and visible wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic-sheathed cable.
- H. Electrical Power Cords: Provide grounded extension cords; use hard-service as defined by NFPA 70, Article 400, where exposed to abrasion and traffic. If single lengths of extension cords will not reach areas where construction activities are in progress provide waterproof connectors to connect separate lengths of electrical extension cords.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Prior to installation of temporary facilities and utilities, submit to the COTR a site layout providing locations and details of the facilities and utilities.
- B. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- C. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 CONTRACTOR STAGING AREA - GENERAL

- A. Contractor will be allowed to store and stage his materials in a staging area located on Airport property as indicated or as designated by the COTR for such purposes. Space is limited to area indicated. COTR and Contractor will make a joint site visit to document condition of staging area prior to occupancy. Take photos for the record.

- B. Erect and maintain an 8-foot high chain link fence topped with 3-strands of barbed wire around perimeter of staging area when the fence serves as an AOA barrier as required by the FAA/TSA. A 6-foot high fence as described above, including barbed wire will be acceptable for all other applications. Protect all stored equipment from the weather. The Authority accepts no responsibility for items stored in this area.
- C. Upon completion of Construction, remove all temporary staging area facilities and return the areas to their original condition.
- D. Park construction equipment in the storage site or storage area identified by the COTR when equipment is not engaged in construction activity.
- E. Do not stockpile construction materials, spoils, debris or refuse in any area other than that specifically approved for such purpose by the COTR.
- F. Constrain stockpiled material in a manner to prevent its movement by wind, jet blast or propeller wash.

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Provide temporary service for each utility required. Comply with requirements of the Authority's Building Codes Manual, the Authority's Construction Safety Manual, and the requirements of all Sections of these specifications.
 - 1. Arrange with COTR for time when service can be interrupted, if necessary, to make connections for temporary services. For additional information on utility outages see Division 01 Section, "Summary."
 - 2. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.
 - 3. Perform work associated with utilities owned by the Authority as approved by the Authority.
 - 4. See additional information in Contract Provisions entitled "Availability and Use of Utility Service."
- B. Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.
- C. When using Authority sewers:
 - 1. Filter out excessive soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
 - 2. Connect temporary sewers to the Authority's system as directed by COTR.
 - 3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. After heavy use, restore normal conditions promptly.
 - 4. Provide temporary filter beds, settlement tanks, separators, and similar devices to purify effluent to levels acceptable to authorities having jurisdiction.

- D. Water Service: Provide temporary water service and distribution piping in sizes and pressures adequate for construction until permanent water service is in use. Sterilize temporary water piping before use. Provide Badger Recordall, Turbo II Utility type water meter to meter all water usage for 2-inch water feed lines and above. Provide Badger Recordall bronze disc water meter for to meter all water usage for water feed lines under 2-inches. COTR will approve water meters, in writing prior to installation of water meters. Do not install water meters until written approval has been received from COTR. Provide Watts Model 909, Type RPZ backflow preventers. Do not install backflow preventers until written approval of backflow preventers has been received from the COTR.
- E. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
 2. Toilets: Install self-contained toilet units, located as approved by COTR. Shield toilets to ensure privacy. Provide separate facilities for male and female personnel. Use of the Authority's existing toilet facilities will not be permitted.
 3. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly. Supply cleaning compounds appropriate for each type of material handled.
 - a. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.
 4. Drinking-Water Facilities: Provide bottled-water, drinking-water units.
 - a. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F.
 5. Locate toilets and drinking-water fixtures so personnel need not walk more than 300 feet horizontally to facilities.
- F. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment from that specified that would not have a harmful effect on completed installations or elements being installed.
1. Maintain a minimum temperature of 50 deg F in permanently enclosed portions of building for normal construction activities, and 65 deg F for finishing activities and areas where finished Work has been installed.
- G. Ventilation and Humidity Control: Provide temporary ventilation and humidity control required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment from that specified that would not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and

minimize energy consumption. Provide and operate either exhaust or supply fans/blowers, or both, sufficient to ventilate work areas adequately.

- H. Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnecting means, automatic ground-fault interrupters, and main distribution switchgear. Provide kilowatt-hour meters with demand capability.
 - 1. Install electric power service underground, unless overhead service is authorized by COTR.
 - 2. Connect temporary service to the Authority's existing power source, as directed by COTR.
 - 3. Install power distribution wiring overhead and rise vertically where least exposed to damage
- I. Electrical Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.
 - 1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
 - 2. Provide warning signs at power outlets other than 110 to 120 V.
 - 3. Provide metal conduit, tubing, or metallic cable for wiring exposed to possible damage. Provide rigid steel conduits for wiring exposed on grades, floors, decks, or other traffic areas.
 - 4. Provide metal conduit enclosures or boxes for wiring devices.
 - 5. Provide 4-gang outlets, spaced so 100-foot extension cord can reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.
- J. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.
 - 1. Provide and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 - 2. Provide exterior-yard site lighting that will provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed. Provide exterior yard and site lighting aligned as directed by the COTR. Provide lighting so as not to interfere with ground, air traffic and air traffic control.
 - 3. Install lighting for Project identification signs.
- K. Telephone Service: Provide temporary telephone service for key personnel engaged in construction activities, throughout the construction period. Install telephones on separate lines for each temporary office and first aid station. Where an office has more than two occupants, install a telephone for each additional occupant or pair of occupants. Provide telephones with exchanges within the Metropolitan Washington service area. The Authority owns and operates an airport-wide Airport Communication System (ACS). This system accommodates all normal telecommunications service requirements, i.e., local, long distance, fax, data, etc. The

Contractor may obtain information about and choose to utilize this service by contacting the ACS Help Desk at (703) 417-8300.

1. At each telephone, post a list of emergency telephone numbers approved by COTR.
2. Provide a portable cellular telephone for superintendent's use in making and receiving telephone calls when away from field office.
3. At the present time the Authority uses cell phones to communicate. The Authority uses Nextel service.

3.4 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.
2. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241 and USBC.

B. Dewatering Facilities and Drains: Comply with requirements in applicable Division 31 and Division 32 Sections for temporary drainage and dewatering facilities and operations not directly associated with construction activities included in individual Sections. Where feasible, use same facilities. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining property nor endanger permanent Work or temporary facilities.
2. Before connection and operation of permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed.
3. Remove snow and ice as required to minimize accumulations.

C. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs where indicated or where directed by COTR to inform public and persons seeking entrance to Project. Provide two Project signs.

1. Engage an experienced sign painter to apply graphics for Project identification signs. Comply with details indicated.
2. Prepare temporary signs to provide directional information to construction personnel and visitors.
3. Construct signs of exterior-type, Grade B-B, high-density concrete form overlay plywood in sizes and thickness indicated. Support on nominal 4-inch-by-4-inch-by-10-foot-long posts or framing of preservative-treated wood or steel.
4. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer.
5. The following signs will be allowed on the Project:
 - a. Identifying captions over offices.
 - b. Other signs as required by the Contract Documents.

6. Take necessary steps to prevent installation of unauthorized signs and, should any appear, remove them immediately. Repair and repaint damage caused thereby at no additional cost to the Authority.
 7. No more than two Project Identification Signs will be permitted. Project identification signs are the only signs on which the Contractors name and logo will be permitted.
- D. **Waste Disposal Facilities:** Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 01 Section "Execution" for progress cleaning requirements.
1. If required by COTR, provide separate containers, clearly labeled, for each type of waste material to be deposited.
 2. Develop a waste management plan for Work performed on Project. Indicate types of waste materials Project will produce and estimate quantities of each type. Provide detailed information for on-site waste storage and separation of recyclable materials. Provide information on destination of each type of waste material and means to be used to dispose of all waste materials.
- E. **Janitorial Services:** Provide janitorial services on a daily basis for temporary offices, first-aid stations, toilets, wash facilities, lunchrooms, and similar areas.
- F. **Storage and Fabrication Sheds:** Provide sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services. Sheds may be open shelters or, if permitted by COTR, fully enclosed spaces within building or elsewhere on-site subject to approval of COTR.
1. Construct framing, sheathing, and siding using fire-retardant-treated lumber and plywood.
 2. Paint exposed lumber and plywood with exterior-grade acrylic-latex emulsion over exterior primer.
 3. Submit the design of storage structures of more than 150 sq. ft. to COTR for review and approval by the Authority's Building Codes/Environmental Department.
- G. **Temporary Stairs:** Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.
- H. **Existing Stair Usage:** Use of the Authority's existing stairs will be permitted, as long as stairs are cleaned and maintained in a condition acceptable to COTR. At Substantial Completion, restore stairs to condition existing before initial use.
1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If, despite such protection, stairs become damaged, restore damaged areas so no evidence remains of correction work.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours of 11:00 p.m. to 5:00 a.m., unless directed otherwise by the COTR, which will minimize complaints from persons or firms near Project site.
- B. Storm water Control: Provide earthen embankments and similar barriers in and around excavations and sub grade construction, sufficient to prevent flooding by runoff of storm water from heavy rains.
- C. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from construction damage. Protect tree root systems from damage, flooding, and erosion. See Contract Provisions for additional requirements.
- D. Tree and Plant Protection: Comply with requirements in Division 01 Section "Tree and Plant Protection."
- E. Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest-control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Engage this pest-control service to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for the Authority. Perform control operations lawfully, using environmentally safe materials.
- F. Security Fencing:
 - 1. Minimum 2-inch, 0.148-inch-thick, galvanized steel, chain-link fabric fencing; minimum 8 feet high with galvanized steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 3 galvanized barbed-wire top strands, unless otherwise indicated.
- G. Site Enclosure Fence: Before construction operations begin, provide portable chain-link site enclosure fence. Minimum 2-inch, 9-gage, galvanized steel, chain-link fabric fencing; minimum 8 feet high with galvanized steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and bottom rails. Provide concrete bases for supporting posts. Contractor is responsible for providing support to protect against wind damage and meeting safety requirements.
 - 1. Entrance into the site: Only through the lockable entrance gates.
 - 2. Set fence posts in concrete bases.
 - 3. Provide gates in sizes and at locations necessary to accommodate delivery vehicles and other construction operations.
 - 4. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide COTR with three set of keys.

- H. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- I. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights. See the Authority's Construction Safety Manual for additional requirements.
- J. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241 and VUSBC.
 - 1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
 - a. Field Offices: Class A, stored-pressure, water-type extinguishers.
 - b. Other Locations: Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
 - c. Locate fire extinguishers per NFPA 10 and where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
 - 2. Store combustible materials in containers in fire-safe locations.
 - 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposure areas.
 - 4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
 - 5. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
 - 6. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 - 7. Provide temporary standpipes with fire hose valve connections for fire protection.
- K. Storage: Where materials and equipment are stored, and are of value or attractive for theft, provide secure lockup. Enforce discipline in connection with installation and release of material to minimize opportunity for theft and vandalism.

3.6 UTILITY PROVISIONS AT SOUTH STAGING AREA

A. EXISTING CONDITIONS

- 1. The Authority will provide at each lot in the South Staging area the following:

- a. Two 2” conduits from the utility sheds, to the limits of the lot, one electrical and one telecommunications. The conduits will be capped below grade and signified by a 4” x 4” x 4’ wood stake at the limits of the lot.
- b. Each lot will be allocated 100 A, 480 v 3 phase, 3 wire power.
- c. The power is available at the utility shed. Provide necessary conductors as indicated in the “TELECOMMUNICATIONS” and “ELECTRICAL POWER” paragraphs below.
- d. Domestic water service will be available at the limit of the lot, identified with a blue painted stake.

B. GENERAL REQUIREMENTS

1. Contractor is responsible for subdividing telecommunications, electrical and water within their assigned lot in a coordinated fashion upon mobilization. Provide a site plan for COTR review and approval. Maintain site plan up-to-date throughout the Project. Indicate on site plan trailer locations, proposed conduit runs, proposed telecom and electrical backboards, proposed water distribution and any other pertinent information. Locate and indicate existing utilities on site plan.
2. Install fence around Contractors allotted area and remove fence upon completion of Contractor’s Work. Refer to other paragraphs of this section for fencing requirements.
3. Contractor employee parking will be limited to within the allotted staging area. Provide transportation for Contractor’s employees between the work site and the staging area.
4. Water tank fill station is located on the south side of the entrance road to the Staging Area. Do not use the fire hydrants along the main staging area road for obtaining water.
5. Restore lot to its original condition upon contract conclusion.

C. TELECOMMUNICATIONS

1. The Airport Communications System (ACS) vendor will provide a pedestal or telecom backboard at the limits of the Contractor’s lot. The pedestal or telecom backboard is supplied via a communications cable installed by the ACS from the nearest utility shed to the limits of the Contractor’s lot. As the electrical and telecommunications are adjacent, excavation at the lot limits for both utilities should be completed at the same time. Determining the routing of all conduits from the telecom pedestal at the lot limits to each subcontractor trailer to avoid future cut cables. Originate all feeds within a lot at the pedestal location. Contractor’s attention is called to the fact that all telecommunications work between the utility sheds and the lot limits is the responsibility of the ACS. Should the Contractor perform any telecommunications work between the utility sheds and the lot limits, the ACS will remove work and the ACS will charge the Contractor for any cost associated with this removal of the work.
2. Provide all conduit installations either above or below ground in accordance with the Virginia Uniform Statewide Building Code and the applicable Division 26 Sections of the specification.
 - a. Communications cable:
 - 1) Cable must be 24 gauge with solid, annealed, bare copper conductors
 - 2) Conductors shall have polyolefin insulation, color coded to telephone industry standards
 - 3) Cable must have a black polyethylene outer jacket

- 4) Cable must have an aluminum or copper shield.
 - 5) Cable must be Gel filled
 - 6) Install in schedule 40 PVC conduits a minimum of 2” in diameter.
 - 7) Advise the COTR of the total number of required telecom cable pairs, including his subcontractor’s requirements, prior to any communications cable work within the lot.
3. Special telecom provisions— T1 service is available in the South Contractors lot at Contractor's expense. T1 or DSL service will be available in the Northwest Contractors Lot at the contractor’s expense. Telecom services can be ordered through the Airport Communications System vender. Please call Louise Epps at 703/417-8605 to order these services.

D. ELECTRICAL POWER

1. Conduit is provided from one of four sheds, to a location just inside each contractor lot. Extend the conduit, as required, to serve all facilities on Contractor’s site and provide cable back to shed. If power requirements greater than 100 ampere, at 480v, three phase, three – wire are required; requests for additional power will be considered on a case-by-case basis.
 - a. Transformers:
 - 1) Suitable for outdoor use
 - 2) Pad mounted with fused safety switches on the primary and secondary sides of the transformer.
2. The Contractor is required to advise the COTR of the estimated electrical consumption including that of his subcontractors prior to provision of cable.

E. PLUMBING

1. Provide a Watts Model 909, Type RPZ backflow prevention device at each trailer. Remove plumbing work in place upon contract completion. There are no sanitary sewer provisions, use above ground tanks specifically designed for sewage holding. The Contractor at his option may use chemical or electrical toilets. Clean, pump and haul sanitary waste. Maintain a clean and odor free lot.

F. MAINTENANCE REQUIREMENTS STAGING AREA

1. Unauthorized soil and concrete stockpiles are prohibited.
2. Cover all containers and drums of any size that are stored on site and their required secondary containment to prevent rainwater from coming in contact with the containers. Earthen berms are not permitted. Clearly label all drums and containers used to hold trash and debris “Trash”. Empty drums and containers when full. Remove all unused empty drums and containers from the site.
3. Include Contractor’s lot in the South Staging Area in the SPPP.
4. Store all fuel, petroleum based products and products potentially detrimental to the environment in aboveground tanks.

5. Aboveground storage tanks:
 - a. Double walled and approved for the use intended.
 - b. Submit manufacturer's literature to COTR for approval in writing for each such storage tank intended for use by Contractor.
6. Store all trash, construction debris, and other debris in metal containers specifically designed for such use. Do not keep trash containers on the site for more than 90 calendar days.
7. Storage of used tires and batteries is prohibited.
8. Storage of waste oil is prohibited.
9. Only routine light equipment maintenance shall be permitted. Should Contractor require more than routine maintenance to be performed on site, submit a work execution plan to COTR, for written approval, describing the type of maintenance and the procedures that will be implemented to protect the environment.

3.7 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Operate Project-identification-sign lighting daily any time from dusk until dawn when personnel are on the site. Should no personnel be on the site after 12:00 midnight the project – identification lighting may be turned off at 12:00 midnight.
- D. Temporary Facility Changeover: Unless Contractor is able to utilize permanent fire protection, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 1. Properly recondition and restore those portions of the site occupied by temporary facilities and controls to condition acceptable to COTR, at least equal to condition at time of start of Work, unless otherwise authorized in writing by COTR.
 2. Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.

3. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace roadway paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
4. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Division 01 Section "Project Closeout."

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.

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SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Special Provisions, Supplementary Conditions, and other Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
 - 1. This Section includes substitutions made for "or as approved by the Authority" items.
- B. Related Sections include the following:
 - 1. Division 01 Section "References" for applicable industry standards for products specified.
 - 2. Divisions 02 through 33 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.4 SUBMITTALS

- A. Product List: Submit a list, in tabular form acceptable to COTR, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
1. Coordinate product list with Contractor's Construction Schedule and Submittals Schedule.
 2. Form: Tabulate information for each product under the following column headings:
 - a. Specification Section number and title.
 - b. Generic name used in the Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.
 - h. Identification of items that require early submittal approval for scheduled delivery date.
 - i. Item Tag Number or similar ID if identified in the drawings
 - j. Location (room number from the drawings)
 - k. Serial Number (once available)
 3. Initial Submittal: Within 90 calendar days after the Notice to Proceed, submit 3 copies of initial product list. Include a written explanation for omissions of data and for variations from the Contract requirements.
 4. COTR's Action: COTR will respond in writing to Contractor within 15 calendar days of receipt of initial product list. COTR's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. COTR's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.
 5. Updated submittal: Submit updated product list every 90 days following initial submittal. The updated list shall be submitted in approved electronic spread sheet format with additional fields as required by COTR.
 6. Completed List: Submit 10 hard copies and one electronic copy of completed product list 90 calendar days before requesting inspection for substantial completion. Include a written explanation for omissions of data and for variations from the Contract requirements.

- B. Substitution Requests: Submit six copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Section number and title and Drawing numbers and titles.
1. Substitution Request Form: Submit requests in the form and according to procedures required for Contract Modification proposals supplied to Contractor at the pre-construction meeting or as directed by COTR. Do not submit requests for substitutions as "Requests for Information" (RFIs).
 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Authority and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Price.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
 - m. Failure by Contractor to include the above requirements in the submittal may cause rejection of the submittal in its entirety.
 3. COTR's Action: If necessary, COTR will request additional information or documentation for evaluation within 15 calendar days of receipt of a request for substitution. COTR will notify Contractor of acceptance or rejection of proposed substitution within 15 calendar days of receipt of request, or two weeks of receipt of additional information or documentation, whichever is later.

- a. Form of Acceptance: Change notice.
 - b. Use product specified if COTR couldn't make a decision on use of a proposed substitution within time allocated.
- C. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. COTR's Action: If necessary, COTR will request additional information or documentation for evaluation within 7 working days of receipt of a comparable product request. COTR will notify Contractor of approval or rejection of proposed comparable product request within 15 calendar days of receipt of request, or 7 calendar days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Division 01 Section "Submittals."
 - b. Use product specified if COTR couldn't make a decision on use of a comparable product request within time allocated.
- D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittals." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
- C. Storage:
1. Store products to allow for inspection and measurement of quantity or counting of units.

2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weather tight enclosure above ground, with ventilation adequate to prevent condensation.
4. Comply with product manufacturers written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Store cementitious products and materials on elevated platforms.
7. Protect stored products from damage.
8. Replace products and materials damaged by the elements due to improper storage at no additional cost to the Authority. This damage can be, but not limited to, oxidization, mold, mildew, warping, and rust.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Authority.
 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Authority.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
 3. Refer to Divisions 02 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Project Closeout."

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. The Authority reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," COTR will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is COTR's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
7. "Or as approved by the Authority": Note that products submitted under an "or as approved by the Authority" provision are considered to be substitutions. Substitutions shall follow the requirements of Paragraph VII-42 of Contract Provisions and provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part - 2 "Comparable Products" Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part - 2 "Comparable Products" Article for consideration of an unnamed product.
7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches COTR's sample. COTR's decision will be final on whether a proposed product matches.

- a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
- a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, COTR will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, COTR will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

- A. Timing: COTR will consider requests for substitution if received within 60 calendar days after issuance of the Notice to Proceed. Requests received after that time may be considered or rejected at the sole discretion of the Contracting Officer.
- B. Conditions: COTR will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, COTR will return requests without action, except to record noncompliance with these requirements:
 1. Requested substitution does not require extensive revisions to the Contract Documents.
 2. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 3. Substitution request is fully documented and properly submitted.
 4. Requested substitution will not adversely affect Contractor's Construction Schedule.
 5. Requested substitution has received necessary approvals of authorities having jurisdiction.
 6. Requested substitution is compatible with other portions of the Work.
 7. Requested substitution has been coordinated with other portions of the Work.
 8. Requested substitution provides specified warranty.
 9. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- C. Contractor's submittal and COTR's review or approval of Shop Drawings, Product Data, or Samples that relate to a substitute does not by itself constitute a final approval of the requested substitution, nor does it relieve Contractor from fulfilling existing Contract requirements.
- D. If a substitution offers a substantial advantage to the Authority, in terms of cost, time, energy conservation, or other considerations of merit, after deducting offsetting responsibilities the

Authority may be required to bear, the substitution shall be submitted as a Value Engineering Change Proposal.

2.3 COMPARABLE PRODUCTS

- A. Conditions: COTR will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, COTR will return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, it is consistent with the Contract Documents, it will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.

END OF SECTION 01 60 00

SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Special Provisions, Supplementary Conditions, and other Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. General installation of products.
 - 4. Coordination of Authority-installed products.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work.
- B. Related Sections include the following:
 - 1. Division 01 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.

1.3 SUBMITTALS

- A. Qualification Data: Submit qualification data for land surveyors and professional engineer.
- B. Certificates: Submit certificate signed and sealed by land surveyor and professional engineer certifying that location and elevation of improvements comply with requirements.
- C. Certified Surveys: Submit 2 copies signed and sealed by land surveyor and professional engineer.
- D. Project Record Documents: Submit a record of Work performed (materials tests, inspections, acceptance tests, etc.) and record survey data as required under provisions in Division 01 Sections "Submittals" and "Project Closeout."

1.4 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in the Commonwealth of Virginia and who is experienced in providing land-surveying services of the kind indicated.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the Commonwealth of Virginia experienced in the area for which he is utilized.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work, including all site utility systems.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical and communication services.
 - 2. For additional requirements for locating and marking existing utilities, see Division 01 Section "Summary."
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. 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 walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to COTR 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.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information (RFI) to COTR. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify COTR promptly.
- B. General: Engage a land surveyor to layout the Work using accepted surveying practices.
 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish dimensions within tolerances indicated. Do not scale 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 COTR when deviations from required lines and levels exceed allowable tolerances.
 6. Close site surveys with an error of closure equal to or less than one inch in 10,000 feet.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by COTR.

3.4 FIELD ENGINEERING

- A. Identification: Existing control points and property line corner stakes are as identified on the Contract Documents.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of COTR. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to COTR before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly with the approval of COTR. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with the Authority for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, including utilities, prepare a certified survey showing coordinates, dimensions, locations, angles, and elevations of construction and site work. Coordinates shall be ACS and elevations shall be NGVD 29.

3.5 INSTALLATION

- A. Inspection of Conditions: Require Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Proceed only after unsatisfactory conditions have been corrected in a manner acceptable to COTR. Coordinate this requirement with Division 01 Section "Quality Requirements."

- B. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.
 - 5. Roughing-in of utilities in areas with vaulted or domed roofs shall follow contour of roof lines.
- C. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- D. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- E. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels. For additional requirements see Section "Supplementary Conditions."
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by COTR.
 - 2. Allow for building movement, including thermal expansion and contraction.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints as directed by COTR. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 AUTHORITY-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for the Authority's construction forces.
- B. Coordination: Coordinate construction and operations of the Work with work performed by the Authority's construction forces.
 - 1. Construction Schedule: Inform COTR of Contractor's preferred construction schedule for the Authority's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify COTR if changes to schedule are required due to differences in actual construction progress.
 - 2. Pre-installation Conferences: Include the Authority's construction forces at pre-installation conferences covering portions of the Work that are to receive the Authority's

work. Attend pre-installation conferences conducted by the Authority's construction forces if portions of the Work depend on the Authority's construction.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Remove combustible debris from the site daily.
 - 3. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
 - 4. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.
 - 1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.
- H. Waste Disposal: Burying or burning waste materials on-airport property will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

- J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- K. Limiting Exposures: Supervise construction operations to ensure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.
- L. Grass Mowing: Mow grass areas contained in Project site, or made inaccessible to the Authority's mowing contractors.

3.8 STARTING AND ADJUSTING

- A. Follow equipment manufacturer's startup procedures, unless otherwise directed by COTR.
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure that installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.

END OF SECTION 01 73 00

SECTION 01 73 29 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Special Provisions, Supplementary Conditions, and other Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
 - 1. Divisions 02 through 33 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal, requesting approval from COTR to proceed, describing procedures at least 10 days before the time cutting and patching will be performed,. Include the following information:
 - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
 - 2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
 - 3. Products: List products to be used and firms or entities that will perform the Work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utility Services and Mechanical/Electrical Systems: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted. Before cutting/core drilling the slab, structural members, concrete walls, etc. X-ray the slab, beam, wall, etc. to determine whether any embedded items such as conduit and reinforcing steel would be cut or disturbed and provide X-rays to COTR. If the

cutting/core drilling will cut any conduits, notify the COTR to re-locate the opening or take other action as required. If reinforcing steel is encountered, notify the COTR to either re-locate the opening or evaluate the effect of cutting the reinforcement. Perform this evaluation by a registered professional engineer licensed in the Commonwealth of Virginia. Refer to Division 01 Section "Summary" for utility outage requirements.

6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure. When cutting and patching involves welding or open flame cutting, obtain the approval of the Authority's Fire Marshal for such work prior to its start. Before cutting or drilling a structural element, X-ray the element to determine whether any embedded items such as conduit and reinforcing steel would be cut or disturbed and provide X-rays to COTR. If the cutting/drilling will cut any rebar or conduits, notify the COTR to re-locate the opening or take other action as required. If reinforcing steel is encountered, notify the COTR to either re-locate the opening or evaluate the effect of cutting the reinforcement. Perform this evaluation by a registered professional engineer licensed in the Commonwealth of Virginia.
7. COTR's Approval: Obtain COTR's approval in writing of cutting and patching proposal before cutting and patching. Approval does not waive COTR's right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch the following operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Obtain COTR's written approval of the cutting and patching of the following operating elements or safety related items:
 1. Primary operational systems and equipment.
 2. Air or smoke barriers.
 3. Fire-suppression systems.
 4. Control systems.
 5. Communication systems.
 6. Conveying systems.
 7. Electrical wiring systems.
 8. Operating systems of special construction in Division 13 Sections.
 9. Security systems including CCTV and duress alarms.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:
 1. Water, moisture, or vapor barriers.
 2. Membranes and flashings.
 3. Exterior curtain-wall construction.
 4. Equipment supports.

5. Piping, ductwork, vessels, and equipment.
6. Noise- and vibration-control elements and systems.
7. Insulating systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in COTR's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1. Processed concrete finishes.
2. Stonework and stone masonry.
3. Ornamental metal.
4. Matched-veneer woodwork.
5. Preformed metal panels.
6. Roofing.
7. Fire stopping.
8. Window wall system.
9. Stucco and ornamental plaster.
10. Terrazzo.
11. Finished wood flooring.
12. Fluid-applied flooring.
13. Aggregate wall coating.
14. Wall covering.
15. HVAC enclosures, cabinets, or covers.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections of these Specifications.
- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned; bypass such services/systems before cutting to prevent interruption to occupied areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size

- required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Should excavating and backfilling be required by cutting and patching operations comply with requirements in applicable Division 31 Sections.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting. Remove conductors back to source of supply.
 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or re-hang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather tight condition.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.

END OF SECTION 01 73 29

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SECTION 01 77 00 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Special Provisions, Supplementary Conditions, and other Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Warranties.
 - 3. Final cleaning.
- B. Related Sections include the following:
 - 1. Division 01 Section "Quality Requirements" for final requirements of the Warranty Manual.
 - 2. Division 01 Section "Photographic Documentation" for submitting Final Acceptance construction photographs and negatives.
 - 3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, Record Product Data, and other Record Documents.
 - 4. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 5. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for products of those Sections.

1.3 SUBSTANTIAL COMPLETION

- A. Definition: "Substantial Completion" is the stage in the progress of the work when COTR determines that all the Work, or a designated portion thereof, is sufficiently complete and functional according to the Contract Documents so that the Authority can occupy or utilize the Work for its intended use. The only remaining physical work shall be the completion of punch list work prior to Final Acceptance.
- B. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, reasons why the Work is not complete, and a schedule for completing punch list work according to Section III of the Contract.

2. Ensure previously outstanding technical submittals and Shop Drawings have been submitted and approved.
 3. Advise COTR of pending insurance changeover requirements.
 4. Submit warranties required by Contract Documents, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - a. Submit Contractor Warranty Letter, for review and approval, a minimum of 60 days before requesting inspection for determining date of Substantial Completion. After date of Substantial Completion has been determined revise the Contractor's Warranty Letter to include that date as start of Warranty period.
 5. Obtain and submit releases permitting the Authority unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 6. Prepare and submit Project Record Documents except Record Contract CPM Schedule; also prepare and submit Operation and Maintenance manuals, Final Completion construction photographs and photographic negatives, damage or settlement surveys, and similar final record information.
 7. Prepare and submit proof that specified testing and code inspections have been completed, accepted and certified, including, but not limited to, structural work, sprinkler piping systems, fire alarm and FPS systems, bacteriological testing of domestic lines, back-flow prevention, electrical system testing, and hydrostatic pressure testing of sanitary lines. Submit approvals of Health Department or the FDA as applicable.
 8. Deliver tools, spare parts, extra materials, and similar items to location designated by COTR. Label with manufacturer's name and model number where applicable.
 9. Make final changeover of permanent locks and deliver keys to COTR. Advise the Authority's personnel of changeover in security provisions.
 10. Complete startup testing of systems.
 11. Submit test/adjust/balance records.
 12. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 13. Advise the Authority of changeover in utilities.
 14. Submit changeover information related to the Authority's occupancy, use, operation, and maintenance.
 15. Instruct the Authority's personnel in operation, adjustment, and maintenance of products, equipment, and systems, as required by Division 01 Section "Demonstration and Training."
 16. Complete final cleaning requirements, including touchup painting.
 17. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- C. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, COTR will either proceed with inspection or notify Contractor of unfulfilled requirements. COTR will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by COTR, that must be completed or corrected before certificate will be issued.
1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. Punch list work must be completed within the duration specified in Section III, "Schedule." Failure to complete the punch list work within the duration specified may result in the Contracting Officer ordering the work to be completed by others at the cost to Contractor.
3. Results of completed inspection will form the basis of requirements for Final Acceptance.

1.4 FINAL COMPLETION AND ACCEPTANCE

- A. Definition: "Final Completion" is the stage in the Contract when the Contracting Officer determines that all Work has been 100 percent completed according to the terms and conditions of the Contract Documents, including administrative obligations. The date of Final Acceptance is the date of execution by the Contracting Officer of a Certificate of Final Acceptance.
- B. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
 1. Submit a final Application for Payment according to Division 01 Section "Application for Payment."
 2. Submit certified copy of COTR's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by COTR. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Submit a Contractor/COTR joint statement evidencing that all Record Documents, Operation and Maintenance Manuals, warranties, and similar required submittals have been approved.
 4. Complete demobilization and removal of temporary facilities from the site including construction equipment and facilities, mockups, and other similar elements. Restore areas to previously existing condition, if applicable.
 5. Execute final Contract Modification and submit final Subcontractor Payment Form.
 6. Return all AOA badging and all Authority Ids.
 7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 8. Submit Record Contract CPM Schedule.
 9. Submit warranty book.
- C. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, COTR will either proceed with inspection or notify Contractor of unfulfilled requirements. COTR will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit four copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
2. Include the following information at the top of each page:
 - a. Contract name and number.
 - b. Date.
 - c. Name of COTR.
 - d. Name of Architect/Engineer.
 - e. Name of Contractor.
 - f. Page number.

1.6 WARRANTIES

- A. Submittal Time: Submit one draft copy of proposed Warranty Manual Specified below within 90 days of Notice to Proceed. COTR will return comments to the Contractor no later than 30 calendar days after receipt.
 1. Provide Manufacturer's Standard Warranties, made out to the Authority, and statement of willingness to provide any applicable Special Warranties required by the Contract Documents 14 calendar days prior to shipping of materials and equipment. Products and Equipment shall not be considered delivered (for payment purposes) until the approved warranties have been received.
 2. Submit written warranties on request of COTR for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by the Authority during construction period by separate agreement with Contractor.
- C. Warranty Manual: Organize warranty documents into an orderly sequence based on the table of contents of the Contract Specifications. Warranty documents include Contractor and major subcontractors warranty letters, special warranty documents, and manufacturer's warranties.
 1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents. Binders shall not be filled beyond 75 percent of their rated capacity. Binders shall also have boomerang plastic sheet lifters, metal backbone, concealed rivet construction, and three-trigger position locking mechanism (lock, unlock, open) on top and bottom. Binder color shall be black unless another color is selected by COTR.
 - a. Provide maximum 3-inch binder thickness.
 - b. Identify each binder on front and spine, with printed title "PROJECT WARRANTIES," Contract number and name, and subject matter of contents. If identification cannot be attached to the front include it as the first page in the manual. Indicate volume number for multiple-volume sets. The use of business labels is prohibited.

2. Dividers: Provide three-hole, heavyweight, plastic tabbed dividers, (, or as approved by the Authority) for each separate section. Provide laser printed description for each tabbed section on the front and back of tabs. Tabs shall indicate the appropriate Specification Section. Provide a description of the warranty or heading for sub tabs using the same laser printed format on the dividers. Provide an index of the contents in each section on the first page behind each section divider. The index shall be generated using a word processor and printed on a laser printer. Include a matching master table of contents for each volume using the same indexing system. Install a colored sheet between each different warranty within a tabbed section.
- D. Provide additional copies of each warranty that shall be included in Operation and Maintenance Manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: For final cleaning, use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with Authority requirements, local laws and ordinances and Federal and local environmental and antipollution regulations. General cleaning during construction is included in Division 01 Section "Execution."
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.

- e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - m. Wipe surfaces of mechanical and electrical equipment, [elevator equipment,] and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Replace parts subject to unusual operating conditions.
 - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - q. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and high intensity discharge fixtures to comply with requirements for new fixtures.
 - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare and submit a report to COTR.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Authority's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.
- 1. Where extra materials of value remaining after completion of associated Work have become the Authority's property, arrange for disposition of these materials as directed by COTR.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.

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SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Special Provisions, Supplementary Conditions, and other Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and Maintenance Documentation Directory and formatting.
2. Manuals, General and formatting
3. Emergency Information Manuals and formatting.
4. Operation Information Manuals and formatting for systems, subsystems, and equipment.
5. Maintenance Information Manuals and formatting for the care and maintenance of products, materials, finishes, systems, and equipment.

- B. Related Sections include the following:

1. Division 01 Section "Application for Payment" for values assigned to Operation and Maintenance Manuals
2. Division 01 Section "Quality Requirements" for ensuring the development and continuing update of the Operation and Maintenance Documentation Directory and Operation and Maintenance Manual.
3. Division 01 Section "Submittals" for submitting copies of submittals for operation and maintenance manuals.
4. Division 01 Section "Project Closeout" for submitting operation and maintenance manuals.
5. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
6. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for products in those Sections.

- C. For purposes of payment, O & M and Material and Finishes Manuals are to be valued at 5% of Contract.

- D. Payment for materials and equipment will be withheld if complete O & M manual material is not received from the contractor at time of material or equipment delivery. Namely, instruction sheets, operation manuals, installation instructions, and other documents received from the manufacturer at the time of delivery.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular

interaction.

- B. Subsystem: A portion of a system with characteristics similar to a system.
- C. Equipment: An instrument or appliance designed for a specific operation.
- D. Product: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
- E. Location: A defined area such as roof, room, hallway, ceiling, pavement, wall, or floor that has special maintenance requirements that are documented in the Operation and Maintenance Data.

1.4 SUBMITTALS

- A. Operation and Maintenance Manual Format: Submit to COTR within 90 calendar days of Notice to Proceed one (1) draft paper copy and one (1) electronic copy of the proposed Operation and Maintenance Manual Format. Format shall include a table of contents and be as specified in Part 2 of this Section. COTR will return comments regarding the Operation and Maintenance Manual Format and planned contents of the completed manual within 30 calendar days of receipt. Throughout the construction period of the project, Operation and Maintenance data shall be continually inserted in the appropriate sections/parts of the Manual as it is approved.
- B. Operation and Maintenance Documentation Directory: Submit to COTR within 90 calendar days of Notice to Proceed one (1) draft copy of the Operation and Maintenance Documentation Directory. Format shall be as specified in Part 2 of this section. COTR will return comments regarding the Directory and planned contents of the completed manual set within 30 calendar days of receipt of submittal. Throughout the construction period of the project, the Directory shall be updated to reflect changes resulting from other submittal approvals.
- C. Operation and Maintenance Manuals Initial Submittal: Submit four (4) printed draft printed copies of each Manual in the approved format, including four (4) copies on CD-ROM containing all information from the manuals in electronic format, at least 90 calendar days before requesting inspection for Substantial Completion. Include a copy of the complete Operations and Maintenance Directory. COTR will return a copy of draft within 30 calendar days of receipt, and mark whether general scope and content of Manuals are acceptable.
- D. Operation and Maintenance Manuals Revised Submittals: Submit four (4) printed revised copies of each manual in final form, including four (4) copies on CD-ROM containing all the information from the manuals in electronic format, at least 45 calendar days before substantial completion or training, whichever occurs first. COTR will return a copy with comments within 15 calendar days after receipt.
- E. Operation and Maintenance Manuals Final Submittal: Correct or modify each manual to comply with COTR's comments. Submit six (6) printed copies of the Document Directory and six (6) printed copies of each corrected manual at least 15 calendar days before substantial completion or training whichever occurs first.
 - 1. Provide four (4) copies of all Operation and Maintenance Data in electronic format on

CD-ROM consistent with the organization and format in the “Manuals, General” section. All electronic files shall be in Adobe PDF format and limited to 10 megabytes in size per file.

2. All information must be legible in the digital versions. Instead of scanned images, Original files are required.

1.5 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, the General Contractor shall assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Provide the Operation and Maintenance Documentation Directory in separate binder from operation and maintenance information. Binders, dividers and all portions of the Directory shall comply with requirements of “Manuals, General” as applicable. Size of binder for directory shall be appropriate for quantity of contents. Information in O & M Directory shall be in alphabetical order with references to contract Division and Specification Section.
- B. Organization: Include a section in the directory for each of the following:
 1. General Information.
 2. Table of Contents
 3. List of systems and subsystems.
 4. List of equipment.
 5. List of Products
- C. General Information: Include documents that are pertinent to the project, including, but not limited to, a detailed description of the facility or project, general safety information and a users guide to the project operation and maintenance manuals.
- D. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- E. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list. Include references to operation and maintenance manuals that contain information about each system.
- F. List of Products: List products alphabetically to include all products not part of a system, subsystem, or component of equipment. Include references to operation and maintenance manuals that contain information about each product.
- G. Tables of Contents: Include a complete table of contents for each volume of the Operation and Maintenance Manuals.
- H. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment and products with the same designation used by the Authority. If no designation is provided for equipment, systems, sub-

systems, or equipment assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

- I. Provide a draft of the proposed "Operation and Maintenance Documentation Directory" at least 90 calendar days before requesting inspection for Substantial Completion. Submit draft to COTR for approval in writing.

2.2 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize information by Division and then into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following in the order listed:
 1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information on the title page:
 1. Specific subject matter included in manual such as Division number and title, Specification Section number and title, equipment, systems and subsystems.
 2. Name and number of the Contract.
 3. Date of submittal.
 4. Name, address, telephone number, and contact person of Contractor, Subcontractor, and supplier.
 5. Name and address of Architect/Engineer.
 6. Cross-reference to related systems in other portions of the Operation and Maintenance Manuals.
- C. Table of Contents: Include a Table of Contents, printed by a laser printer, for each volume, arranged according to the specification sections. List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in the Contract Documents.
 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents by Division then by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
 1. Binders: Heavy-duty, 3-ring metal hinged loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents. Binders shall not be filled beyond 75 percent of their rated capacity. Binders shall also have boomerang plastic sheet lifters, concealed rivet construction, and three-trigger position Dublock mechanism (lock, unlock, open) on top and bottom of binders. Binder color shall be black unless another color is selected by COTR.

- a. Provide maximum 3 inch binder thickness. Smaller binders are acceptable as long as 75 percent rated binder capacity is not exceeded.
 - b. If two or more binders are necessary to accommodate data for a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - c. Identify each binder on front (If Identification cannot be placed on the front provide as the first page) and spine of binder, with printed title "OPERATION AND MAINTENANCE MANUAL," Contract number and name, and specific subject matter of contents, such as "Division 23 Heating Ventilating and Air Conditioning". Indicate volume number for multiple-volume sets. The use of business labels is prohibited.
2. Dividers: Provide three-hole, heavyweight, and plastic tabbed dividers for each separate section. Provide laser printed description for each tab section (front and back of tabs), to indicate the appropriate Specification Section. Provide a description of the product or heading for sub tabs using the same laser printed format on the dividers.
 3. Provide a typed index describing each product, equipment, and subject addressed in each section on the first page behind each section divider. Include a matching master table of contents for each volume using the same indexing system. Install a colored sheet between major topics and each different device within a tabbed section.
 4. Protective Plastic Sleeves: Provide protective transparent plastic sheet protectors to enclose the Title Page, all Table of Content pages, and photographs.
 - a. For CD-ROMs, provide transparent plastic three-ring sleeves designed to accommodate CD-ROMs.
 5. Text: Prepared on 8-1/2-by-11-inch, 20-lb/sq. ft. white bond paper. Copies of faxed materials may be rejected. Two-sided text shall be provided on 24-lb/sq. ft. white bond paper to eliminate "bleed through" of text with a minimum brightness of 96.
 6. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in transparent envelopes and bind envelopes with text. Insert typewritten pages indicating drawing titles, descriptions of contents, in the transparent envelopes along with drawings. Drawings shall cross-reference the appropriate manual volume and Specification Section. Drawing holding envelopes are not acceptable.
 - c. Provide operation and maintenance material on CD-ROM.
- E. Transfer Cases: Manuals shall be submitted in durable, multiple thickness fiberboard transfer boxes (legal-size boxes, 15 inches wide by 24 inches long by 10 inches high) with plastic tote handles string and button closures, reinforced poly edge, and a large labeling area that accurately describes the contents.

1. Approved Product: Bankers Box, "Liberty Plus," Fast Fold, Item No. 12112 or other product as approved by the Authority.

2.3 EMERGENCY INFORMATION

- A. Content: Organize information by Division into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Fuel leak.
6. Power failure.
7. Water outage.
8. System, subsystem, or equipment failure.
9. Chemical release or spill.
10. Weather related events, thunderstorms, hurricanes, tornados, etc.

- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of the Authority's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

- D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

- E. Provide a draft of the proposed Emergency Information Manual. Submit draft at least 90 calendar days before requesting inspection for Substantial Completion to COTR for approval in writing.

2.4 OPERATION INFORMATION

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information. Organize manuals into separate and distinct volumes by Division.

1. System, subsystem, and equipment descriptions.
2. Safety instruction and related issues.

3. Performance and design criteria if Contractor is delegated design responsibility.
4. Operating standards.
5. Operating procedures.
6. Operating logs.
7. Wiring diagrams, including color-coding and terminal designations. Include all factory preset or field-set dip switch and jumper settings for all electronic equipment.
8. Control diagrams.
9. Piped system diagrams.
10. Precautions against improper use.
11. License requirements including inspection and renewal dates.
12. Material Safety Data Sheets.

B. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.
10. Procedures or operations that may void warranty.
11. Copies of equipment warranties.

C. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

D. Piped Systems: Diagram piping as installed and color-coding shall be used where required for identification.

E. Provide a draft of the proposed Operation Information Manual. Submit draft at least 90 calendar days before requesting inspection for Substantial Completion to COTR for approval in writing.

2.5 PRODUCT MAINTENANCE INFORMATION

A. This Section shall contain information for all products with the exception of Systems and Equipment, which shall be provided as indicated elsewhere in this Section.

B. Content: Organize information into a separate section for each product, material, and finish. Provide one section for architectural products, including applied materials and finishes, and a second for products designed for moisture protection and products exposed to the weather. Include source information, product information, maintenance procedures, repair materials and sources, schedule of products, location of products and warranties and bonds, as described below.

C. Source Information: List each product included in manual identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference

Specification Section number and title in Project Manual.

D. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.
6. Fire/flammability test certificates.
7. Material Safety Data Sheets.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Schedule of Products and Locations: Provide complete information, including reference drawings, in the materials and finishes manual on all products specified in Divisions 02 through 33.

H. Warranties and Bonds: Provide copies of all applicable warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.
2. Clearly indicate commencement and expiration dates.

I. Provide a draft of the proposed Product Maintenance Information Manual. Submit draft at least 90 calendar days before requesting inspection for Substantial Completion to COTR for approval in writing.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE INFORMATION

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, preventative maintenance program, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below. Organize information into separate and distinct volumes by Division, and further divided into separate volumes by system (for example, HVAC systems and plumbing systems).

B. Source Information: List each system, subsystem, and piece of equipment included in manual identified by product name and arranged to match manual's table of contents. For each product,

list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

- C. Descriptions: Include the following:
1. Product name, model number, and location.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
 10. Charts of valve tag numbers, with the room number location and function of each valve.
 11. Circuit directories of panelboards for electric and electronic systems, including the following:
 - a. Electric service.
 - b. Controls.
 - c. Telecommunications.
 - d. Computer network.
 - e. Security.
- D. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
1. Safety information.
 2. Standard printed maintenance instructions and bulletins.
 3. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 4. Identification and nomenclature of parts and components.
 5. List of items recommended to be stocked as spare parts.
- E. Preventative Maintenance Plan: Provide an annual preventative maintenance plan indicating when maintenance tasks should be performed, such that work is spread evenly as possible throughout the year. Preventative Maintenance should not be misconstrued as reconditioning, or major repairs or replacement of components, but designed to reveal through certain procedures and inspection the need for such actions in time to prevent malfunctions during operation.
- F. Preventative Maintenance and Maintenance and Repair Procedures: Include the following information and items that detail essential preventative maintenance and maintenance and repair procedures:
1. Preventative Maintenance:
 - a. Provide instructions and location diagrams for the following:
 - 1) Checking general condition of System and Components.

- 2) Inspecting for accumulation of dust, dirt or any foreign matter, and clean as needed.
- 3) Cleaning or replacing all filters and screens and adjust packing for pumps, valves, etc.
- 4) Examining indicating lamps, gauges, thermometers, etc., and replace as required.
- 5) Checking electrical primary, secondary, terminal blocks and contacts, for loose connections.
- 6) Checking Operation of strainers, valves, instruments and control switches, including their contacts.
- 7) Checking instrument transformers for proper condition and replace burned out fuses.
- 8) Removing dust from all electrical insulators and insulation and inspecting bus bars and connections for proper condition, loose connection, and overheating or overloads.
- 9) Examining safety interlocks, automatic shutters, dampers, valves, etc, and their operating mechanisms for proper operation.
- 10) Checking space heaters, thermostats, and all controls for proper operation
- 11) Lubricating mechanisms, contacts, and other moving component parts.
- 12) Specific procedures applicable to specialized equipment and systems.

2. Maintenance and Repairs:

- a. Include information and detailed diagnostic testing and inspection instructions, and procedures that detail essential system and equipment maintenance procedures including but not limited to:
 - 1) Examination of shaft seal for excessive leakage.
 - 2) Monitoring of systems for excessive bearing noise.
 - 3) Checking equipment motor housing for excessive heat buildup.
 - 4) Measuring and recording suction and discharge pressures.
 - 5) Verifying lubrication requirements.
 - 6) Realignment of shaft coupling.
 - 7) Checking motor amperes drawn at full load.
 - 8) Checking motor shaft run-out
 - 9) Performing thermographic scanning of motor starters, motors, pumps, and all mechanical and electrical equipment that requires a connection.
 - 10) Proper cleaning and corrosion control of drip pan and drainage lines.
 - 11) Inspection of internal equipment components for unusual wear or failure.
 - 12) Procedures for maintenance including precautions against improper maintenance.
- b. Include the following information and items that detail essential system and equipment repair procedures:
 - 1) Complete troubleshooting guide.
 - 2) Complete repair instructions including equipment and component removal, disassembly, repair, and replacement; and reassembly instructions.
 - 3) Aligning, adjusting, and checking instructions including noise, vibration,

- and efficiency adjustments.
- 4) Demonstration and training video, if such video, CD-ROM or DVD is provided by the manufacturer.

G. Maintenance Service Schedules

1. Provide recommended frequencies, inspections, service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and maintenance and service with standard time allotment.
 - a. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - b. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

H. Spare Parts List, Recommended Inventory Requirements, and Source Information: Include lists of replacement and repair parts, with parts identified, and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

I. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

J. Schedule of Products and Locations: Provide complete information, including reference drawings if necessary, in the Equipment and Systems manual on all products specified in Divisions 02 through 33.

K. Warranties and Bonds: Include copies of all applicable warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.
2. Clearly indicate commencement and expiration dates.

L. Provide a draft of the proposed Product Maintenance Information Manual. Submit draft at least 90 calendar days before requesting inspection for Substantial Completion to COTR for approval in writing.

2.7 WARRANTY MANUAL

A. Organize warranty documents into an orderly sequence based on the table of contents of the Contract Specifications. Warranty documents include Contractor and Major Subcontractors warranty letters, special warranty documents, and manufacturer's warranties.

B. Binders: Heavy-duty, 3-ring metal hinged loose-leaf binders in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents. Binders shall not be filled beyond 75 percent of their rated capacity. Binders shall also have boomerang plastic sheet lifters, metal backbone, concealed rivet construction, and three-trigger position DublLock mechanism (lock, unlock, open) on top and bottom. Binder color shall be black unless another color is selected by COTR.

C. Identify each binder on front (If identification can not be attached to the front include it as the

first page in the manual) and spine, with printed title "PROJECT WARRANTIES," Contract number and name. The use of business labels is prohibited.

- D. Dividers: Provide three-hole, heavyweight, and tabbed dividers for each separate section. Provide laser printed description front and back of tabs, to indicate the appropriate Specification Section. Provide a typed index of the contents in each section on the first page behind each section divider. Include a matching master table of contents for the manual using the same indexing system. Install a colored sheet between each different warranty within a tabbed section.
- E. Provide additional copies of each warranty to include in operation and maintenance manuals.
- F. Provide a draft of the proposed Warranty Manual. Submit draft at least 90 calendar days before requesting inspection for Substantial Completion to COTR for approval in writing.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Compile all required information, as it is approved, into volumes grouped first by specification Division and then by Section in accordance with the information requirements outlined in Part 2 of this specification section and the approved Operation and Maintenance Manual Format.
- B. For the first Directory Submittal, prepare a separate manual that provides an organized reference to the complete manual set. Subsequent submittals of the Directory shall integrate this information by Division.
- C. Emergency Information: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by the Authority's operating personnel for types of emergencies indicated. Include the emergency information in the volume of the manual set to which it applies.
- D. Product Maintenance Information: For Divisions that specify products (refer to definitions) assemble a complete set of maintenance data indicating manufacturer's product information, part numbers, description, and care and maintenance instructions for each product, material, and finish incorporated into the Work. Provide sufficient information, and when applicable color samples, for all products to enable repair or replacement of matching products or finishes.
- E. Operation and Maintenance Information: For Divisions that specify systems, sub-systems, and equipment (refer to definitions) assemble a complete set of operation and maintenance and repair data providing complete information for each system, subsystem, and piece of equipment. Include complete operation, preventative maintenance, maintenance and repair instructions, and parts listing with sources indicated; recommended parts inventory listing, and similar information. Include all diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional

manual for use by the Authority's operating personnel.

- F. **Manufacturers' Data:** Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet with black arrows to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
1. Provide supplementary text if manufacturers' standard printed data is not provided by the manufacturer. Provide supplementary text where the information is necessary for proper operation and maintenance of equipment or systems.
- G. **Drawings:** Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams and their relation to the structure or facility. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation. Prepare floor plans that show the location of equipment in the building.
1. Do not use original Project Record Documents as part of Operation and Maintenance Manuals.
 2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Project Record Documents."
- H. Comply with Division 01 Section "Project Closeout" for a schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

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SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Special Provisions, Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications
 - 3. Record Product Data.
 - 4. Record Samples.
 - 5. Record Schedule.
 - 6. Miscellaneous Record Submittals.
 - 7. Computer Aided Design and Drafting (CADD) requirements for Record Drawings.
- B. Related Sections include the following:
 - 1. Division 01 Section "Construction Progress Documentation" for construction schedules as basis for Record Schedule.
 - 2. Division 01 Section "Quality Requirements" for ensuring the record drawings and specifications are kept current on a daily basis and marked to show deviations which have been made from the original Contract documents
 - 3. Division 01 Section "Project Closeout " for general closeout procedures
 - 4. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 5. Divisions 02 through 33 Sections for specific requirements for Project Record Documents of products in those Sections.

1.3 SUBMITTALS

- A. CADD Record Drawings. Comply with the following:
 - 1. Submit copies of CADD Record Drawings as follows:
 - a. Initial Submittal: Submit one set of complete, full-sized, CADD Record Drawings. Additional sets of drawings are not to be copied and submitted until after substantial completion to insure all changes are shown on the drawings. The COTR will facilitate review of drawings and indicate whether the CADD Record

Drawings are acceptable. The COTR will return review comments indicating any corrections that need to be made to the drawings. The corrected CADD Record Drawings may then be reproduced, and organized into sets, printed, bound, and submitted as final submittal.

- b. Final Submittal: After construction is complete and changes are recorded, submit six complete, full-sized, printed sets of CADD Record Drawings. Include each sheet, whether or not changes and additional information were recorded. Submit two copies of the CADD Record drawings in the approved electronic format. In addition, submit the original set of marked-up record drawings onto which the mark-ups were made.
- B. Record Specifications: Submit two copies of Project Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one copy of each Product Data submittal at the direction of the COTR.
 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in the manual instead of submittal as Record Product Data.
- D. Record Samples: Submit Record Samples as specified.
- E. Record Schedule: Submit three copies of Record Schedule.
- F. Miscellaneous Record Submittals: Submit miscellaneous Record Submittals as specified.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: During construction, maintain one complete, full sized, set of blue- or black-line prints of the Drawings, applicable shop drawings, and coordination drawings for record purposes. These drawings shall be updated periodically, by the contractor, in CADD to replace the hand mark-ups. The mark-ups shall be preserved for the record. A complete set of Conformed Drawings in CADD will be provided to the Contractor for his use in maintaining the CADD Record Drawings. The CADD files will be provided in Autodesk AutoCAD Civil 3D 2013.
 1. Maintenance of Drawings: Maintain the drawings in a clean, dry, legible condition. Keep drawings available during normal working hours for inspection by the COTR.
 2. Preparation: Routinely mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the mark-ups on the record set.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later especially underground structures.

- b. Record information in an understandable drawing technique. Ensure mark-ups are legible and reproducible.
 - c. Record data as soon as possible after obtaining it. Record and check markups before enclosing concealed installations.
 3. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Notice and RFI.
 - k. Changes made following COTR's written orders.
 - l. Details not on the original Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 4. Mark the Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, insert them into drawing set and assign an appropriate sheet number (one that follows the number sequence of the contract drawings). Show cross-references to the new sheets on the Drawings. Update drawing index as needed to reflect new sheets.
 5. Mark record drawings with red pen that will reproduce clearly. Use different colors to distinguish between changes for different categories of the Work at the same location.
 6. Mark important additional information that was either shown schematically or not indicated on the original Drawings.
 7. Note applicable Construction Change Notices, Requests for Information, Technical Support Requests, and similar identification numbers, where applicable. Copies of change documentation shall be inserted into the set for clarification but are not a substitute for mark-ups. If identification numbers for documentation are marked on the drawing when no change resulted, indicate "No Change".
- B. Newly Prepared Project Record Drawing Sheets: The contractor may add new sheets with supporting sketches and change documentation instead of marking original sheets when neither the original Drawings nor Shop Drawings are suitable to show actual installation or if the new sheets can show the changes more clearly or additional space is required for markup information.
 1. Assign a number to each new sheet and cross-reference on the appropriate related sheets.
 2. Consult with COTR for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction.
 3. Integrate newly prepared sheets into Record Drawing sets and update drawing index to reflect new sheets.

C. Format:

1. Identify and date each Record Drawing. Include the designation "PROJECT RECORD DRAWING" in a prominent location on each sheet.
2. Cover Sheet shall have the designation "PROJECT RECORD DRAWINGS", Date, Name of Contractor, and signature.
3. Record CADD Drawings:
 - a. CADD files provided by COTR and utilized for recording of record mark-ups shall maintain the format of the files provided. Place electronic mark-ups in a newly created layer on each drawing.
 - b. CADD files created by Contractor: Organize CADD information into separate electronic files that correspond to each sheet of the Record Drawing set. Name each file with the sheet identification. Include identification in each CADD file.
4. Include the following identification on newly prepared Project Record Drawing Sheets:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWING."
 - d. Name of Architect/Engineer (if applicable).
 - e. Name of Contractor.
 - f. Initials of person incorporating the change.
 - g. Drawing identification number. (Ixx/Dxx)
5. Organization of Newly Prepared Project Record Drawing Prints: Organize newly prepared Record Drawings into manageable sets. Include any contract required coordination drawings and applicable shop drawings. Bind each set with durable paper cover sheets. Include identification on cover sheets.

D. ADDITIONAL REQUIREMENTS FOR RECORD DRAWINGS

1. When there are multiple copies of the same sheet with different mark-ups on each copy, the General Contractor is responsible for consolidating all mark-ups onto a single copy of each individual sheet.
2. The information from all RFI's, Change Notices, Design Clarifications, field adjustments, or any other changes, must be noted on the appropriate drawing. These mark-ups must include enough information to clearly show the actual constructed conditions resulting from the change. The information may be drawn onto the drawing, copied onto the drawing or copied onto a new full size sheet. Every change in construction must have RFI's, Change Orders or similar supplementary documents; therefore they must be copied in original size and attached to the back of the preceding drawing or at the end of the drawing set, as an appendix, as a full size sheet, same in size as the drawing set. Multiple RFI's, CN's and other supplemental documents may be copied in each single sheet.
3. All changes made on the drawings shall reference the appropriate RFI, Change Notices, Design Clarification, or details from the contractor prepared shop drawings. If the mark-up is due to a field adjustment, it shall be indicated as such.

4. Additional Sheets such as shop drawings and sheets showing copies of applicable change documentation must be inserted into the set as necessary. Such sheets shall have a title block.
5. Notes and sketches printed by hand are acceptable but shall be neat, legible, and reproducible. Hand lettering shall be 3/8" high minimum.
6. All shop drawings showing information not on the construction drawings (with the exception of concrete embedded steel reinforcement bending drawings and steel reaction and fabrication drawings) shall be marked up and included in the record drawing set. They shall be the same size (changes in scale noted) as all other drawings, include a title block, and clearly indicate that they are record shop drawings. When the shop drawings more accurately show locations and conditions, they may be marked in lieu of referenced on the original drawings. This does not relieve the contractor from the shop drawing inclusion requirements in the Operation and Maintenance Manuals that are a separate item
7. Include contract required coordination drawings in the record drawing set.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications. Print marked specifications, addenda, and contract modifications on paper any color but white and ensure that black font is clearly legible on the color chosen. Use the same paper color throughout the project. Use black font for these changes.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the brand name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of the manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 5. Note related Change Orders, Record Drawings, and Product Data where applicable.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, Record Drawings, and Product Data where applicable.
 4. Upon completion of mark-up, submit a complete set of record Product Data to COTR for the Authority's records.

5. Where Record Product Data is required as part of maintenance manuals, submit marked-up product data as an insert in the manual.

2.4 RECORD SAMPLE SUBMITTAL

- A. Prior to date of Substantial Completion, the Contractor shall meet the Authority's personnel at the site to determine which of the samples maintained during the construction period shall be transmitted to the Authority for record purposes. Comply with the COTR's instructions for packaging, identification marking, and delivery to the Authority's sample storage space. Dispose of other samples in manner specified for disposal of surplus and waste materials.

2.5 RECORD SCHEDULE

- A. Record Schedule Submittal: Immediately prior to date of inspection for Final Acceptance, submit a copy of the As-built Contract CPM Schedule (if applicable) to the COTR.
- B. Mark the Contractor's Construction Schedule to show actual start and finish dates for all work activities and milestones, based on the accepted monthly updates. This Record Schedule shall be in same format as Contractor's Construction Schedule. This Record Schedule shall be in tabular and in time-scaled PDM plot formats.

2.6 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference. Submit to COTR.
 1. Categories of requirements resulting in miscellaneous records include, but are not limited to the following:
 - a. Field records on excavations and foundations.
 - b. Field records on underground construction and similar Work.
 - c. Survey showing locations and elevations of underground lines.
 - d. Invert elevations of drainage piping.
 - e. Surveys establishing building lines and levels.
 - f. Authorized measurements utilizing unit prices or allowances.
 - g. Records of plant treatment.
 - h. Ambient and substrate condition tests.
 - i. Certifications received in lieu of labels on bulk products.
 - j. Batch mixing and bulk delivery records.
 - k. Testing and qualification of tradesmen.
 - l. Documented qualification of installation firms.
 - m. Load and performance testing.
 - n. Inspections and certifications by governing authorities.
 - o. Leakage and water-penetration tests.
 - p. Fire resistance and flame spread test results.

- q. Final inspection and correction procedures.
- r. Summary letter from Special Inspector indicating structural work was completed in accordance with applicable standards.
- s. Report of potable water testing.
- t. Backflow prevention certificates.
- u. Final inspections of all trades.
- v. Certificates for piping for fire protection systems and FPS supervisory systems.
- w. Approvals of Health Department or FDA as applicable.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Repair or reproduce torn or dirty sheets. Provide access to Project Record Documents for COTR's reference during normal working hours.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.

END OF SECTION 01 78 39

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SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Requirements:
 - 1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement and slag cement; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete Subcontractor.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, forms and form removal limitations, anchor rod and anchorage device

installation tolerances, steel reinforcement installation, concrete repair procedures, and concrete protection.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, and supports for concrete reinforcement.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the COTR.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, manufacturer and testing agency.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Waterstops.
 - 6. Curing compounds.
 - 7. Bonding agents.
 - 8. Adhesives.
- C. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Aggregates.
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.
- E. Field quality-control reports.
- F. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.10 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301.
 2. ACI 117.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- D. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.

2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed bars, ASTM A 775/A 775M, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.
- C. Epoxy-Coated Wire: ASTM A 884/A 884M, Class A, Type 1 coated, as-drawn, plain-steel wire, with less than 2 percent damaged coating in each 12-inch wire length.
- D. Epoxy-Coated Welded-Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, plain steel.

2.4 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

2.5 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
 1. Portland Cement: ASTM C 150/C 150M, Type I or Type I/II.
 2. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
 3. Blended Hydraulic Cement: ASTM C 595/C 595M, Type IS, portland blast-furnace slag cement.
- C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
 1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

- D. Air-Entraining Admixture: ASTM C 260/C 260M.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- F. Water: ASTM C 94/C 94M and potable.

2.6 WATERSTOPS

- A. Flexible PVC Waterstops: CE CRD-C 572 for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
 - 1. Profile: Ribbed without center bulb.
 - 2. Dimensions: 6 inches by 3/8 inch thick; nontapered.

2.7 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.8 RELATED MATERIALS

- A. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- B. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.9 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Slag Cement: 50 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.10 CONCRETE MIXTURES

- A. Footings, Foundation Walls and Piers: Normal-weight concrete.
 - 1. Minimum Compressive Strength: 4000 psi at 28 days.
 - 2. Maximum W/C Ratio: 0.50.
 - 3. Slump Limit: 4 inches or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
 - 4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
- B. Sand Trap: See item "VDOT-302 Drainage Structures".

2.11 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 - 2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- G. Chamfer exterior corners and edges of permanently exposed concrete.
- H. Form openings, offsets, sinkages, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

- K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing materials are not acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by the COTR.

3.4 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

- F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by the COTR.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate horizontal joints in walls and columns at the top of footings.
 - 4. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

3.6 WATERSTOP INSTALLATION

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by the COTR.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

3.8 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces exposed to public view.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.9 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.10 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Formed Surfaces: Cure formed concrete surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces.

- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.11 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by the COTR. Remove and replace concrete that cannot be repaired and patched to COTR's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by the COTR.
- D. Repairing Unformed Surfaces: Test unformed surfaces for finish and verify surface tolerances specified for each surface. Correct low and high areas.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 5. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to COTR's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to COTR's approval.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.
- B. The following describes the minimum inspection and testing required in the Contractor's Quality Control (CQC) Plan and Program for the work of this section and is for CQC only. The implementation of the Contractor Quality Control Program does not relieve the Contractor from the responsibility to provide the work in accordance with the Contract Documents, applicable codes, regulations and governing authorities. The CQC plan and program shall include, but not be limited to, the following testing and inspection elements. These elements are provided only as a minimum starting point for the Contractor to use to generate his complete CQC Program. The Contractor shall engage an independent testing agency to perform the sampling, testing, and inspection specified herein, meeting requirements specified below.
- C. Special Inspections:
1. Special Inspections are to be performed by the Authority's agent.
 2. Special Inspector shall perform all applicable "Special Inspections" as defined by Section 1704 of IBC 2012.

D. Field Quality Control:

1. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
2. Inspections:
 - a. Steel reinforcement placement.
 - b. Steel reinforcement welding.
 - c. Verification of use of required design mixture.
 - d. Concrete placement, including conveying and depositing.
 - e. Curing procedures and maintenance of curing temperature.
3. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - a. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - b. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - c. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - d. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 - e. Compression Test Specimens: ASTM C 31/C 31M.
 - 1) Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - 2) Cast and field cure two sets of two standard cylinder specimens for each composite sample.
 - f. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - 1) Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - 2) A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 - g. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 - h. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive

- strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- i. Test results shall be reported in writing to COTR, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 - j. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by COTR but will not be used as sole basis for approval or rejection of concrete.
 - k. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by COTR. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by COTR.
 - l. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 - m. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 03 30 00

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SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Structural steel.
- 2. Grout.

- B. Related Sections include the following:

- 1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
- 2. Section 09 96 00 "High-Performance Coatings" for surface-preparation and priming requirements.

1.3 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 COORDINATION

- A. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
- C. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment Drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, fabricator and testing agency.
- B. Welding certificates.
- C. Mill test reports for structural steel, including chemical and physical properties.
- D. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Direct-tension indicators.
 - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 - 4. Shop primers.
 - 5. Nonshrink grout.
- E. Survey of existing conditions.
- F. Source quality-control reports.
- G. Field quality-control and special inspection reports.

1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 360.
3. RCSC's "Specification for Structural Joints Using High Strength Bolts."

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 1. Fasteners may be repackaged provided testing and inspecting agency observes repackaging and seals containers.
 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.
 1. Select and complete connections using schematic details indicated and AISC 360.
 2. Use Allowable Stress Design; data are given at service-load level.

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M.
- B. Channels, Angles: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M or ASTM A 572/A 572M, Grade 50 as indicated.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B, structural tubing.
- E. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.
 1. Weight Class: Standard unless indicated otherwise.

2. Finish: Black except where indicated to be galvanized.

F. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

A. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating.
2. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with mechanically deposited zinc coating finish.

B. Unheaded Anchor Rods: ASTM F 1554, Grade 36.

1. Configuration: Straight.
2. Nuts: ASTM A 563 heavy-hex carbon steel.
3. Plate Washers: ASTM A 36/A 36M carbon steel.
4. Washers: ASTM F 436, Type 1, hardened carbon steel.
5. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

C. Threaded Rods: ASTM A 36/A 36M.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Washers: ASTM F 436, Type 1, hardened carbon steel.
3. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

2.4 PRIMER

A. Galvanizing Repair Paint: ASTM A 780/A 780M.

2.5 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.

3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel according to SSPC-SP 1, "Solvent Cleaning" or "SSPC-SP 2, "Hand Tool Cleaning."

F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.7 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using High Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened or slip critical.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

2. Do not quench or apply post galvanizing treatments that might interfere with High-Performance Coating adhesion.
- B. Preparation for Priming Galvanized Items: After galvanizing, thoroughly clean steel of grease, dirt, oil, flux, and other foreign matter by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings. See Section 09 96 00 "High-Performance Coatings" for surface-preparation and priming requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Baseplates and Leveling Plates: Clean concrete -bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
1. Set plates for structural members on wedges, shims, or setting nuts as required.
 2. Weld plate washers to top of baseplate.
 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection unless approved by the COTR. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM High Strength Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened or slip critical.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.5 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.
- B. The following describes the minimum inspection and testing required in the Contractor's Quality Control (CQC) Plan and Program for the work of this section and is for CQC only. The implementation of the Contractor Quality Control Program does not relieve the Contractor from the responsibility to provide the work in accordance with the Contract Documents, applicable codes, regulations and governing authorities. The CQC plan and program shall include, but not be limited to, the following testing and inspection elements. These elements are provided only as a minimum starting point for the Contractor to use to generate his complete CQC Program. The Contractor shall engage an independent testing agency to perform the sampling, testing, and inspection specified herein, meeting requirements specified below.
- C. Special Inspections:
 - 1. Special Inspections are to be performed by the Authority's agent.
 - 2. Special Inspector shall perform all applicable "Special Inspections" as defined by Section 1704 of IBC 2012.
- D. Field Quality Control:
 - 1. Testing Agency: Engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
 - 2. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM High Strength Bolts."
 - 3. Welded Connections: Field welds will be visually inspected according to AWS D1.1.
 - a. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures:
 - 1) Ultrasonic inspection conforming to ASTM E 164 shall be performed on 100% of the first 25% of moment connections and 25% of remaining moment connections if rejection rate is less than 5%. Test all moment connections if rejection rate is greater than or equal to 5%.
 - 2) Magnetic Particle Inspection conforming to ASTM E 709 shall be performed on 100% of the first 25% of welded connections (not including moment connections) and 25% of remaining welded connections (not including moment connections) if rejection rate is less than 5%. Test all welded connections (not including moment connections) if rejection rate is greater than or equal to 5%.
 - 4. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION 05 12 00

SECTION 05 31 00 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof deck.
- B. Related Sections include the following:
 - 1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings:
 - 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Certificates: For each type of steel deck.
- C. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - 1. Power-actuated mechanical fasteners.
- D. Evaluation Reports: For steel deck, from ICC-ES.
- E. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.2 ROOF DECK

- A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
 - 1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 G90 zinc coating.
 - 2. Deck Profile: Type WR, wide rib.
 - 3. Profile Depth: 1-1/2 inches.
 - 4. Design Uncoated-Steel Thickness: 0.0358 inch.
 - 5. Span Condition: Triple span or more.
 - 6. Side Laps: Overlapped.

2.3 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

- C. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- D. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- E. Galvanizing Repair Paint: ASTM A 780/A 780M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Locate deck bundles to prevent overloading of supporting members.
- C. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- D. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- E. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- F. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- G. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.3 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: 5/8 inch, nominal.
 2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches apart in the field of roof and 6 inches apart in roof corners and perimeter.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 18 inches, and as follows:
1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws or fasten with a minimum of 1-1/2-inch long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
1. End Joints: Lapped 2 inches minimum.
- D. Miscellaneous Roof-Deck Accessories: Install finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

3.4 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.
- B. The following describes the minimum inspection and testing required in the Contractor's Quality Control (CQC) Plan and Program for the work of this section and is for CQC only. The implementation of the Contractor Quality Control Program does not relieve the Contractor from the responsibility to provide the work in accordance with the Contract Documents, applicable codes, regulations and governing authorities. The CQC plan and program shall include, but not be limited to, the following testing and inspection elements. These elements are provided only as a minimum starting point for the Contractor to use to generate his complete CQC Program. The Contractor shall engage an independent testing agency to perform the sampling, testing, and inspection specified herein, meeting requirements specified below.
- C. Special Inspections:
1. Special Inspections are to be performed by the Authority's agent.

2. Special Inspector shall perform all applicable “Special Inspections” as defined by Section 1704 of IBC 2012.

D. Field Quality Control:

1. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
2. Field welds will be subject to inspection.
3. Testing agency will report inspection results promptly and in writing to Contractor and COTR.
4. Remove and replace work that does not comply with specified requirements.
5. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

END OF SECTION 05 31 00

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SECTION 05 51 19 - METAL GRATING STAIRS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes metal grating platform, industrial-type, straight-run stairs with steel-grating treads and railings attached to metal grating platform and stairs.
- B. Related Requirements:
 - 1. Section 05 52 13 "Pipe and Tube Railings" for steel pipe railings.

1.3 COORDINATION

- A. Coordinate installation of anchorages for platform and metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For metal grating stairs and the following:
 - 1. Grout.
- B. Sustainable Design Submittals:
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments.
- D. Delegated-Design Submittal: For platform, stairs and railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design platform, stairs and railings.
- B. Structural Performance of Platform and Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Uniform Load - Platform: 60 lbf/sq. ft
 - 2. Uniform Load - Stairs: 100 lbf/sq. ft..
 - 3. Concentrated Load: 300 lbf applied on an area of 4 sq. in..
 - 4. Uniform and concentrated loads need not be assumed to act concurrently.
 - 5. Platform and Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
 - 6. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.
- C. Seismic Performance of Platform and Stairs: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. Component Importance Factor: 1.5.
- D. Platform, stairs and railings shall be supported directly from the concrete drying bin wall and not from the canopy roof framing.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

- C. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- D. Steel Bars for Grating Treads: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.
- E. Wire Rod for Grating Crossbars: ASTM A 510.

2.3 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts.
- D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
 - 1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.4 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

- A. Provide complete platform, stair and railing assemblies, including metal framing, hangers, clips, brackets, bearing plates, and other components necessary to support and anchor platform, stairs and railing on supporting structure.
 - 1. Join components by welding unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.

- B. Form exposed work with accurate angles and surfaces and straight edges.
- C. Weld connections to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Weld exposed corners and seams continuously unless otherwise indicated.
 - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 4 welds: good quality, uniform undressed weld with minimal splatter.
- D. Fabricate joints that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.6 STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," Industrial Class, unless more stringent requirements are indicated.
- B. Stair Framing:
 - 1. Fabricate stringers of steel channels.
 - a. Provide closures for exposed ends of channel stringers.
 - 2. Construct platforms of steel channel headers and miscellaneous framing members as needed to comply with performance requirements.
 - 3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers.
- C. Metal Bar-Grating Platform and Stairs: Form treads and platforms from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."
 - 1. Fabricate treads and platforms from welded steel grating with openings in gratings no more than 5/16 inch in least dimension.
 - 2. Surface: Plain.
 - 3. Finish: Galvanized.
 - 4. Fabricate grating treads with nosing and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.
 - 5. Fabricate grating platforms with nosing matching that on grating treads. Provide 4-inch tall toeplates at open-sided edges of grating platforms. Weld grating to platform framing.

2.7 STAIR RAILINGS

- A. Comply with applicable requirements in Section 05 52 13 "Pipe and Tube Railings."

1. Rails may be bent at corners, rail returns, and wall returns, instead of using prefabricated fittings.
2. Connect posts to stair framing by direct welding unless otherwise indicated.

2.8 FINISHES

- A. Finish metal stairs after assembly.
- B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- C. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth
- D. Preparation for Priming Galvanized Items: After galvanizing, thoroughly clean steel of grease, dirt, oil, flux, and other foreign matter by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings. See Section 099600 "High-Performance Coatings" for surface-preparation and priming requirements.

2.9 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing platforms and metal stairs to in-place construction. Include threaded fasteners for concrete inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

2.10 ADJUSTING AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

PART 3 - EXECUTION (Not Used)

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section - Quality Requirements for requirements for Contractor Quality Control Program.

END OF SECTION 05 51 19

SECTION 05 52 13 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Steel pipe railings.

- B. Related Requirements:

- 1. Section 05 51 19 "Metal Grating Stairs" for steel pipe railings associated with metal pan stairs.

1.3 COORDINATION

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:

- 1. Grout.

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

- C. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..

- b. Infill load and other loads need not be assumed to act concurrently.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

2.3 STEEL AND IRON

- A. Tubing: ASTM A 500 (cold formed).
- B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish.
- C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.4 FASTENERS

- A. General: Provide the following:
 - 1. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
- D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
 - 1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Form Changes in Direction as Follows:

1. By bending.

- J. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- K. Close exposed ends of railing members.
- L. Provide anchorage devices for connecting railings to concrete work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- M. For railing posts set in concrete, provide stainless-steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.
- N. Toe Boards: Provide 4-inch tall toe boards at railings around openings and at edge of open-sided floors and platforms.

2.7 STEEL AND IRON FINISHES

A. Galvanized Railings:

- 1. Hot-dip galvanize steel railings, including hardware, after fabrication.
- 2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
- 3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
- 4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- 5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

A. Preparation for Priming Galvanized Items: After galvanizing, thoroughly clean steel of grease, dirt, oil, flux, and other foreign matter by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings. See Section 09 96 00 "High-Performance Coatings" for surface-preparation and priming requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet .
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ANCHORING POSTS

- A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions or form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.
- C. Anchor posts to metal surfaces as required by conditions, connect posts to metal supporting members as follows:
 - 1. For steel pipe railings, weld posts to metal supporting surfaces.

3.5 ADJUSTING AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

3.6 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.

END OF SECTION 05 52 13

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SECTION 09 96 00 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Specification Sections, Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes surface preparation and application of high-performance coating systems on the following substrates:
 - 1. Exterior Substrates:
 - a. Galvanized Structural Steel.
 - 2. Wastewater Valves and Piping
 - a. Ferrous metal.
- B. Related Sections include the following:
 - 1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of finish-coat product indicated.
- C. Product List: For each product indicated. Cross-reference products to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.4 QUALITY ASSURANCE

- A. Master Painters Institute (MPI) Standards:
 - 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
 - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and coating systems indicated.

3. Apply benchmark samples after permanent lighting and other environmental services have been activated.
4. Final approval of color selections will be based on benchmark samples.
 - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by COTR at no added cost to The Authority.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F.
- B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 HIGH-PERFORMANCE COATINGS, GENERAL

- A. Material Compatibility:
 1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. Provide products of same manufacturer for each coat in a coating system.
- B. Volatile Organic Compound (VOC) Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
 2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
 3. Anticorrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC content of not more than 250 g/L.
 4. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
 5. Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
 6. Zinc-Rich Industrial Maintenance Primers: VOC content of not more than 340 g/L.

7. Pre-Treatment Wash Primers: VOC content of not more than 420 g/L.

C. Colors: As follows, as acceptable to the COTR:

1. Exterior

- a. Exterior Curtain WALL “Washington White,” PPG #UC 70129 BC
- b. Exposed Structural Steel Match Adjacent Existing Structure, as acceptable to the COTR from manufactures standard range.
- c. Exterior CMU Match Adjacent Existing Structure, as acceptable to the COTR from manufactures standard range.

2. Wastewater valves and piping: “Pure Green”, RAL 6037.

2.2 METAL PRIMERS

A. Rust-Inhibitive Primer (Water Based): MPI #107.

1. Available Products: Subject to compliance with requirements, or as acceptable to The Authority, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Benjamin Moore & Co.; Acrylic Metal Primer, M04.
 - b. ICI Paints; Devoe Fuller, Mirolac-WB, DP85XX or Paints; Devoe Coatings, Devflex TDM Flat Int/Ext W.B. Primer, 4020.
 - c. Kelly-Moore Paints; DTM Acrylic Metal Primer, 5725.
 - d. PPG Architectural Finishes, Inc.; Pitt-Tech, Rust Inhibitive Primer (W.B.), 90-712.
 - e. Sherwin-Williams Company (The); DTM Acrylic Primer/Finish, B66W1.
2. Environmental Characteristics:
 - a. VOC Content:
 - 1) Minimum E Range of E2.

B. Waterborne Galvanized-Metal Primer: MPI #134.

1. Available Products: Subject to compliance with requirements, or as acceptable to The Authority, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, or as acceptable to the Authority, provide product indicated on Drawings or comparable product. Products may be provided by, but are not limited to, one of the following:
 - a. Benjamin Moore & Co.; Acrylic Metal Primer, M04.
 - b. ICI Paints; Devoe Coatings, Devflex WB DTM Primer Finish, 4020.
 - c. Kelly-Moore Paints; Kel-Guard, Galvanized Iron Primer, 1722.
 - d. PPG Architectural Finishes, Inc.; Pitt-Tech, DTM High Performance Primer/Finish, 90-712.

- e. Sherwin-Williams Company (The); Industrial & Marine, DTM Acrylic Primer/Finish, B66W1.
 - 3. Environmental Characteristics:
 - a. VOC Content:
 - 1) Minimum E Range of E2.
 - C. Three-component, Zinc Rich Epoxy Primer
 - 1. Available Products: Subject to compliance with requirements, or as acceptable to The Authority, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. PPG Protective and Marine Coatings, Amercoat 68 HS
- 2.3 WATER-BASED, LIGHT-INDUSTRIAL COATINGS
- A. Semigloss, Water-Based, Light-Industrial Coating: MPI #110-G5.
 - 1. Available Products: Subject to compliance with requirements, or as acceptable to The Authority, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Benjamin Moore & Co.; (Canada), Latex, M28-08.
 - b. ICI Paints; Devoe Coatings, Devflex WB Acrylic SG Enamel, 4206-0100.
 - c. Sherwin-Williams Company (The); Industrial & Marine, Sher-Cryl HPA Semi-Gloss, B66W351.
 - 2. Environmental Characteristics:
 - a. VOC Content:
 - 1) Minimum E Range of E2.
- 2.4 HIGH SOLIDS HIGH BUILD EPOXY COATING SYSTEM
- 1. Available Products: Subject to compliance with requirements, or as acceptable to The Authority, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Intermediate Coat: PPG Protective and Marine Coatings, Amercoat 385
 - b. Top Coat: PPG Protective and Marine Coatings, Amerlock 400.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
 - 1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - a. Concrete: 12 percent.
 - b. Masonry (CMU): 12 percent.
 - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 3. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 4. Coating application indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
 - 1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.
- C. Clean substrates of substances that could impair bond of coatings, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce coating systems indicated.
- D. Steel Substrates: Remove rust and loose mill scale.
 - 1. Clean using methods recommended in writing by coating manufacturer.
 - 2. Blast clean according to SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning or SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."
- E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

- F. Ferrous metal valves and piping:
 - 1. Remove all rust, dust, scale and other foreign substances.
 - 2. Give welded joints special attention, removing all welding flux, slag and weld splatter.
 - 3. Blast clean according to SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."

3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for coating and substrate indicated.
 - 2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by COTR, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.5 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Steel Substrates:

1. Water-Based, Light-Industrial Coating System:
 - a. Prime Coat: Rust-inhibitive primer, (water based), MPI #107 primer.
 - b. Intermediate Coat: Water-based, light-industrial coating, MPI #110, gloss matching topcoat.
 - c. Topcoat: Water-based, light-industrial coating, MPI #110- Match existing gloss.
- B. Galvanized-Metal Substrates:
 1. Water-Based, Light-Industrial Coating System:
 - a. Prime Coat: Waterborne galvanized-metal primer, MPI #134.
 - b. Intermediate Coat: Water-based, light-industrial coating, MPI #110, gloss matching topcoat.
 - c. Topcoat: Water-based, light-industrial coating, MPI #110- Match existing gloss.
- C. Aluminum (Not Anodized or Otherwise Coated) Substrates:
 1. Water-Based, Light-Industrial Coating System:
 - a. Prime Coat: Quick-drying primer for aluminum, MPI #95.
 - b. Intermediate Coat: Water-based, light-industrial coating, MPI #110, gloss matching topcoat.
 - c. Topcoat: Water-based, light-industrial coating, MPI #110- Match existing gloss.
- D. Wastewater valves and piping:
 1. High-solids epoxy Coating System
 - a. Prime Coat: Three-component, Zinc Rich Epoxy Primer, 4.0 dry mills
 - b. Intermediate Coat: High solids high build epoxy coating, 4.0 dry mills
 - c. Top Coat: High solids high build epoxy coating, 8.0 dry mills

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.
- B. The following describes the minimum inspection and testing required in the Contractor's Quality Control Program for the Work of this Section. The implementation of a Contractor Quality Control Program does not relieve the Contractor from the responsibility to provide work in accordance with the Contract Documents, applicable codes, regulations, and governing authorities. The Contractor Quality Control Program shall include, but not be limited to, the elements included herein. These elements are provided only as a minimum starting point for the contractor to use to generate the complete Contractor's Quality Control Program.

C. Inspector Qualifications:

1. Engage an experienced Inspector who has at least 5 years experience in inspections of the type required by this section for this Project. The Inspector shall be certified, licensed, or otherwise have the necessary experience, staff, and training qualified to perform the required inspections. The Inspector shall have not less than five installations similar in material, design, and extent to that indicated for Project which have resulted in installations with a record of successful in-service performance.

D. Inspections:

1. Verify compliance with Specifications.
2. Verify installation procedures and locations comply with the Drawings, submittals and manufacturers recommendations.
3. Submit findings promptly in writing to Contractor and COTR.

E. Preinstallation Conference:

1. Before beginning installation, conduct a preinstallation conference at the Project site with the COTR manufacturer, installer, and other interested parties to review procedures, schedules, and coordination of the installation with other elements of the Work.
2. Comply with requirements of Division 1 Section "Project Management and Coordination."

F. Field Quality Control:

1. The Authority reserves the right to invoke the following test procedure at any time and as often as The Authority deems necessary during the period when paint is being applied.
2. The Authority will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
3. The testing agency will perform appropriate tests for the following characteristics as required by The Authority:
 - a. Quantitative materials analysis.
 - b. Abrasion Resistance.
 - c. Apparent reflectivity.
 - d. Flexibility.
 - e. Washability.
 - f. Absorption.
 - g. Accelerated Weathering.
 - h. Dry Opacity.
 - i. Accelerated yellowing.
 - j. Recoating.
 - k. Skinning.
 - l. Color retention.
 - m. Alkali and mildew resistance.

4. If Test results show material being used does not comply with specified requirements, the Contractor may be directed to stop painting, remove non-complying paint, pay for testing, repaint surfaces coated with rejected paint, and remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are incompatible

G. Correction of Defective Work:

1. No claims for additional cost or extension of the schedule will be warranted or awarded for the time and effort necessary to correct defective or faulty work.

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SECTION 22 13 29 – SAND TRAP/OWS WITH INTEGRAL PUMP STATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 03 30 00 “Cast-In-Place Concrete.”
 - 2. VDOT Section 303 “Earthwork.”
 - 3. Section 31 23 19 “Dewatering.”
 - 4. Section 31 50 00 “Excavation Support and Protection.”
 - 5. Section 33 05 00 “Common Work Results for Utilities.”
 - 6. Pump station electrical work shall be in accordance with Division 26 – Electrical.

1.2 SUMMARY

- A. The work to be performed under this Section includes, but is not limited to, the furnishing of all materials, labor, tools, and equipment required for the construction of one (1) new underground duplex wastewater pumping station to be located inside new concrete sand trap/OWS structure as shown on the Drawings; including all necessary excavation and backfilling, sheeting and shoring; dewatering; the furnishing and installation of all electrical and mechanical equipment including duplex submersible cutter pumps and controls, pipes, fittings, valves, electrical conduits, control panel and alarms, concrete sand trap/OWS structure; testing; and all incidentals necessary to complete the work as indicated on the Plans and/or specified herein.

1.3 FINAL CERTIFICATION

- A. Upon completion of the project and before final acceptance, the contractor shall deliver to the COTR a statement signed by the principal officers of the contracting firm stating that the sand trap/OWS with integral wastewater pumping station and related piping installation is satisfactory and in complete accordance with contract plans, specifications, and the manufacturer’s prescribe procedures and has been found to be tight and in accordance with all State, County and MWA (the Authority) codes covering such installations.

1.4 ACTION SUBMITTALS

- A. Product Data: General: Submit product data including materials, pressure rating, capacity, and selected models for the following:

1. Duplex wastewater cutter pump product data including certified performance curves, furnished specialties, and accessories. Include pump startup instructions.
 2. Pump Accessories: Pump, float controls, wiring diagrams for power, signal and control, alarm, and all accessories.
 3. Swing type check valves.
 4. Eccentric plug valves with lever operator.
 5. Mechanical link seals.
 6. Pipe, fittings, and supports.
 7. Prime and finished paint products to be used on piping, valves, and accessories.
 8. Miscellaneous mechanical/structural accessory items specified or shown on the plans.
 9. Pump control panel galvanized steel frame support.
- B. Shop Drawings: Show fabrication and installation details for the duplex wastewater pumping station, including access doors. Detail equipment assemblies and indicated dimensions; shipping, installed, and operating weights; loads; required clearances; method of field assembly; components; electrical characteristics; and location and size of each field connection.
- C. Reinforcing steel for concrete sand trap/OWS structure including H20 rated aluminum access covers; concrete design mix.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control test reports.
- B. Warranty: Special warranty specified in this Section.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For pumps and controls, to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Storage: Inspect materials delivered to site for damage. Unload and store with minimum handling. Store materials on site in enclosures or under protective covering. Store plastic piping and joining materials, and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside pipes and fittings free of dirt and debris.
- B. Protect pumps and controls, pipe, fittings, valves and seals or gaskets from dirt and damage.

- C. Handle pumps, motors, valves, and mechanical equipment according to the manufacturer's rigging instructions.
- D. Ensure that mechanical and electrical equipment and valves are dry and internally protected against rust and corrosion.
- E. Protect bearings and couplings against damage from sand, grit, or other foreign matter.
- F. Equipment and materials shall be stored in a secure, temporarily fenced-in area designated by the COTR. Store packaged pumping stations, valves, and mechanical/electrical equipment in a clean, dry location.
- G. From the commencement of the work until its completion and acceptance by the Owner, the Contractor shall be solely responsible for the storage and care of all equipment and materials. All injury or damage thereto, for whatever cause, shall be repaired by him as his own expense, before the final estimate is made. He shall provide suitable means of protection for all materials intended to be used in the work progress, as well as for complete work.

1.9 PROJECT CONDITIONS

- A. Site Information: Perform site survey and verify existing utility locations.
- B. Existing Utilities: Do not interrupt existing utilities serving on-site facilities occupied by the Authority. Do not proceed with start-up of new duplex wastewater pumping station or connection to existing sanitary system without receiving the COTR's written permission.

1.10 COORDINATION

- A. All work shall be so arranged that there will not be any delay in the proper installation and completion of any part(s) of the new concrete sand trap/OWS and integral wastewater pumping station with controls.
- B. The Contractor shall coordinate the delivery and receipt of equipment at the project site so that erection is made in proper sequence and with a minimum loss of time.
- C. All equipment shall be installed in accordance with the manufacturer's recommendations. Positioning of equipment shall be performed in a manner to prevent marring, scratching, gouging, or any other damage or deformation to the equipment. The equipment shall be installed plum, level, and true to line for proper orientation, and securely anchored.

1.11 SEQUENCE AND SCHEDULING

- A. Coordinate and schedule start-up of new duplex wastewater pumping station and connection to existing IWTO system with the Authority's maintenance and the COTR.
- B. Coordinate with pipe, materials, sizes, entry locations, and pressure requirements of the wastewater force main and gravity drain.

- C. Work shall be carefully coordinated with work under other items of the Specifications so that all work will be complementary and not required excessive cutting and patching. It is the responsibility of the Contractor for this section to see that necessary information, materials, etc. are turned over to the Contractor(s) for other work in time to be incorporated into their work.
- D. Maintenance of traffic shall be provided at all times.

1.12 WARRANTY

- A. Special Warranty: Manufacturer's standard for in which manufacturer agrees to repair or replace components of packaged sewage pumping station that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of duplex wastewater, controls, or accessories.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - 2. Warranty Period for Reinforced Concrete Sand Trap/OWS: One year from date of Substantial Completion.
 - 3. Warranty Period for Cutter Pumps and Controls: One year from date of Substantial Completion.
 - 4. Warranty Period for Accessories: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The Contractor shall furnish and install an explosion-proof cutter pump system equal to and as distributed by AMES, Inc., 8918 Herman Drive, Columbia, Maryland 21045, 301-621-8899 Ext. 104, Contact: Carole Pappas. This system shall include two (2) submersible cutter pumps with quick removal fittings, stainless steel guide rails, discharge elbows and bottom glide rail supports, pump access covers and top guide rail supports, AMES/MESSCO Deadfront NEMA 3R steel pump control panel for remote pedestal mounting, or approved equal. All pumping equipment, piping, and valves shall be assembled inside concrete sand trap wet well and adjacent valve vault.

2.2 CONCRETE SAND TRAP/OWS WITH INTEGRAL PUMP STATION WET WELL AND VALVE VAULT

- A. The reinforced concrete sand trap/OWS shall be constructed as detailed on the Drawings and shall include aluminum access covers rated for H2O loading (cast in top slab), manhole steps, and cast-iron wall pipe as detailed.

2.3 SUBMERSIBLE CUTTER PUMPS

- A. Tsurumi submersible cutter pumps Model #TOS80C21.5, or approved equal, rated for 100 gpm at 24 TDH with 3" discharge. Construction of major parts of the pumping units including pump casing, impeller, and discharge elbow shall be manufactured from gray cast iron, ASTM A48 CLASS 35. Units shall have a field adjustable and or replaceable, high chrome cast iron cutter plate. Internal and external surfaces coming into contact with the pumpage shall be protected by a fused polymer coating. All exposed fasteners shall be stainless steel. All units shall be furnished with a discharge elbow with 150 lb. flat face flange and NPT companion flange. The pump casing shall incorporate an air relieve valve. Grinder pumps shall *not* be considered as equal.
- B. Motors: The pump motors shall be explosion proof, 2 HP, 60Hz, 480 V, 3-phase, 3400 RPM, and shall be NEMA 6 Submersible, Design Type B equivalent. Motors shall be rated at full load amps. Motors shall have a 1.15 service factor and shall be rated for 20 starts per hour. Motors shall be air filled, copper wound, and Class F insulated with built-in thermal protection for each winding. Oil filled motor shells shall *not* be considered equal. Motor shaft shall be 420 or 403 stainless steel and shall be supported by two permanently lubricated, high temperature ball bearings. With a B-10 life rating at best efficiency point of 60,000 hours. The bottom bearing shall be two row, double shielded, C3, deep groove type ball bearings. The top bearing on all units shall be single row, double shielded, C3, deep groove type ball bearings. Motor housing and bearing housing shall be gray cast iron, ASTM A 48 Class 30. Motors shall be D.O.L. or Star-delta start and shall be suitable for across the line start or variable speed applications, utilizing a property sized variable frequency drive. Each motor shall be furnished with 32 feet of neoprene jacketed power cable.
- C. Mechanical Seal: A double mechanical seal system shall be furnished. All units shall be furnished with a dual inside mechanical shaft seal located completely out of the pumpage, running in a separate chamber filled with clean dielectric oil and further protected by an exclusionary oil seal located between the bottom seal faces and the fluid being pumped. The device shall not consume any additional electrical power. Mechanical seals shall be rated to preclude the incursion of water up to 42.6 psi. (98.4 ft.). Units shall have silicon carbide mechanical seal faces. Mechanical seal hardware shall be stainless steel. Units designed to exceed 42.6 psi at shutoff head shall incorporate seal pressure relief ports. Carbon ceramic, Tungsten carbide, or systems that allow the lower seal mechanism to come in contact with the pumped media shall *not* be considered equal. Mechanical seal chamber shall include the Tsurumi "Oil Lifter" lubrication system.
- D. Cutting Device: Cutting device shall be able to pump liquid containing rags, hair, sanitary napkins, diapers, and scraps by disintegrating to solid materials during suction.
- E. Impeller and Section Cover: Impellers shall be of the single or two-vane, semi-open, solids handling design equipped with Tungsten carbide vane tip and shall be slip fit to the shaft and key driven. The impeller shall have a sintered Tungsten carbide alloy edge that is brazed on the impeller vanes, and the suction cover shall be serrated for instant shredding of solids for quick sewage discharge; no clogging in the pump, discharge pipes, and valves. The serrated suction

plate shall be 12 I/O chrome/ductile iron for cutting hardness. The cutter pumps shall pass a minimum of 2" solids.

- F. Quick Removal System: These units are to be furnished with a stainless steel sliding guide rail so that the motor and pump end can be raised and lowered in the pit without un-bolting or disturbing the discharge piping. The pump elbows shall be heavy duty four bolt pattern by the pump manufacturer.
- G. Casing/Volute: Casing and volute shall be heavy, close-grain cast iron with symmetrical waterway to provide unobstructed flow.
- H. Spare Parts: Contractor shall provide one (1) spare submersible cutter pump.

2.4 CONTROL PANEL

- A. Control shall be from a duplex NEMA 4X stainless steel control panel. Panel shall be a Deadfront NEMA 3R steel enclosure. Panel shall be pedestal-mounted adjacent to pump station on galvanized steel support frame. The following items shall be standard:
 - 1. (2) Fused disconnect switches with lockout handles thru cover for main sewage pumps.
 - 2. (2) Magnetic starters with overload and low voltage protection (Two for main pumps and one for agitator pump).
 - 3. (2) Hand-Off-Automatic selector switches.
 - 4. (1) "Easy" Electric alternator and PLC.
 - 5. (2) Control circuit transformers, 120 V.
 - 6. (2) Pump running lights.
 - 7. (2) Overload reset buttons.
 - 8. (1) Wired and numbered terminal strip.
 - 9. (1) High water alarm with light, alarm buzzer, and silencing switch with dry contacts for remote monitoring. Connect control panel to the Authority's Siemens Control System (ECMS) located at the Utility Building.
 - 10. (4) Mercury float switches with 20' cord (for backup).
 - 11. (1) Duplex receptacle.

2.5 SOURCE QUALITY CONTROL

- A. Test and inspect cutter pumps according to HI 1.6, "Centrifugal Pump Tests." Include test recordings that substantiate correct performance of pumps at design head, capacity, suction lift, speed, and horsepower.
- B. Test accessories and controls through complete cycle. Include test recordings that substantiate correct performance.

PART 3 - EXECUTION

3.1 GENERAL

- A. It is the Contractor's responsibility to inspect the site and to perform any test pit investigation as might be required to verify location and depth of existing utilities and/or subsurface structures within the areas of proposed work. Test pit excavation cost shall be incidental to the lump sum pay item.
- B. The Contractor shall furnish all materials, perform all excavation and backfill, construct all necessary joints and connections, construct all appurtenances, dispose of all surplus excavation and discard materials as may be necessary to complete the sand trap/OWS with integral cutter pump station. All materials and equipment shall be installed complete in a first class manner and in accordance with modern methods and practice. Any material or equipment installed which does not present an orderly and reasonable neat appearance shall be removed and replaced when directed by the COTR. The removal and replacement of this work shall be done at the Contractor's expense.
- C. Removal of Water: The Contractor shall at all times during construction provide proper and satisfactory means and devices for the removal of all water entering the excavated area, and he shall remove all such water as fast as it may collect to avoid interference with the prosecution of the work of the proper placing of pipe, concrete, or other materials. See Specification Section 31 23 19 "Dewatering."
- D. Delivery, Handling and Storage of Materials: Inspect materials delivered to site for damage. Unload materials with minimum handling and store on site in enclosures or under protective covering. Do not store materials directly on the ground. Keep inside of pumps, pipes, valves, and fittings free of dirt and debris. Handle pipes, fittings, valves, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. Take special care to avoid injury to coatings, and linings on pipe and fittings; make satisfactory repairs if coatings or linings are damaged. Carry pipe to the trench; do not drag it.
- E. Excavation:
 - 1. The Contractor shall excavate, protect, and backfill all excavation that may be necessary for completing the work under the Contract in conformance with VDOT Section 303 "Earthwork" and Section 31 50 00 "Excavation, Support, and Protection." Sheet piling, shoring, and hand excavation shall be done as may be necessary for the protection of the work and for the safety of personnel in accordance with local, State, and Federal regulations including OSHA.
 - 2. All sheet piling in excavations shall be withdrawn as the backfilling is being done. The Contractor shall cut off any sheet piling left in place at least 18 inches below finished grade and shall remove the material cut off without compensation therefore.
 - 3. All excavations must be kept free of water below the subgrade of the work while work is in progress. This may be accomplished by ordinary pumping methods, the use of underdrains or by wellpoints. Use whichever will produce the required results.

3.2 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Pumps and controls will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.4 ADJUSTING

- A. Adjust pumps to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust control set points.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain controls and pumps.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.

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SECTION 26 05 19 - LOW-VOLTAGE POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Specification Sections, Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Specification Section Includes:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Alpha Wire Company.

2. Belden Inc.
3. Cerro Wire LLC.
4. Cooper Industries, Inc.
5. Encore Wire Corporation.
6. General Cable Technologies Corporation.
7. General Cable; General Cable Corporation.
8. Senator Wire & Cable Company.
9. Service Wire Co.
10. Southwire Company.
11. Thomas & Betts Corporation, A Member of the ABB Group.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN/ THWN-2 and Type SO.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. 3M.
2. AFC Cable Systems; a part of Atkore International.
3. Gardner Bender.
4. Hubbell Power Systems, Inc.
5. Ideal Industries, Inc.
6. ILSCO.
7. NSi Industries LLC.
8. O-Z/Gedney; a brand of Emerson Industrial Automation.
9. Tyco Electronics Corp.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN/THWN-2, single conductors in raceway.
- B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Specification Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Specification Section 26 05 29 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Specification Section 26 05 53 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
 - a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
 - b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

- c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

- C. Test and Inspection Reports: Prepare a written report to record the following:
 - 1. Procedures used.
 - 2. Results that comply with requirements.
 - 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

- D. Cables will be considered defective if they do not pass tests and inspections.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section - Quality Requirements for requirements for Contractor Quality Control Program.

END OF SECTION 26 05 19

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SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Specification Sections, Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.
- B. Section includes grounding and bonding systems and equipment, plus the following special applications:
 - 1. Underground distribution grounding.
 - 2. Ground bonding common with lightning protection system.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Burndy; Part of Hubbell Electrical Systems.
 2. Dossert; AFL Telecommunications LLC.
 3. ERICO International Corporation.
 4. Fushi Copperweld Inc.
 5. Galvan Industries, Inc.; Electrical Products Division, LLC.
 6. Harger Lightning & Grounding.
 7. ILSCO.
 8. O-Z/Gedney; a brand of Emerson Industrial Automation.
 9. Robbins Lightning, Inc.
 10. Siemens Power Transmission & Distribution, Inc.
 11. Thomas & Betts Corporation, A Member of the ABB Group.

2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
1. Solid Conductors: ASTM B 3.
 2. Stranded Conductors: ASTM B 8.
 3. Tinned Conductors: ASTM B 33.
 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 3/0 AWG minimum.
 - 1. Bury at least 30 inches below grade.
 - 2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.
- C. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.

3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.

- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.

3.4 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- E. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column extending around the perimeter of building.
 - 1. Install tinned-copper conductor not less than No. 3/0 AWG for ground ring and for taps to building steel.
 - 2. Bury ground ring not less than 24 inches from building's foundation.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
 - 4. Prepare dimensioned Drawings locating each ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- E. Grounding system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.
- G. Report measured ground resistances that exceed the following values:
 - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 5 ohms.
- H. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section - Quality Requirements for requirements for Contractor Quality Control Program.

END OF SECTION 26 05 26

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Specification Sections, Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Specification Section Includes:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Hangers.
 - b. Steel slotted support systems.
 - c. Nonmetallic support systems.
 - d. Trapeze hangers.
 - e. Clamps.
 - f. Turnbuckles.
 - g. Sockets.
 - h. Eye nuts.
 - i. Saddles.
 - j. Brackets.
 - 2. Include rated capacities and furnished specialties and accessories.
- B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.
 - 1. Trapeze hangers. Include product data for components.
 - 2. Steel slotted-channel systems.
 - 3. Equipment supports.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4 factory-fabricated components for field assembly.
1. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit; a part of Atkore International.
 - b. B-line, an Eaton business.
 - c. ERICO International Corporation.
 - d. Flex-Strut Inc.
 - e. GS Metals Corp.
 - f. G-Strut.
 - g. Haydon Corporation.
 - h. Metal Ties Innovation.
 - i. Thomas & Betts Corporation, A Member of the ABB Group.
 2. Material: Galvanized steel.
 3. Channel Width: 1-5/8 inches.
 4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 6. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
 7. Channel Dimensions: Selected for applicable load criteria.
- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems unless requirements in this Specification Section are stricter.
- B. Comply with requirements for raceways and boxes specified in Specification Section 26 05 33 "Raceways and Boxes for Electrical Systems."
- C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.
- E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMTs, and RMCs may be supported by openings through structure members, according to NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
1. To New Concrete: Bolt to concrete inserts.
 2. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 3. To Existing Concrete: Expansion anchor fasteners.
 4. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts or Spring-tension clamps.
 6. To Light Steel: Sheet metal screws.
 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Specification Section 03 30 00 "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base as follows:
1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.4 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section - Quality Requirements for requirements for Contractor Quality Control Program.

END OF SECTION 26 05 29

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SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Specification Sections, Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Boxes, enclosures, and cabinets.
5. Handholes and boxes for exterior underground cabling.

- B. Related Requirements:

1. Specification Section 26 05 43 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, handholes, and underground utility construction.

1.3 DEFINITIONS

- A. GRC: Galvanized rigid steel conduit.
- B. EMT: Electrical metallic tubing.
- C. FMC: Flexible metal conduit.
- D. LFMC: Liquidtight flexible metal conduit.
- E. RNC: Rigid nonmetallic conduit.

1.4 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 - 1. Utility and structural members in paths of conduit groups with common supports.
- B. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AFC Cable Systems; a part of Atkore International.
 - 2. Allied Tube & Conduit; a part of Atkore International.
 - 3. Anamet Electrical, Inc.
 - 4. Electri-Flex Company.
 - 5. FSR Inc.
 - 6. O-Z/Gedney; a brand of Emerson Industrial Automation.
 - 7. Patriot Aluminum Products, LLC.
 - 8. Picoma Industries, Inc.
 - 9. Republic Conduit.
 - 10. Robroy Industries.
 - 11. Southwire Company.
 - 12. Thomas & Betts Corporation, A Member of the ABB Group.
 - 13. Western Tube and Conduit Corporation.
 - 14. Wheatland Tube Company.
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
 - 1. Comply with NEMA RN 1.
 - 2. Coating Thickness: 0.040 inch, minimum.
- E. EMT: Comply with ANSI C80.3 and UL 797.
- F. FMC: Comply with UL 1; zinc-coated steel.
- G. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 2. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: Compression.
 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
 4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.
- I. Joint Compound for GRC or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AFC Cable Systems; a part of Atkore International.
 2. Anamet Electrical, Inc.
 3. Arnco Corporation.
 4. CANTEX INC.
 5. CertainTeed Corporation.
 6. Condux International, Inc.
 7. Electri-Flex Company.
 8. Kraloy.
 9. Lamson & Sessions.
 10. Niedax Inc.
 11. RACO; Hubbell.
 12. Thomas & Betts Corporation, A Member of the ABB Group.
- B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. LFNC: Comply with UL 1660.
- E. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- F. Fittings for LFNC: Comply with UL 514B.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. B-line, an Eaton business.
 - 2. Hoffman; a brand of Pentair Equipment Protection.
 - 3. MonoSystems, Inc.
 - 4. Square D.
- B. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Screw-cover type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Adalet.
 - 2. Crouse-Hinds, an Eaton business.
 - 3. EGS/Appleton Electric.
 - 4. Erickson Electrical Equipment Company.
 - 5. FSR Inc.
 - 6. Hoffman; a brand of Pentair Equipment Protection.
 - 7. Hubbell Incorporated.
 - 8. Kraloy.
 - 9. Milbank Manufacturing Co.
 - 10. MonoSystems, Inc.
 - 11. Oldcastle Enclosure Solutions.
 - 12. O-Z/Gedney; a brand of Emerson Industrial Automation.
 - 13. RACO; Hubbell.
 - 14. Robroy Industries.
 - 15. Spring City Electrical Manufacturing Company.
 - 16. Stahlin Non-Metallic Enclosures.
 - 17. Thomas & Betts Corporation, A Member of the ABB Group.
 - 18. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
- F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- G. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- H. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- I. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed Conduit: GRC.
 - 2. Concealed Conduit, Aboveground: GRC.
 - 3. Underground Conduit: RNC, Type EPC-40-PVC, concrete encased.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R and NEMA Type 4X stainless steel as noted on plans.
- B. Minimum Raceway Size: 3/4-inch trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 - 3. EMT: Use compression fittings. Comply with NEMA FB 2.10.
 - 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter.
- B. Complete raceway installation before starting conductor installation.
- C. Comply with requirements in Specification Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.
- D. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- E. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- F. Support conduit within 12 inches of enclosures to which attached.
- G. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- H. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- J. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- K. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- L. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- M. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- N. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- O. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

- P. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service raceway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.

- Q. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations subject to severe physical damage.
 - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

- R. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

- S. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
 - 1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in VDOT Specification Section 303 "Earthwork" for pipe less than 6 inches in nominal diameter.
 - 2. Install backfill as specified in VDOT Specification Section 303 "Earthwork."
 - 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in VDOT Specification Section 303 "Earthwork."
 - 4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
 - 5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of

60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

6. Underground Warning Tape: Comply with requirements in Specification Section 26 05 53 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- D. Install handholes with bottom below frost line, 30 inches below grade.

3.5 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section - Quality Requirements for requirements for Contractor Quality Control Program.

END OF SECTION 26 05 33

SECTION 26 05 43 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Specification Sections, Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Specification Section Includes:
 - 1. Direct-buried conduit, ducts, and duct accessories.
 - 2. Concrete-encased conduit, ducts, and duct accessories.
 - 3. Handholes and boxes.

1.3 DEFINITIONS

- A. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include duct-bank materials, including separators and miscellaneous components.
 - 2. Include ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
 - 3. Include accessories for handholes, boxes, and other utility structures.
 - 4. Include warning tape.
- B. Shop Drawings:
 - 1. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:
 - a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
 - b. Include duct entry provisions, including locations and duct sizes.
 - c. Include cover design.
 - d. Include grounding details.
 - e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.5 INFORMATIONAL SUBMITTALS

- A. Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.
 - 1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
 - 2. Drawings shall be signed and sealed by a qualified professional engineer.
- B. Qualification Data: For testing agency responsible for testing nonconcrete handholes and boxes.
- C. Source quality-control reports.
- D. Field quality-control reports.

1.6 MAINTENANCE MATERIALS SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- B. Furnish cable-support stanchions, arms, insulators, and associated fasteners in quantities equal to 5 percent of quantity of each item installed.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.
- B. Store underground utility structures at Project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.
- C. Lift and support precast concrete units only at designated lifting or supporting points.

1.9 COORDINATION

- A. Coordinate layout and installation of ducts, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field.
- B. Coordinate elevations of ducts and duct-bank entrances into handholes, and boxes with final locations and profiles of ducts and duct banks as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations from those indicated as required to suit field conditions and to ensure that duct runs drain to handholes.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR DUCTS AND RACEWAYS

- A. Comply with ANSI C2.

2.2 CONDUIT

- A. RNC: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.3 NONMETALLIC DUCTS AND DUCT ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ARNCO Corp.
2. Beck Manufacturing.
3. CANTEX INC.
4. CertainTeed Corporation.
5. Condux International, Inc.
6. ElecSys, Inc.
7. Electri-Flex Company.
8. IPEX USA LLC.
9. Lamson & Sessions.
10. Manhattan/CDT.
11. Spiraduct/AFC Cable Systems, Inc.

- B. Solvents and Adhesives: As recommended by conduit manufacturer.

- C. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and size of ducts with which used, and selected to provide minimum duct spacing indicated while supporting ducts during concreting or backfilling.
2. Warning Tape: Underground-line warning tape specified in Specification Section 26 05 53 "Identification for Electrical Systems."

2.4 HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

- A. General Requirements for Handholes and Boxes: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.

1. Color: Gray.
2. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.

3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
 4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 5. Cover Legend: Molded lettering, "ELECTRIC," "TELEPHONE," and "OPTICAL FIBER" as applicable.
 6. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
 7. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
 8. Handholes 12 inches wide by 24 inches long and larger shall have factory-installed inserts for cable racks and pulling-in irons.
- B. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.
1. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armorcast Products Company.
 - b. Carson Industries LLC.
 - c. NewBasis.
 - d. Quazite: Hubbell Power Systems, Inc.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate layout and installation of ducts, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.
- B. Coordinate elevations of ducts and duct-bank entrances into handholes, and boxes with final locations and profiles of ducts and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.

3.2 UNDERGROUND DUCT APPLICATION

- A. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank in paved areas unless otherwise indicated.
- B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.

- C. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.
- D. Underground Ducts for Telephone, Communications, or Data Utility Service Cables: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank in paved areas, unless otherwise indicated.
- E. Underground Ducts for Telephone, Communications, or Data Utility Service Cables: RNC, NEMA Type EPC-40-PVC, installed in direct-buried duct bank in non-paved areas, unless otherwise indicated.

3.3 UNDERGROUND ENCLOSURE APPLICATION

- A. Handholes and Boxes for 600 V and Less, Including Telephone, Communications and Data Wiring.

3.4 EARTHWORK

- A. Excavation and Backfill: Comply with VDOT Specification Section 303 "Earthwork," but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated.
- C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.
- D. Cut and patch existing pavement in the path of underground ducts and utility structures according to Specification Section 01 73 29 "Cutting and Patching."

3.5 DUCT INSTALLATION

- A. Slope: Pitch ducts a minimum slope of 1:300 down toward handholes and away from buildings and equipment. Slope ducts from a high point in runs between two handholes, to drain in both directions.
- B. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches, both horizontally and vertically, at other locations unless otherwise indicated.
- C. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.
- D. Duct Entrances to Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 5-inch ducts, and vary proportionately for other duct sizes.

1. Begin change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line.
 2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to handhole. Install an expansion fitting near the center of all straight line direct-buried duct banks with calculated expansion of more than 3/4 inch.
 3. Grout end bells into structure walls from both sides to provide watertight entrances.
- E. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet outside the building wall, without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as specified in Specification Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
- F. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.
- G. Pulling Cord: Install 100-lbf-test nylon cord in empty ducts.
- H. Concrete-Encased Ducts: Support ducts on duct separators.
1. Excavate trench bottom to provide firm and uniform support for duct bank. Prepare trench bottoms as specified in VDOT Specification Section 303 "Earthwork" for pipes less than 6 inches in nominal diameter.
 2. Width: Excavate trench 12 inches wider than duct bank on each side.
 3. Depth: Install top of duct bank at least 30 inches below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.
 4. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
 5. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than four spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
 6. Minimum Space between Ducts: 3 inches between ducts and exterior envelope wall, 2 inches between ducts for like services, and 4 inches between power and signal ducts.
 7. Elbows: Use manufactured duct elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run unless otherwise indicated. Extend concrete encasement throughout length of elbow.
 8. Elbows: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
 - b. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.

9. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
10. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
11. Concrete Cover: Install a minimum of 3 inches of concrete cover at top and bottom, and a minimum of 2 inches on each side of duct bank.
12. Concreting Sequence: Pour each run of envelope between handholes or other terminations in one continuous operation.
 - a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.
 - b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing-rod dowels extending a minimum of 18 inches into concrete on both sides of joint near corners of envelope.
13. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Specification Section 03 30 00 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.

I. Direct-Buried Duct Banks:

1. Excavate trench bottom to provide firm and uniform support for duct bank. Comply with requirements in VDOT Specification Section 303 "Earthwork" for preparation of trench bottoms for pipes less than 6 inches in nominal diameter.
2. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
3. Space separators close enough to prevent sagging and deforming of ducts, with not less than four spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.
4. Depth: Install top of duct bank at least 36 inches below finished grade unless otherwise indicated.
5. Set elevation of bottom of duct bank below frost line.
6. Install ducts with a minimum of 3 inches between ducts for like services and 6 inches between power and signal ducts.
7. Elbows: Install manufactured duct elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
8. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.

- b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
9. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in VDOT Specification Section 303 "Earthwork" for installation of backfill materials.
- a. Place minimum 3 inches of sand as a bed for duct bank. Place sand to a minimum of 6 inches above top level of duct bank.
 - b. Place minimum 6 inches of engineered fill above concrete encasement of duct bank.
- J. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

3.6 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by manufacturer.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch above finished grade.
- D. Install handholes and boxes with bottom below frost line, 30 inches below grade.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.
- F. Field cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.7 GROUNDING

- A. Ground underground ducts and utility structures according to Specification Section 26 05 26 "Grounding and Bonding for Electrical Systems."

3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
 - 1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
 - 2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 6-inch-long mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
 - 3. Test handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Specification Section 26 05 26 "Grounding and Bonding for Electrical Systems."
- B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.9 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section - Quality Requirements for requirements for Contractor Quality Control Program.

END OF SECTION 26 05 43

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SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Specification Sections, Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Specification Section Includes:
 - 1. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Underground-line warning tape.
 - 5. Warning labels and signs.
 - 6. Instruction signs.
 - 7. Equipment identification labels, including arc-flash warning labels.
 - 8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.
- B. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.

- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

- A. Raceways and Cables Carrying Circuits at 600 V or Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.

2.3 LABELS

- A. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
 - 1. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Brady Corporation.
 - b. Champion America.
 - c. emedco.
 - d. Grafoplast Wire Markers.
 - e. LEM Products Inc.
 - f. Marking Services, Inc.
 - g. Panduit Corp.
 - h. Seton Identification Products.
- B. Snap-Around Labels for Raceways and Cables Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters of raceways they identify, and that stay in place by gripping action.
 - 1. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Brady Corporation.
 - b. Marking Services, Inc.
 - c. Panduit Corp.
 - d. Seton Identification Products.

- C. Self-Adhesive Labels:

1. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. A'n D Cable Products.
 - b. Brady Corporation.
 - c. Brother International Corporation.
 - d. emedco.
 - e. Grafoplast Wire Markers.
 - f. Ideal Industries, Inc.
 - g. LEM Products Inc.
 - h. Marking Services, Inc.
 - i. Panduit Corp.
 - j. Seton Identification Products.
2. Preprinted, 3-mil-thick, polyester vinyl flexible label with acrylic pressure-sensitive adhesive.
 - a. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized to fit the raceway diameter, such that the clear shield overlaps the entire printed legend.
3. Polyester or Vinyl, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
 - a. Nominal Size: 3.5-by-5-inch.
4. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
5. Marker for Tags: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

2.4 BANDS AND TUBES:

- A. Snap-Around, Color-Coding Bands for Raceways and Cables: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters of raceways or cables they identify, and that stay in place by gripping action.
 1. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Brady Corporation.
 - b. Marking Services, Inc.
 - c. Panduit Corp.
- B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameters of and shrunk to fit firmly around cables they identify. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.

1. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Brady Corporation.
 - b. Panduit Corp.

2.5 TAPES:

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

1. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlton Industries, LP.
 - b. Champion America.
 - c. Ideal Industries, Inc.
 - d. Marking Services, Inc.
 - e. Panduit Corp.

- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.

1. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. emedco.
 - d. Marking Services, Inc.

- C. Tape for Raceways Carrying Circuits 600 V or Less: 4-inch-wide black stripes on 10-inch centers placed diagonally over orange background that extends full length of raceway or duct and is 12 inches wide. Stop stripes at legends.

1. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. LEM Products Inc.
 - b. Marking Services, Inc.
 - c. Seton Identification Products.

- D. Underground-Line Warning Tape

1. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Brady Corporation.
 - b. Ideal Industries, Inc.
 - c. LEM Products Inc.
 - d. Marking Services, Inc.
 - e. Reef Industries, Inc.
 - f. Seton Identification Products.
2. Tape:
- a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
 - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
3. Color and Printing:
- a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
 - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
 - c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

2.6 TAGS

- A. Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.
1. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. emedco.
 - d. Grafoplast Wire Markers.
 - e. LEM Products Inc.
 - f. Marking Services, Inc.
 - g. Panduit Corp.
 - h. Seton Identification Products.

2.7 SIGNS

- A. Baked-Enamel Signs:
1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
 2. 1/4-inch grommets in corners for mounting.
 3. Nominal Size: 7 by 10 inches.

4. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlton Industries, LP.
 - b. Champion America.
 - c. emedco.
 - d. Marking Services, Inc.

B. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:
 - a. For signs up to 20 sq. inches, minimum 1/16-inch-.
 - b. For signs larger than 20 sq. inches, 1/8 inch thick.
 - c. Engraved legend with white letters on a dark grey background.
 - d. Punched or drilled for mechanical fasteners.
 - e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
3. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. emedco.
 - d. Marking Services, Inc.

2.8 CABLE TIES

- A. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Ideal Industries, Inc.
 2. Marking Services, Inc.
 3. Panduit Corp.
- B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
 1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi.
 3. Temperature Range: Minus 40 to plus 185 deg F.
 4. Color: Black, except where used for color-coding.
- C. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in Specification Section 09 91 00 "Painting" for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Specification Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.
- D. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- G. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
- H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 1. Outdoors: UV-stabilized nylon.
 2. In Spaces Handling Environmental Air: Plenum rated.
- I. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

- J. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive vinyl label or self-adhesive vinyl tape applied in bands. Install labels at 10-foot maximum intervals.
- B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.
 - a. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - b. Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- C. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, use self-adhesive vinyl labels with the conductor or cable designation, origin, and destination.
- D. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive vinyl labels with the conductor designation.
- E. Conductors To Be Extended in the Future: Attach write-on tags to conductors and list source.
- F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - 2. Use system of marker-tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

- G. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
1. Limit use of underground-line warning tape to direct-buried cables.
 2. Install underground-line warning tape for direct-buried cables and cables in raceways.
- H. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- I. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Engraved, laminated acrylic or melamine plastic label, punched or drilled for mechanical fasteners. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Unless labels are provided with self-adhesive means of attachment, fasten them with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
 2. Equipment To Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a engraved, laminated acrylic or melamine label.
 - b. Enclosures and electrical cabinets.
 - c. Access doors and panels for concealed electrical items.
 - d. Enclosed switches.
 - e. Enclosed controllers.
 - f. Push-button stations.
 - g. Contactors.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section - Quality Requirements for requirements for Contractor Quality Control Program.

END OF SECTION 26 05 53

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Specification Sections, Supplementary Conditions and other Division 01 Specification Sections, apply to this Section..

1.2 SUMMARY

- A. Specification Section Includes:

1. Straight-blade convenience, hospital-grade, isolated-ground, and tamper-resistant receptacles.
2. Twist-locking receptacles.
3. Pendant cord-connector devices.
4. Cord and plug sets.
5. Toggle switches.
6. Wall plates.

1.3 DEFINITIONS

- A. Abbreviations of Manufacturers' Names:

1. Cooper: Cooper Wiring Devices; Division of Cooper Industries, Inc.
2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
3. Leviton: Leviton Mfg. Company, Inc.
4. Pass & Seymour: Pass& Seymour/Legrand.

- B. BAS: Building automation system.

- C. EMI: Electromagnetic interference.

- D. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

- E. RFI: Radio-frequency interference.

- F. UTP: Unshielded twisted pair.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 - 2. Devices shall comply with the requirements in this Specification Section.
- D. Devices for the Authority-Furnished Equipment:
 - 1. Receptacles: Match plug configurations.
 - 2. Cord and Plug Sets: Match equipment requirements.
- E. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STRAIGHT-BLADE RECEPTACLES

- A. Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 - 1. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/LeGrand (Pass & Seymour).

2.3 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: 0.035-inch-thick, satin-finished, Type 302 stainless steel.
 - 3. Material for Unfinished Spaces: Galvanized steel.
 - 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
- C. Conductors:
 - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtail existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
 - 1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.

3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 IDENTIFICATION

- A. Comply with Specification Section 26 05 53 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

- A. Test Instruments: Use instruments that comply with UL 1436.
- B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- C. Perform the following tests and inspections:
 1. Test Instruments: Use instruments that comply with UL 1436.
 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- D. Tests for Convenience Receptacles:
 1. Line Voltage: Acceptable range is 105 to 132 V.
 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.

3. Ground Impedance: Values of up to 2 ohms are acceptable.
 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- E. Test straight-blade for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz.
- F. Wiring device will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section - Quality Requirements for requirements for Contractor Quality Control Program.

END OF SECTION 26 27 26

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SECTION 26 56 19 – LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Specification Sections, Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Specification Section Includes:
 - 1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
 - 2. Luminaire supports.
 - 3. Luminaire-mounted photoelectric relays.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color rendering index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of luminaire.
- B. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and photoelectric relays to include in operation and maintenance manuals.
 - 1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
 - 2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.6 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.
- C. Provide luminaires from a single manufacturer for each luminaire type.
- D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.
- E. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.8 FIELD CONDITIONS

- A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.
- B. Mark locations of exterior luminaires for approval by the Authority prior to the start of luminaire installation.

1.9 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures, including luminaire support components.
 - b. Faulty operation of luminaires and accessories.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: 2 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. UL Compliance: Comply with UL 1598 and listed for wet location.
- E. Lamp base complying with ANSI C81.61 or IEC 60061-1.
- F. Bulb shape complying with ANSI C79.1.
- G. CRI of minimum 80. CCT of 5000 K.
- H. L70 lamp life of 50,000 hours.
- I. Internal driver.
- J. Nominal Operating Voltage: See Design Drawings.
- K. In-line Fusing: On the primary for each luminaire.
- L. Lamp Rating: Lamp marked for outdoor use.
- M. Source Limitations: Obtain luminaires from single source from a single manufacturer.
- N. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.3 LUMINAIRE TYPES – AS INDICATED ON PLAN DRAWINGS

- A. Area and Site:
 - 1. Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Architectural Area Lighting.
 - b. Atlas Lighting Products.

- c. Cooper Lighting, an Eaton business.
- d. Deco Lighting.
- e. Gallium Lighting, LLC.
- f. GE Lighting Solutions.
- g. H.E. Williams.
- h. Howard Lighting Products.
- i. Juno Lighting Group by Schneider Electric.
- j. KIM Lighting.
- k. Lightolier; a Philips group brand.
- l. Lithonia Lighting; Acuity Brands Lighting, Inc.
- m. Luraline Lighting.
- n. OSRAM SYLVANIA.
- o. RAB Lighting.
- p. Selux Corporation.

2.4 MATERIALS

- A. Metal Parts: Free of burrs and sharp corners and edges.
- B. Sheet Metal Components: Corrosion-resistant aluminum. Form and support to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.
- D. Diffusers and Globes:
 - 1. Polycarbonate Lens
- E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- F. Housings:
 - 1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
 - 2. Provide filter/breather for enclosed luminaires.
- G. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 - 1. Label shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. LED, shape, size, and wattage.
 - c. CCT and CRI for all luminaires.

2.5 FINISHES

- A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
- C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - a. Color: Standard by fixture manufacture.

2.6 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Specification Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.
- C. Examine walls and roofs, for suitable conditions where luminaires will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Comply with NECA 1.
- B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Install lamps in each luminaire.
- D. Fasten luminaire to structural support.
- E. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Support luminaires without causing deflection of finished surface.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

F. Wall-Mounted Luminaire Support:

1. Mount luminaires per manufacturer's installation instructions.

G. Wiring Method: Install cables in raceways. Conceal raceways and cables.

H. Install luminaires level, plumb, and square with finished grade unless otherwise indicated. Install luminaires at height and aiming angle as indicated on Drawings.

I. Coordinate layout and installation of luminaires with other construction.

J. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

K. Comply with requirements in Specification Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" and 26 05 33 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Specification Section 26 05 53 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Verify operation of photoelectric controls.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):
 - a. IES LM-5.
 - b. IES LM-50.
 - c. IES LM-52.
 - d. IES LM-64.
 - e. IES LM-72.

2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

- D. Luminaire will be considered defective if it does not pass tests and inspections.
- E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
 1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
 2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 3. Adjust the aim of luminaires in the presence of the Authority.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section - Quality Requirements for requirements for Contractor Quality Control Program.

END OF SECTION 26 56 19

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SECTION 31 23 19 - DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. VDOT Section 303 "Earthwork" for excavating, backfilling, site grading, and controlling surface-water runoff and ponding.
 - 2. Section 31 50 00 "Excavation Support and Protection" for temporary excavation support requiring dewatering.

1.2 SUMMARY

- A. Specification Section includes construction dewatering.

1.3 PRE-INSTALLATION MEETING

- A. Pre-Installation Conference: Conduct conference at Project site.
 - 1. Verify availability of Installers personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review condition of site to be dewatered including coordination with temporary erosion control measures and temporary controls and protections.
 - 3. Review geotechnical report.
 - 4. Review proposed site clearing and excavations.
 - 5. Review existing utilities and subsurface conditions.
 - 6. Review observation and monitoring of dewatering system.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installer and professional engineer.
- B. Field quality-control reports.
- C. Existing Conditions: Using photographs show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.

1.6 FIELD CONDITIONS

- A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. The Authority is not responsible for interpretations or conclusions drawn from this data.
 - 1. Make additional test borings and conduct other exploratory operations necessary for dewatering according to the performance requirements.
 - 2. The geotechnical report is included elsewhere in Project Manual.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
 - 1. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
 - 2. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 3. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
 - 4. Remove dewatering system when no longer required for construction.
- B. Regulatory Requirements: Comply with governing Local Environmental/EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.
 - 1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
 - 2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- B. Install dewatering system 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 written permission from COTR and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Provide temporary grading to facilitate dewatering and control of surface water.
- D. Protect and maintain temporary erosion and sedimentation controls, which are specified in VDOT Standard Specifications for Materials and Construction, during dewatering operations.

3.2 INSTALLATION

- A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
 - 1. Space well points or wells at intervals required to provide sufficient dewatering.
 - 2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
- B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.
- C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.
- D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

- A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.
- B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
 - 1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
 - 2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
 - 3. Maintain piezometric water level a minimum of 24 inches below bottom of excavation.
- C. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.
- D. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

3.4 FIELD QUALITY CONTROL

- A. Observation Wells: Provide observation wells or piezometers, take measurements, and maintain at least the minimum number indicated; additional observation wells may be required by authorities having jurisdiction.
 - 1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
 - 2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
 - 3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.
- B. Survey-Work Benchmarks: Resurvey benchmarks regularly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Project Engineer if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.
- C. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.
- D. Prepare reports of observations.

3.5 PROTECTION

- A. Protect and maintain dewatering system during dewatering operations.
- B. Promptly repair damages to adjacent facilities caused by dewatering.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.

END OF SECTION 31 23 19

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SECTION 31 50 00 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. VDOT Section 303 "Earthwork" for excavating and backfilling and for controlling surface-water runoff and ponding.
 - 2. Specification Section 31 23 19 "Dewatering" for dewatering excavations.

1.2 SUMMARY

- A. This Specification Section includes temporary excavation support and protection systems.

1.3 PRE-INSTALLATION MEETING

- A. Pre-installation Conference: Conduct conference at Project site
 - 1. Review geotechnical report.
 - 2. Review existing utilities and subsurface conditions.
 - 3. Review proposed excavations.
 - 4. Review proposed equipment.
 - 5. Review monitoring of excavation support and protection system.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, performance properties, and dimensions of individual components and profiles, and calculations for excavation support and protection system.
- B. Shop Drawings: For excavation support and protection system, prepared by or under the supervision of a qualified professional engineer.
 - 1. Include plans, elevations, sections, and details.

2. Show arrangement, locations, and details of soldier piles, piling, lagging, tiebacks, bracing, and other components of excavation support and protection system according to engineering design.
3. Indicate type and location of waterproofing.
4. Include a written plan for excavation support and protection, including sequence of construction of support and protection coordinated with progress of excavation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Contractor Calculations: For excavation support and protection system. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 FIELD CONDITIONS

- A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Administration or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
 1. Notify COTR no fewer than three (3) days in advance of proposed interruption of utility.
 2. Do not proceed with interruption of utility without COTR's written permission.
- B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. The Authority is not responsible for interpretations or conclusions drawn from the data.
 1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection according to the performance requirements.
- C. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Provide, design, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting earth and hydrostatic pressures and superimposed and construction loads.

1. Contractor Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer.
2. Prevent surface water from entering excavations by grading, dikes, or other means.
3. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
4. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is prevented.

2.2 MATERIALS

- A. General: Provide materials that are either new or in serviceable condition.
- B. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of size and strength required for application.
- C. Shotcrete: Comply with Industry standards for shotcrete materials and mixes, reinforcement, and shotcrete application.
- D. Tiebacks: Steel bars, ASTM A 722/A 722M.
- E. Tiebacks: Steel strand, ASTM A 416/A 416M.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
 1. Shore, support, and protect utilities encountered.
- B. Install excavation support and protection systems 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 written permission from Project Engineer and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Locate excavation support and protection systems clear of permanent construction so that construction and finishing of other work is not impeded.

3.2 SOLDIER PILES AND LAGGING

- A. Install steel soldier piles before starting excavation. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.
- B. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.
- C. Install wales horizontally and secure to soldier piles.

3.3 SHEET PILING

- A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock vertical edges to form a continuous barrier.
- B. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.
- C. Cut tops of sheet piling to uniform elevation at top of excavation.

3.4 TIEBACKS

- A. Drill, install, grout, and tension tiebacks.
- B. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.
 - 1. Have test loading observed by a qualified professional engineer responsible for design of excavation support and protection system.
- C. Maintain tiebacks in place until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.5 BRACING

- A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.
 - 1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by the COTR.
 - 2. Install internal bracing if required to prevent spreading or distortion of braced frames.

3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.6 FIELD QUALITY CONTROL

- A. Survey-Work Benchmarks: Resurvey benchmarks regularly during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify the COTR if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.
- B. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.
- C. Promptly repair damages to adjacent facilities caused by installation or faulty performance of excavation support and protection systems.

3.7 REMOVAL AND REPAIRS

- A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.
 1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction and abandon remainder.
 2. Fill voids immediately with approved backfill compacted to density specified in VDOT Section 303 "Earthwork."
 3. Repair or replace, as approved by the COTR, adjacent work damaged or displaced by removing excavation support and protection systems.
- B. Leave excavation support and protection systems permanently in place.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section "Quality Requirements" for requirements for Contractor Quality Control Program.

END OF SECTION 31 50 00

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SECTION 32 92 00 – TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Specification Sections, Supplementary Conditions, and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Sections subsoil scarification, topsoil placement, application of soil amendments, final grading, fertilizing, turf seeding, mulching, and initial irrigation for the areas indicated on Drawings.
- B. This Section also includes removing of topsoil from designated stockpiles, areas to be stripped on the site or from approved sources off the site and subsequent transporting of topsoil to area of placement on site.
- C. Topsoil has been (or will be) stockpiled for reuse in turf and grass areas. If quantity of stockpiled topsoil is insufficient, provide additional topsoil to complete turf and grass areas. Delete above and retain below if known that required quantity of suitable topsoil will not be available from stripping of site.
- D. Sufficient topsoil for indicated turf areas is not available at site. Furnish additional topsoil from approved offsite source as specified under "Products", below.

1.3 SUBMITTALS

- A. Submit the following to COTR in accordance with requirements of Division 01 Section, "Submittals."
- B. Certification of Grass Seed: Seed vendor's signed statement of turf seed analysis, certifying that each lot of seed has been tested in accordance with requirements of the Commonwealth of Virginia within the previous 6 months by a recognized independent seed testing laboratory. This statement shall include:
 - 1. Name and address of laboratory.
 - 2. Date of analysis.
 - 3. Origin and lot number for each type of seed variety.
 - 4. Results of analysis, including, for each seed variety:
 - a. Botanical and common name (species and variety).
 - b. Percentage by weight of variety in overall mixture.

- c. Percentage of purity.
 - d. Percentage of germination.
 - e. Percentage by weight of weed content.
 - f. Percentage by weight of inert content.
- C. Topsoil Analysis Report: Report of analysis by an Authority approved soil testing laboratory stating percentages of silt, clay, sand and organic matter, soil pH, and the mineral and plant nutrient content of soil. Report shall indicate suitability of topsoil for healthy, vigorous growth of turf grasses. If not suitable, include recommended quantities for nitrogen, phosphorus, potash, limestone, aluminum sulfate, or other soil amendments that shall be added to make topsoil suitable.
- D. Sod Analysis: Notify COTR of sod source, including name and telephone number of supplier, and provide certification of seed mix of sod in accordance with sod certification requirements of the Commonwealth of Virginia.

1.4 PROJECT CONDITIONS

- A. Planting time: Sow permanent seed in all areas of project in periods between March 15 to May 15, or between August 15 and October 1 unless otherwise approved in writing by the COTR.
- B. Maintenance period: Correlate planting with specified maintenance periods to provide required maintenance from date of substantial completion.

1.5 SPECIAL PROJECT WARRANTY

- A. Warranty turf areas through specified maintenance period and until final acceptance.

1.6 MEASUREMENT AND PAYMENT

- A. The quantity of seeding to be paid to the Contractor shall be paid based on the quantity of seeding completed by the number of completed and accepted acres, as measured on the ground surface.
- B. Payment shall be made at the Contract Unit Price per acre or fraction thereof, which price and payment shall be full compensation for furnishing and placing all materials and for all labor, equipment, tool, and incidentals necessary to complete the work prescribed in this Section.

PART 2 - PRODUCTS

2.1 NEW TOPSOIL

- A. Fertile, friable, naturally loamy, surface soil; free of subsoil, clay lumps, brush, weeds, and other litter; and free of roots, stumps, stones larger than 2 inches in any dimension, and other extraneous or toxic matter harmful to plant growth.
- B. When tested in accordance with the methods of testing as recommended by the Association of Official Agricultural Chemists topsoil shall have a pH range of 5.5 to 7.6. Organic content shall not be less than 3 percent or more than 20 percent as determined by the wet-combustion method (chromic acid reduction). Not less than 20 percent or more than 80 percent of the topsoil material shall pass the 200 - mesh (0.075 mm) sieve, as determined by the wash test in accordance with ASTM C 117.
 - 1. Natural topsoil may be amended by the Contractor with approved materials and methods to meet above requirements.
- C. Obtain topsoil from local sources or from areas having similar soil characteristics to that found at site of work. Obtain topsoil from naturally well-drained sites where topsoil occurs at least 4 inches deep. Obtaining topsoil from bogs or marshes is prohibited.

2.2 SOIL AMENDMENTS

- A. Lime: Natural limestone, conforming to requirements of ASTM C 602, and containing at least 85 percent of total carbonates ground to such fineness that at least 90 percent passes a 10-mesh sieve and at least 50 percent passes a 100-mesh sieve.
 - 1. Provide lime in form of dolomitic limestone.
- B. Peat Humus: Finely divided or granular texture and with pH of 6.0 to 7.5 composed of moss peat (other than sphagnum), peat humus, or reed-sedge peat.

2.3 FERTILIZER

- A. Complete, 10-20-10 commercial fertilizer of neutral character, with some elements derived from organic sources, conforming to requirements of Federal Specification O-F-241d and applicable laws of the Commonwealth of Virginia. Fertilizer to provide nitrogen in a form that will be available during initial period of turf growth.

2.4 GRASS SEED MIXTURE

- A. Grass Seed: Provide fresh, clean, new-crop seed complying with tolerance for purity and germination established by Official Seed Analysts of North America for lawn grasses. Seeds

included in the mix shall be listed in the most current version of the Virginia Turfgrass Variety Recommendations. Seed mixtures shall be a blend of three standard varieties with no dwarf and shall consist of the following (by weight):

- 10% Kentucky Bluegrass
- 80% Tall Fescue
- 10 % Perennial Rye

2.5 SOD

- A. Machine-cut, strongly rooted, certified turfgrass sod, at least 2 years old and free of weeds and undesirable native grasses. Provide sod capable of vigorous growth and development when planted (viable, not dormant) and complying with the following requirements:
 - 1. Type: Kentucky Bluegrass (*Poa pratensis*).
- B. Sod Pad Size: Uniform thickness of 5/8 inch, plus or minus 1/4 inch, measured at time of cutting and excluding top growth and thatch. Provide in supplier's standard size of uniform length and width with maximum 5 percent allowable deviation in either length or width. Broken or torn pads or pads with uneven ends are not acceptable.
- C. Sod Strength: Provide sod pads capable of supporting their own weight and retaining size and shape when supplier's standard size pad is suspended vertically from a firm grasp on upper 10 percent of the pad.

2.6 MULCH

- A. Anti-Erosion Mulch: Clean, salt hay or threshed straw of wheat, rye, oats or barley. Mulch to be air-dry and free of mold and seeds of noxious grasses or weeds.
- B. Seed Mulch: Peat moss in natural, shredded, or granulated form, of fine texture, with a pH of 4.0 to 6.0 and a water absorbing capacity of 1,100 to 2,000 percent.

PART 3 - EXECUTION

3.1 SOIL PREPARATION

- A. Limit preparation to areas that will be planted within 72 hours.
- B. Till sub grade to a minimum depth of 6 inches. Remove stones exceeding 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter including gravel or other inorganic deposits in excess of 4 stones per square foot (average).
 - 1. Immediately after initial tilling, remove existing grass clumps, vegetation, and turf. Dispose of such material outside of Owner's property; do not turn over into soil being prepared for turfs.

2. Maintain grades in a true and even condition where grades to be provided with topsoil have been established by others.
 3. Where grades have not yet been established, smooth-grade the areas to the prescribed elevations indicated and leave in a condition that is properly compacted and evenly graded to prevent formation of low areas where water may pond.
- C. Spread topsoil mixture to depth required meeting thickness, grades, and elevations shown, after light rolling and natural settlement.
1. Provide minimum depth of 2 inches (50 mm) after compaction, unless otherwise indicated. Do not spread if either topsoil material or sub grade is frozen.
 2. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful or toxic to plant growth.
 3. Allow for sod thickness in areas to be sodded.
- D. Add soil amendments to top surface of topsoil at rates specified and spread initial fertilizers at rate of 1500 lbs. per acre of topsoil.
1. Mix lime with dry soil before mixing in fertilizer.
 2. Mix thoroughly into top 4 inches of topsoil prior to fine-grading.
 3. Do not mix fertilizer with topsoil more than 72 hours in advance of seeding or sodding operations.
 4. Till soil to a homogenous mixture of fine texture, free of lumps, clods, stones, roots, and other extraneous matter.
- E. Fine-grade to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. After compaction rolling, leave surfaces at prescribed grades with uniform slope to drain and free from low areas where water might pond. Limit fine-grading to areas that can be planted within 72 hours. Remove trash, debris, stones larger than 2 inches in diameter, and other objects that may interfere with planting or maintenance operations.
- F. Promptly remove topsoil or other materials falling on pavement as result of hauling or spreading of topsoil.
- 3.2 SEEDING
- A. Restore prepared turf areas to specified condition if eroded or otherwise disturbed after fine-grading and before planting.
- B. Moisten prepared turf areas before planting if soil is dry. Water thoroughly and allow surface to dry off before seeding operations. Do not create muddy soil.
- C. Sow seed with a spreader or a seeding machine. Do not seed when wind velocity exceeds 5 miles per hour. Distribute seed evenly over entire area by sowing equal quantity in 2 directions at right angles to each other.
1. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.
 2. Sow no less than the quantity of seed specified.

- D. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

3.3 HYDROSEEDING

- A. Mix specified seed, fertilizer, and pulverized mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.
- B. Apply slurry uniformly to all areas to be seeded. Rate of application as required obtaining seed application rate equivalent to 6 pounds per 1000 sq. ft. (260 lbs. per acre).

3.4 SODDING

- A. Lay sod within 24 hours of stripping. Do not lay dormant sod or if ground is frozen.
- B. Lay sod to form solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to avoid damage to sub grade or sod.
- C. Tamp or roll lightly to ensure contact with sub grade. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering adjacent grass.
- D. Anchor sod on slopes with wood pegs as required to prevent slippage.
- E. Water sod with fine spray immediately after planting. During first week, water daily or more frequently as necessary to maintain moist soil to depth of 4 inches.

3.5 MULCHING

- A. Protect seeded slopes against erosion with jute mesh erosion netting or other similar coverings acceptable to COTR.
- B. Protect seeded areas against hot, dry weather or drying winds by applying specified mulch within 24 hours after completion of seeding operations. Presoak and scatter evenly to a depth of 1/8 inches to 3/16 inches thick and roll to a smooth surface. Do not mound.

3.6 RECONDITIONING EXISTING TURF AREAS

- A. Recondition turf areas where settlement or washouts occur or where minor re-grading is required.
- B. Recondition existing turf areas damaged by Contractor's operations including storage of materials or equipment and movement of vehicles.

- C. Provide fertilizer, seed or sod, and soil amendments same as specified for new turf areas and as required to provide healthy stand of grass in reconditioned areas. Provide new topsoil as required to fill low spots and meet required finish grades.
- D. Remove diseased or unsatisfactory grass clumps; do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operations including oil drippings, stone, gravel, and other construction materials; replace with new topsoil.
- E. Where substantial turf remains (but is thin), mow, rake, aerate if compacted, fill low spots, remove humps, cultivate soil, apply lime, fertilizer, and sow specified seed at rate indicated. Remove weeds before seeding. If weeds are extensive, apply selective chemical weed killers as required. Apply seedbed mulch, if required, to maintain moist condition.
- F. Water newly planted areas and keep moist until new grass is established.

3.7 PROTECTION

- A. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout the maintenance period. Maintain barricades until a substantial and healthy stand of grass is established.
- B. Take necessary precautions as required to avoid damage to existing plants, turf, and structures.

3.8 MAINTENANCE

- A. Obtain the services of a professional lawn and landscape firm to provide the required maintenance services of this Article. Do not use Contractor's own forces to accomplish this maintenance.
- B. Begin maintenance of grass areas immediately after each area is planted and continue for the periods required to establish acceptable stand of turf grass, but no less than the following:
 - 1. Seeded areas, at least 60 days, after date of Substantial Completion.
 - a. If seeded in fall after September 1, provide minimum of 30 days maintenance in fall, and provide a minimum of 45 additional days continuing maintenance during following spring until acceptable turf is established.
 - 2. Sodded areas, at least 30 days after date of Substantial Completion.
- C. Maintain turf areas by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, re-grading, and replanting as required to establish a smooth, acceptable turf, free of eroded or bare areas.
- D. Re-mulch with new mulch in areas where mulch has been disturbed by wind or maintenance operations sufficiently to nullify its purpose. Anchor as required preventing displacement.
- E. Replant bare areas with same materials specified for new turf.

- F. Watering: Provide and maintain temporary piping, hoses and watering equipment to convey water from Authority's water source(s) location indicated and to keep turf areas uniformly moist as required for proper growth. Design temporary watering system to provide a minimum of 3/4 inch of water per day.
1. Lay out temporary watering system and arrange watering schedule to prevent puddling, water erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid necessity of walking over muddy or newly seeded areas.
 2. Begin watering immediately. Water on a daily basis for the following 10 days. Apply water uniformly, providing coverage over entire site nominally equivalent to 3/4 inches of rainfall per day. Reduce rate to nominal 1/2 inch of water per day after 5 days.
 3. At end of initial 10-day period, remove temporary irrigation system. Continue watering with conventional sprinkler watering system on an as-needed basis.
- G. Mow grass as soon as there is 3 - 4 inches of top growth, cut grass with the mower blades set at 1-1/2" to 2" height. Repeat mowing as required to maintain specified height.
1. Remove no more than 40 percent of grass leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Time initial and subsequent mowings to maintain following grass heights.
 - a. Mow grass from 1-1/2 inches to 2 inches high. Do not mow to less than 1-1/2 inches.
 2. Apply second fertilizer application after first mowing and when grass is dry. Use fertilizer that will provide at least 1.0 lb. of actual nitrogen per 1,000 sq. ft. of turf area.

3.9 ACCEPTANCE

- A. When work is substantially completed, including maintenance, COTR will, upon request, make an inspection to determine acceptability. Consider retention of below for large sites and/or sites where construction schedule may require phased planting. Delete if not applicable or desired.
- B. Turf work may be inspected for acceptance in parts agreeable to the COTR, provided work offered for inspection is complete, including maintenance.
- C. Replant rejected work and continue specified maintenance until re-inspected by COTR and found to be acceptable.
- D. Seeded areas will be acceptable provided requirements, including maintenance, have been met and healthy, uniform close stand of specified grass has been established with an average of one healthy grass plant per square inch, free of weeds, with no bare spots in excess of 5 inches in diameter, and free of surface irregularities.
- E. Sodded areas will be acceptable provided requirements, including maintenance, have been met and healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

3.10 CLEANUP

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto surface of paved areas.
- B. Maintain all areas neat and clean during seeding operations. On a daily basis, remove excess materials and debris to site location designated by COTR. At completion of Work, remove all such materials from site and dispose of in a legal manner.
- C. Restore any damage caused by seeding operations to original condition.
- D. Remove all staples form sodded areas, upon acceptance.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section - Quality Requirements for requirements for Contractor Quality Control Program.

END OF SECTION 32 92 00

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SECTION 33 05 00 - COMMON WORK RESULTS FOR UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Specification Sections, Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Piping joining materials.
 - 2. Transition fittings.
 - 3. Dielectric fittings.
 - 4. Sleeves.
 - 5. Grout.
 - 6. Flowable fill.
 - 7. Piped utility demolition.
 - 8. Piping system common requirements.
 - 9. Equipment installation common requirements.
 - 10. Painting.

1.3 DEFINITIONS

- A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.
- B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Dielectric fittings.
 - 2. Identification devices.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Steel Piping Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

1.8 COORDINATION

- A. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- B. Concrete formwork, reinforcement, and concrete requirements are specified in Section 03 30 00 "Cast-in-Place Concrete".

PART 2 - PRODUCTS

2.1 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness, unless otherwise indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

- D. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- E. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.2 TRANSITION FITTINGS

- A. Transition Fittings, General: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
- B. Transition Couplings NPS 1-1/2 and Smaller:
 - 1. Underground Piping: Manufactured piping coupling or specified piping system fitting.
 - 2. Aboveground Piping: Specified piping system fitting.
- C. AWWA Transition Couplings NPS 2 and Larger:
 - 1. Description: AWWA C219, metal sleeve-type coupling for underground pressure piping.

2.3 DIELECTRIC FITTINGS

- A. Dielectric Fittings, General: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.
- B. Dielectric Unions:
 - 1. Description: Factory fabricated, union, NPS 2 and smaller.
 - a. Pressure Rating: 150 psig minimum at 180 deg F.
 - b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded ferrous.
- C. Dielectric Flanges:
 - 1. Description: Factory-fabricated, bolted, companion-flange assembly, NPS 2-1/2 to NPS 4 and larger.
 - a. Pressure Rating: 150 psig minimum.
 - b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Kits:
 - 1. Description: Nonconducting materials for field assembly of companion flanges, NPS 2-1/2 and larger.

- a. Pressure Rating: 150 psig minimum.
- b. Gasket: Neoprene or phenolic.
- c. Bolt Sleeves: Phenolic or polyethylene.
- d. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:

1. Description: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining, NPS 3 and smaller.
 - a. Pressure Rating: 300 psig at 225 deg F.
 - b. End Connections: Threaded.

F. Dielectric Nipples:

1. Description: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining.
 - a. Pressure Rating: 300 psig at 225 deg F.
 - b. End Connections: Threaded.

2.4 SLEEVES

- A. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- B. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.

2.5 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 2. Design Mix: 5000-psi, 28-day compressive strength.
 3. Packaging: Premixed and factory packaged.

2.6 FLOWABLE FILL

- A. Description: Low-strength-concrete, flowable-slurry mix.
 1. Cement: ASTM C 150, Type I, portland.
 2. Density: 115- to 145-lb/cu. ft..
 3. Aggregates: ASTM C 33, natural sand, fine and crushed gravel or stone, coarse.
 4. Aggregates: ASTM C 33, natural sand, fine.
 5. Admixture: ASTM C 618, fly-ash mineral.
 6. Water: Comply with ASTM C 94/C 94M.
 7. Strength: 100 to 200 psig at 28 days.

PART 3 - EXECUTION

3.1 PIPED UTILITY DEMOLITION

- A. Refer to Section 02 41 19 "Selective Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.
 - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - 2. Piping to Be Abandoned in Place: Drain piping. Fill abandoned piping with flowable fill, and cap or plug piping with same or compatible piping material.
 - 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 DIELECTRIC FITTING APPLICATIONS

- A. Wet Piping Systems: Connect piping of dissimilar metals with the following:
 - 1. NPS 2 and Smaller: Dielectric couplings or dielectric nipples.
 - 2. NPS 2-1/2 to NPS 4: Dielectric nipples.
 - 3. NPS 2-1/2 to NPS 8: Dielectric nipples or dielectric flange kits.

3.3 PIPING INSTALLATION

- A. Install piping according to the following requirements and utilities Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping to permit valve servicing.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.

- G. Install fittings for changes in direction and branch connections.
- H. Select system components with pressure rating equal to or greater than system operating pressure.
- I. Sleeves are not required for core-drilled holes.
- J. Permanent sleeves are not required for holes formed by removable PE sleeves.
- K. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - 2. Install cast iron wall pipe with integral waterstop or sleeves in new walls and slabs as new walls and slabs are constructed.
 - a. PVC Pipe Sleeves: For pipes smaller than NPS 4.
- L. Verify final equipment locations for roughing-in.
- M. Refer to equipment specifications in other Sections for roughing-in requirements.

3.4 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and utilities Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

- G. Soldered Joints: Apply ASTM B 813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B 32.
- H. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- I. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.

3.5 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Install dielectric fittings at connections of dissimilar metal pipes.

3.6 EQUIPMENT INSTALLATION

- A. Install equipment level and plumb, unless otherwise indicated.
- B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.
- C. Install equipment to allow right of way to piping systems installed at required slope.

3.7 PAINTING

- A. Painting of piped utility systems, equipment, and components is specified in Section 09 96 00 "High Performance Coatings".
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.8 GROUTING

- A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.

- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section - Quality Requirements for requirements for Contractor Quality Control Program.

END OF SECTION 33 05 00

SECTION 33 11 16 – SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Specification Sections, Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes materials, methods, accessories and labor necessary to completely execute piping and specialties for the installation of underground, potable water distribution systems and water services.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressures: The following are minimum pressure requirements for piping unless otherwise indicated:
 - 1. Combination Domestic and Fire-Protection Water Service: 250 psig.
 - 2. Domestic Water System: 160 psi.

1.4 SUBMITTALS

- A. Submittals shall be in accordance with the requirements of Division 01 Section “Submittals”.
- B. Product Data and Shop Drawings: For the following:
 - 1. Pipe and fittings
 - 2. Valves and valve boxes
 - 3. Yard hydrants
 - 4. Pipe warning and identification tape.
- C. Coordination Drawings: For piping and specialties including relation to other services in same area. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.
- D. Record Drawings: At Project closeout of installed domestic and fire protection water service piping according to Division 01, Section “Project Closeout.”
- E. Purging and Disinfecting Reports.
- F. Maintenance Data:

1. Prepare and submit data for the Operation and Maintenance manual in accordance with the provisions of Section "Operation and Maintenance Data."
2. For specialties to include in the maintenance manuals specified in Division 01 Section "Operation and Maintenance Data" include data for the following:
 - a. Curb Valve and Valve Box
 - b. Non-Freeze Yard Hydrant

G. Contractor Certification of Work: Upon completion of work on the Facility Water Distribution System, submit a statement signed by a professional engineer, licensed to practice in the Commonwealth of Virginia, stating that the work was completed in accordance with the approved drawings and the approved specifications.

1.5 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of water service piping specialties and are based on specific types and models indicated.
- B. Comply with standards of authorities having jurisdiction for water service piping including materials, hose threads, installation, and testing.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves and yard hydrants according to the following:
 1. Ensure that valves and hydrants are dry and internally protected against rust and corrosion.
 2. Protect valves and hydrants against damage to threaded ends and flange faces.
 3. Set valves and hydrants in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves and yard hydrants according to the following:
 1. Do not remove end protectors, unless necessary for inspection; then reinstall for storage.
 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Deliver piping with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- D. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- E. Protect flanges, fittings, and specialties from moisture and dirt.

1.7 SITE CONDITIONS

- A. Perform site survey, research Authority utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.
- B. Verify that water-service piping may be installed to comply with original design and referenced standards.
- C. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by the Authority or tenants unless permitted by procedures indicated in Division 01 Section "Summary". Do not proceed with interruption of water-distribution service without COTR's written permission.

1.8 SEQUENCING AND SCHEDULING

- A. Coordinate connections to existing water mains with COTR.
- B. Coordinate with other utility work.

PART 2 - PRODUCTS SITE CONDITIONS

2.1 MATERIALS

- A. Available Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, provide product indicated on Drawings or comparable product. Products may be provided by, but are not limited to, one of the following:
 - 1. Curb Valves:
 - a. Mueller Company
 - 2. Yard Hydrants:
 - a. Zurn Industries, Inc.
 - 3. Valve Box:
 - a. Shall be compatible with Mueller Company valves.

2.2 PIPES

- A. 2½" and smaller copper pipe shall be seamless, Type K and meet requirements of ASTM B88. Fittings shall be cast copper alloy pressure fitting per ASME B16.18 or wrought copper and copper alloy pressure fitting per ASME B16.22.

- B. Copper-to-copper couplings shall be those couplings known as two-part type. The two-part type coupling consists of a tubing connection, a coupling nut and a friction ring. The copper tube end of the couplings shall be the flare type for connecting to Type K copper service pipe. The opposite end, and all couplings nuts shall be threaded in accordance with AWWA C800. Brazed joints are permitted with lead free silver alloy filler metal.

2.3 JOINING MATERIALS

- A. Flanged Ductile-Iron Piping: The following materials apply:
 - 1. Flanged Joints: AWWA C115 ductile-iron or gray-iron pipe flanges, rubber gaskets, and high-strength steel bolts and nuts.
 - 2. Gaskets: Rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
 - 3. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

2.4 CURB VALVES

- A. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.
- B. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches in diameter.
 - 1. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

2.5 YARD HYDRANTS

- A. Hydrant shall be non-freeze post type yard hydrant with 1 inch inlet and outlet connections, bronze casing, neoprene plunger, removable bronze operating parts and T-handle operating key. Hydrant shall be equipped with a tapped chain port in valve housing.
- B. Yard hydrant shall be located where shown on the drawings.

2.6 PIPE WARNING AND IDENTIFICATION TAPE

- A. Metallic-Lined Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick. Include solid blue background with continuously printed caption in black letters.
 - 1. Caption "CAUTION--BURIED WATER LINE BELOW."

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Refer to Division 31 Section “Excavation Support and Protection” and VDOT Specification Section 303 “Earthwork” for excavation, bedding, and back filling. Trenching shall be as indicated.

3.2 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications:
 - 1. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.
 - 2. Do not use flanges for underground piping.
 - 3. Exception: Piping in boxes and structures, but not buried, may be joined with flanges or keyed couplings instead of joints indicated.
 - 4. Flanges and special fittings may be used on aboveground piping.
 - 5. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
 - 6. Remove scale and dirt, on inside and outside, before assembly.
 - 7. Prepare piping connections to equipment with flanges or unions.
 - 8. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
 - 9. Route piping in orderly manner and maintain gradient.
 - 10. Establish elevations of buried piping to ensure not less than 3 feet of cover for the water distribution and domestic service lines.
 - 11. Install valves with stems upright.
 - 12. Water lines shall not be laid in the same trench with sewer lines, gas lines, fuel lines, or electric wiring.

3.3 VALVE APPLICATIONS

- A. Drawings indicate valve types and sizes to be used.

3.4 JOINT CONSTRUCTION

- A. Underground water service piping: Soft copper tube, ASTM B88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

3.5 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. See Section 33 05 00 “Common Work Results For Utilities”
- B. Locations and Arrangements: Drawings indicate location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss,

expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.

- C. Install components with pressure rating equal to or greater than system operating pressure.
- D. Install piping free of sags and bends.

3.6 PIPING INSTALLATION

- A. Water-Main Connection: Connect to existing water main with mechanical joints and valves at locations shown on the plans. Hot taps, wet taps, saddle taps or service taps are not permitted.
- B. Contractor shall apply for utility outages as required by Division 01 Section "Summary" prior to interruption of water services when making connections to existing water mains.
- C. Inspect pipe for cracks and defects before lowering into the trench. Faulty pipe and fittings shall be removed from the site. Install copper pipe and fittings according to CDA's "Copper Tube Handbook".
- D. Pipes shall be installed in accordance with the profiles and grades shown on the contract plans, with top at least 12 inches below level of maximum frost penetration. All pipe, fittings, valves and yard hydrants shall be carefully lowered into the trench in such a manner as to prevent damage to the materials, protective coatings and linings. Under no circumstances shall materials be dropped or dumped into the trench.
- E. Connections to water mains shall be provided with full mechanical tees.
- F. At the end of each work day, the installed water mains shall be protected so that line remains free of dirt, mud and debris. At the start of the next work day, the line shall be inspected for tracked dirt, mud and debris. All lines failing the inspection shall be removed, cleaned, and replaced to the satisfaction of the COTR.

3.7 VALVE INSTALLATION

- A. Curb Valve: Install underground curb valve with headed pointed up and with service box.

3.8 YARD HYDRANT INSTALLATION

- A. Install post type non-freeze yard hydrant where shown and as detailed on the drawings.

3.9 PIPE WARNING AND IDENTIFICATION TAPE INSTALLATION

- A. Install continuous plastic underground warning and identification tape during back-filling of trench for underground water piping. Place the tape 18 inches directly above the piping.

3.10 PROTECTION OF WATER SUPPLIES

- A. During the course of construction the Contractor shall take proper steps to protect the potable water supply facilities from contamination within the limits of construction.
- B. The following criteria shall be used to govern the installation of water lines in proximity of other utilities considered to be sources of contamination. Sources of contamination include sanitary lines, combination sewers, sanitary manholes, storm water lines, fuel lines, and other utilities indicated or included in the Project Specifications.
 - 1. Parallel Separation: Except as specified hereinafter or otherwise permitted by the COTR, water lines shall be laid at least 10 feet horizontally from existing or proposed sources of contamination. This distance shall be measured edge to edge. If local conditions prevent a lateral separation of 10 feet, then the top of the source of contamination shall be at least 18 inches below the bottom of the water lines. Where this vertical separation cannot be obtained, the source of contamination shall be sleeved, encased, or shall be constructed of mechanical joint water pipe and pressure tested in place to 50 psi without leakage prior to backfilling.
 - 2. Crossings: Water and the source of contamination lines crossing each other shall be laid to provide a separation of at least 18 inches between the bottom of the water line and the top of the source of contamination line. Where this vertical separation cannot be obtained, the source of contamination shall be encased in concrete for a minimum distance of 10 feet from the water line on each side of the crossing.
 - a. Sources of contamination lines crossing over a water line shall, in addition, have a vertical separation of at least 18 inches between the bottom of the sewer and the top of the water line. The contractor shall provide adequate structural support for the sewer to prevent excessive deflection of the joints and settling on and breaking the water line. Deflection shall not exceed [Insert Number Here]. Also, the water line shall be installed in a watertight steel sleeve, sealed at each end at a distance of 10 feet from the source of contamination.
 - b. Water lines shall not pass through nor come in contact with any part of a source of contamination.
 - c. During the course of construction should the Contractor become aware that the work will result in the violation of the criteria herein the Contractor shall immediately notify the COTR. Upon such notification, the COTR will issue instructions of remedial measures.

3.11 TESTING

- A. Piping Tests: Conduct piping tests before joints are covered. [For lines 24" and larger the joints may be backfilled prior to hydro static testing] Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water. Testing shall be completed prior to connection to the existing water mains.
- B. Water mains, appurtenances and materials shall be tested for leakage after installation. Such testing shall be performed under the observation of the COTR. The Contractor shall provide all

backflow device, hydrant double check, plugs, equipment, tools, labor, materials and incidentals necessary to perform the testing. Water for testing is provided by the Authority through existing hydrants. In the event any section of main under test shows leakage in excess of that specified, the Contractor shall, at no additional cost to the Authority, make such repairs or replacements as are required and testing shall be repeated until satisfactory results are obtained. All visible leaks shall be repaired regardless of the amount of allowable leakage.

1. Hydrostatic Tests shall be conducted in accordance with NFPA 24, Chapter 10.10 "Testing of Pipe" and the following:
 - a. Test at not less than 225 psig pressure for 2 hours.
 - b. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig. Slowly increase pressure again to test pressure and hold for one more hour. The allowable pressure drop during a 2 hour test shall not exceed 0 psig. Remake leaking joints with new materials and repeat test until accepted.
 2. In addition to hydrostatic test, the contractor shall meet requirements of the local water provider.
- C. Contractor shall submit as-built documentation in the form of plan and profile to the COTR for review and approval at the close of business each day. The as-built documentation shall include horizontal and vertical alignment data of the constructed utility. Alignment data to be taken at 50 foot intervals and at alignment changes. Use the sample table at the end of this section for recording as-built conditions.
- D. Prepare and submit reports for testing activities.
- E. Test gauges used for testing shall be as follows:
1. Tests requiring a pressure 10 psi or less shall utilize a testing gauge having increments of 0.10 psi or less.
 2. Tests requiring a pressure greater than 10 psi but less than or equal to 100 psi or less shall utilize a testing gauge having increments of 1.0 psi or less.
 3. Tests requiring a pressure greater than 100 psi shall utilize a testing gauge having increments of 2.0 psi or less.

3.12 DISINFECTING WATER MAINS

- A. Except as otherwise specified, all new, relocated, or modified water mains and accessories shall be disinfected prior to tie-ins in accordance with AWWA C651, which includes the following requirements:
1. Preliminary Flushing of Mains: All mains shall be flushed prior to disinfection except when the tablet method of disinfection is used (AWWA C651, Section 7.3). The mains shall be flushed at a minimum velocity of 10.0 feet/second and all points in the main shall receive a minimum of five consecutive minutes of flushing at this velocity, until the water runs clear. The Authority shall furnish water, unless otherwise specified.

2. Form of Chlorine to be used: Liquid chlorine, calcium hypochlorite or sodium hypochlorite may be used for disinfection. Liquid chlorine shall be used only when suitable equipment is available and only under the direct supervision of a person familiar with the physiological, chemical and physical properties of this material and who is properly trained and equipped to handle any emergency that may arise. Calcium hypochlorite and sodium hypochlorite shall be added to water to form a chlorine water solution before being used.
3. Methods of Application: The chlorine shall be applied by continuous feed method or the tablet method and performed as specified hereinafter.
 - a. Continuous Feed Method:
 - 1) The rate of water and chlorine shall be proportioned so that the chlorine concentration of water in the pipe is maintained at a minimum of 50 milligrams per liter available chlorinate. To assure that this concentration is maintained, the chlorine residual shall be measured at regular intervals.
 - 2) During the application of the chlorine, valves shall be manipulated to prevent the treatment dosage from flowing back into the line supplying the water. Chlorine application shall not cease until the entire main is filled with the chlorine solution.
 - 3) The chlorinated water shall be retained in the main for at least 24 hours during which time all valves and hydrants, in the section treated, shall be operated in order to disinfect the appurtenances.
 - 4) At the end of this 24-hour period, the treated water shall contain no less than 25 milligrams per liter of chlorine throughout the length of the main.
 - b. Tablet Method:
 - 1) Tablet disinfection is best suited to extensions up to 2,500 feet and mains up to 12 inches in diameter; however, tablet method shall not be used if trench water or foreign material has entered the main or if the water is below 40°F.
 - 2) When used, tablets shall be placed in each section of pipe and also in hydrant branches and other appurtenances. They shall be attached by an adhesive, except for the tablets placed in hydrants and in the joints between the pipe sections.
 - 3) All the tablets within the main shall be at the top of the main. If the tablets are fastened before the pipe section is placed in the trench, their position shall be marked on the section to assure that there will be no rotation. In placing tablets in joints, they shall be crushed and placed on the inside annular space, or if the type of assembly does not permit, they shall be rubbed like chalk on the butt ends of the sections to coat them with calcium hypochlorite.
 - 4) The Contractor shall obtain the COTR's approval in writing the adhesive as recommended by the manufacturer or any alternative. There shall be no adhesive on the tablet except on the broad side next to the surface to which the tablet is attached.
 - 5) When installation has been completed, the main shall be filled with water at a velocity of less than one foot per second. This water shall remain in the pipe for at least 24 hours. Valves shall be manipulated so that the strong

chlorine solution in the line being treated will not flow back into the line supplying the water.

4. **Modifying or Repairing Existing Water Mains:** Liberal quantities of hypochlorite shall be applied to the opened trench (AWWA C651, Section 9) and all pipe and fittings used shall be swabbed or sprayed with a one percent hypochlorite solution before being installed. After completion of the modification or repair the systems shall be disinfected by the methods described herein.
5. **Final Flushing:**
 - a. After the applicable retention period, the heavily chlorinated water shall be flushed from the main until the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the system or less than 1 milligram per liter. Chlorine residual determination shall be made to ascertain that the heavily chlorinated water has been removed from the pipeline. The contractor shall dispose of the heavily chlorinated water and flushing water in accordance with NFPA 24, Chapter 10.10.2. The Contractor shall provide written notification to the COTR of the place of disposal. Flushing shall conform to NFPA regulations.
6. **Bacteriological Test:**
 - a. After the chlorination and final flushing and before the water main is placed in service, a certified laboratory shall collect and analyze two water samples for bacteriological testing. The samples shall be collected at least 24 hours apart. The results of these samples must indicate no coliform contamination before the pipe, tanks, or equipment can be utilized as part of the waterworks. If contamination is indicated the disinfection procedure and bacteriological test shall be repeated and accepted before the system can be placed into service. Samples shall be collected in duplicate at the opposite end of the line from where the pipe was filled with water and at approximately one thousand foot intervals. Samples shall be taken using a sample tap. The sample tap shall consist of a corporation cock and a copper tub gooseneck assembly.
 - b. After samples are collected, the gooseneck assembly shall be removed. Samples shall be collected in sterile bottles treated with sodium thiosulfate. The treated bottles shall not be rinsed. The samples shall be collected by the following procedure: Flame the outlet of the sample tap; flame the mouth of the sample bottle; take the sample, being careful not to bring the mouth of the sample bottle in contact with the sample tap; flame the mouth of the sample bottle again and seal the bottle.
 - c. If the initial disinfection fails to produce satisfactory samples, disinfection shall be repeated until satisfactory samples have been obtained. After each group of samples is taken, the Contractor shall submit in writing to the COTR a report stating the results of the test.

PART 4 - CONTRACTOR'S QUALITY CONTROL

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section - Quality Requirements for requirements for Contractor Quality Control Program.

4.2 FIELD QUALITY CONTROL

- A. Conform to the requirements specified in Division 01 Section "Quality Requirements".
- B. Contractor shall submit as-built documentation in the form of plan and profile to the COTR for review and approval at the close of business each day. The as-built documentation shall include horizontal and vertical alignment data of the constructed utility. Alignment data to be taken at least every 100-feet and at significant utility line geometry changes.

DAILY PIPE ELEVATION READINGS					
Project Title:					
Pipe Description:					
DATE	STATION NO	Top of Trench Elevation	Proposed Invert Pipe Elevation	Actual Pipe Elevation	Difference

END OF SECTION 33 11 16

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SECTION 33 31 17 - SITE SANITARY UTILITY SEWERAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Specification Sections, Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes piping material, methods and specialties for the installation of sanitary gravity sewer systems and force main systems, and television inspection with video tapes of pipes 6 inches or larger.

1.3 REFERENCES

- A. American National Standards Institute:

1. ANSI A 21.10, Ductile-Iron Fittings, 2 through 48 inches, for Water, Sewer and Other Liquids.
2. ANSI A 21.11, Rubber Gasket Joints for Cast Iron and Ductile Pressure Pipe and Fittings.
3. ANSI A 21.50, Thickness Design of Ductile-Iron Pipe.
4. ANSI A 21.51, Ductile-Iron Pipe, Centrifugally Cast, in Metal Molds or Sand-Lined Molds for Water or Other Liquids.

- B. American Society for Testing and Materials:

1. ASTM 746, Ductile Iron Pipe.

- C. American Water Works Association:

1. AWWA A21.4, Special Lining for Ductile Iron Pipe and Fittings for Sewage Pipe and Fittings.
2. AWWA C104, Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water and Other Liquids.
3. AWWA C110, Ductile-Iron Fittings, 3 inch through 48 inch, for Water, Sewer and Other Liquids.
4. AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pipe and Fittings.
5. AWWA C150, Thickness Design of Ductile-Iron Pipe.
6. AWWA C151, Ductile-Iron Pipe Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water, Sewer or Other Liquids.
7. AWWA C153, Ductile-Iron Compact Fittings, 3 inch through 24 inch.

8. AWWA C600, Installation of Ductile Iron Water and Sewer Lines and their Appurtenances.

D. Commonwealth of Virginia

1. 9 VAC 25-790, Sewage Collection and Treatment Regulations.

1.4 SUBMITTALS

- A. Submittals shall be in accordance with the requirements of Division 01 Section "Submittals".

- B. Shop Drawings and Product Data: Furnish completely dimensioned shop drawings, catalog cut or other data as required to provide a complete description of piping, fittings and other appurtenances as follows but not limited to:

1. Product Data

- a. Pipes, fittings, and gaskets
- b. Cast iron access frames and covers for sand trap
- c. Manhole steps for sand trap
- d. Cast iron wall pipe with integral waterstop
- e. Pipe warning and identification tape

2. Shop Drawings

- a. Pre-cast or cast-in-place sand trap and oil/water separator
- b. Concrete mix designs
- c. Reinforcing steel schedule

C. Certificates

1. Certified records or reports of results of shop tests, such records or reports to contain a sworn statement that shop tests have been made as specified.
2. Manufacturer's sworn certification that pipe will be manufactured in accordance with specified reference standards for each pipe type.

- D. Television inspection reports and videotapes made after new pipe installation for pipes sized 6 inch and larger.

1.5 QUALITY ASSURANCE

A. Design Criteria

1. Use only one type and class of pipe in any continuous line of sewer between structures, unless otherwise indicated on the Drawings.
2. Use pipe and fittings designed to withstand imposed trench loadings and conditions at the various locations.

B. Source Quality Control

1. Shop Tests: The manufacturer shall factory test pipe materials listed in the following table. Each pipe manufacturer must have facilities to perform listed tests. COTR reserves the right to require the manufacturer to perform such additional number of tests, as COTR may deem necessary to establish the quality of the material offered for use.

MATERIAL	CHAPTER 1 TEST METHOD	CHAPTER 2 NUMBER OF TESTS
Ductile Iron Pipe	ANSI A 21.51	As specified in ANSI A 21.51

- C. Laboratory Tests: COTR reserves the right to require that laboratory tests also be conducted on materials that are shop tested. Furnish without compensation, labor, materials, and equipment necessary for collecting, packaging, and identifying representative samples of materials to be tested and the shipping of such samples to the Testing Laboratory. The contractor will pay the cost of these laboratory tests.

1.6 MATERIAL DELIVERY, STORAGE AND HANDLING

- A. Transport, handle and store pipe materials and other Products specified herein in a manner recommended by the respective manufacturers to prevent damage and defects.

1.7 SITE CONDITIONS

- A. Environmental Requirements
 1. Keep trenches de-watered until pipe joints have been made and concrete cradle and encasement, if any, have cured.
 2. Under no circumstances lay pipe in water or on bedding containing frost.
 3. Do not lay pipe when weather conditions, as determined by COTR, are unsuitable for pipe laying work.
 4. Do not lay pipe when weather conditions are unsuitable, as determined by the COTR, for pipe laying work.
 5. Existing Utilities: For additional information regarding existing utilities and necessary outages, refer to Division 01 Section, "Summary".

PART 2 - PRODUCTS

2.1 SEWER PIPE AND FITTINGS

- A. For pipe joints, use rubber gaskets or fusion welds as required by manufacturer of piping material used.
- B. Ductile Iron Pipe (DIP): For Gravity Sewer and Sanitary Force Mains.

1. Available Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Griffin Pipe Products
 - b. Clow Water Systems Corporation
 - c. U.S. Pipe
2. Pipe: ANSI/AWWA C151/A21.51.
3. Wall Thickness: ANSI/AWWA C150/A21.50, Class as follows:

- a. Exterior Below Grade Piping

Depth	Pipe Diameter
	3"-14"
<10'	52
10'-14'	52
>14'	54

4. Fittings
 - a. Ductile Compact Fittings: ANSI/AWWA C153/A21.53, Class 350, diameters 4" through 16".
 - b. Ductile Standard Fittings: ANSI/AWWA C110/A21.10, Class 250, diameters 18" through 24".
5. Joints
 - a. Buried Joints
 - 1) Push-on: ANSI/AWWA C111/A21.11.
 - 2) Mechanical: ANSI/AWWA C111/A21.11.
6. Pipe Lining: Ductile Iron pipe and fittings shall be coated inside in accordance with the following:
 - a. Sanitary Sewage Pipe and Fittings: Lining shall meet all quality requirements of ANSI C104 and AWWA A21.4. Lining thickness through 12 inch, shall be not less than 0.125 inches and over 12 inches shall be not less than 0.1875 inches and seal coated per ANSI/AWWA C104/A21.4
 - b. Other Liquid Pipe and Fittings: Lining shall be double coated cement mortar with a minimum thickness of 0.125 inches and seal coated per ANSI/AWWA C104/A21.4.
7. Pipe and Fittings Coating: ANSI/AWWA C151/A21.51, factory coated inside and out with bituminous paint, minimum 1 mil dry thickness. Ductile Iron Pipe: For Gravity Sanitary Sewers.
8. Class 50 conforming to the same applicable references and requirements for ductile iron force main specifications for pipe, joints, fittings and lining.

9. Available Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. J. M. Manufacturing Co.
 - b. Extrusion Technologies, Inc.
 - c. Carlon – Lamson & Sessions
10. Fittings: Conforming to same applicable ASTM Specification requirements for pipe.
11. Joints: ASTM D3212 push-on joint with ASTM F477 elastomeric gasket. Gasket shall be locked in groove of bell to prevent displacement when pipes are joined.

2.2 PIPING SPECIALTIES

A. Flexible Pipe Coupling (for gravity sewers only):

1. Available Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fernco Joint Sealer Company
 - b. Indiana Seal Company

2.3 BURIED PIPE WARNING AND IDENTIFICATION TAPE

- A. Metallic-Lined Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick. Include solid green background with continuously printed caption in black letters.
- B. Caption: “CAUTION--BURIED SEWER LINE BELOW.”

2.4 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
 1. Cement: ASTM C 150, Type II.
 2. Fine Aggregate: ASTM C 33, sand.
 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 4. Water: Potable
- B. Structures: Portland Cement Design Mix - 4000-psi minimum, with 0.45 maximum water-cementitious materials ratio.
 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615, Grade 60, deformed steel.

2.5 PROTECTIVE COATING

- A. Description: Two coats, coal-tar epoxy; 15-mil minimum thickness, unless otherwise indicated; factory or field applied to the following surfaces:
 - 1. Concrete Structures: On exterior surface.
 - 2. Sand Trap Access Frames and Covers: On surfaces that will be exposed to sewer gases.

2.6 CLEANOUTS

- A. Available Manufacturers: Subject to compliance with requirements, or as acceptable to the Authority, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Neenah Foundry Model R-6016.
- B. Gravity Clean-out: Provide 6-inch D.I.P. clean-out riser as detailed on the plans with cast-iron ferrule and countersunk brass clean-out screw plug with 12-inch diameter cast iron access frame and heavy duty cast iron cover suitable for HS-20 loading and labeled "Sewer Clean-out," set in concrete pad as detailed on the plans.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Carefully examine each section of pipe and each pipe fitting before laying in conformance with the inspection requirements of the appropriate referenced standard.
- B. Remove rejected pipe from the Project.

3.2 PREPARATION

- A. Clean piping interior and mating surfaces of bell, spigot and gasket before laying. Maintain clean until completed work is accepted.
- B. Touch-up chipped, cracked, or abraded surfaces and finished joints with two coats of the particular coating material.
- C. Perform trenching for sewer pipe and place pipe bedding as specified in VDOT Specification Section 303 "Earthwork."
- D. Dig bell holes sufficiently large to permit proper joint making and to insure pipe is firmly bedded full length of its barrel.
- E. Excavate trenches in rock at least twenty-five (25) feet in advance of pipe laying. Protect pipe ends if blasting is allowed.

3.3 LAYING PIPE

A. General Requirements

1. Lay pipe proceeding upgrade true to line and grades given. Lay bell and spigot pipe with bell end upgrade unless shown otherwise on the drawings or directed by COTR.
2. Exercise care to insure that each length abuts against the next in such manner that no shoulder or unevenness of any kind occurs along inside bottom half of pipe-line.
3. Center spigot end in bell or socket end of previously laid pipe, shove tight and secure.
4. No wedging or blocking permitted in laying pipe unless by written order of COTR.
5. Before joints are made, bed each section of pipe full length of barrel with recesses excavated so pipe invert forms continuous grade with invert of pipe previously laid. Do not bring succeeding pipe into position until the preceding length is embedded and securely in place.
6. Walking or working on completed pipeline, except as necessary in tamping and back filling, is not permitted until trench is back-filled one-foot deep over top of pipes.
7. Take up and relay pipe that is out of alignment or grade, or pipe having disturbed joints after laying.
8. All pipe that is out of alignment or grade, or pipe having disturbed joints after placement shall be removed and re-installed at Contractor's expense.
9. Take necessary precautions to prevent newly laid pipe from floating as a result water accumulation in the trench; or the collapse of the pipeline from any cause. Restore or replace pipe as necessary at Contractor's expense.
10. Bed pipe using materials specified in VDOT Section 203 - Course Aggregate. Gravity Sewer Pipe bedding shall conform to AASHTO T-99 to a density of 90% standard proctor or to AASHTO T-180 to a density of 90% modified proctor for airfield work. Backfill in accordance with VDOT Section 303, "Earthwork."
11. Cut pipe using only equipment specifically designed for that purpose such as an abrasive wheel, rotary wheel cutter, a guillotine pipe saw or a milling wheel saw. The use of chisels or handsaws will not be permitted. Grind smooth cut ends and rough edges. Bevel slightly, cut end for push-on connections.
12. Where cutting of pipe is necessary, minimum-laying length shall be five (5) feet.
13. Install ductile iron pipe, and fittings, and assemble joints according to AWWA C600.
14. At the end of each work day, the installed gravity sewer or sanitary force main shall be protected so that line remains free of dirt, mud and debris. At the start of the next work day, the line shall be inspected for tracked dirt, mud and debris. All lines failing the inspection shall be removed, cleaned, and replaced to the satisfaction of the COTR.

B. Joints

1. Make pipe and fitting joints according to pipe manufacturer's specifications and to specifications previously specified for pipe.
2. Make joints watertight. Immediately repair detected leaks and defects. Methods of repair subject to COTR's approval.

C. Alignment and Grade

1. Lay and maintain all pipe at the required lines and grades as shown on the Drawings. Place fittings and valves at the required locations with joints centered, spigots forced home, and all valve stems plumb.

2. Deflect pipe joints for force mains where indicated on the Drawings. Deflections shall not exceed pipe manufacturer's recommended maximum allowable deflection.
3. Do not change grade or alignment without COTR's approval.
4. Force main shall be installed on a continual increasing upgrade to its terminus. No high points will be accepted.

3.4 THRUST RESTRAINTS

- A. General: Provide horizontal and vertical thrust restraint at all plugs, caps, tees and bends on pressure pipelines.
- B. Concrete Reaction Backing: Place concrete reaction backing between undisturbed solid ground and the fitting to be anchored. The backing unless otherwise shown or directed, shall be located as to contain the resultant thrust force and so that the pipe and fitting joints will be accessible for repair.
- C. Install megalug retainer gland according to manufacturer's instructions.
- D. Temporary Thrust Restraint: Provide temporary thrust restraint at temporary caps or plugs. Submit details of temporary restraint to COTR for approval.

3.5 BURIED PIPE WARNING AND IDENTIFICATION TAPE

- A. Install continuous plastic underground warning identification tape during back-filling of trenches for gravity sewer and sanitary force main piping. Place tape 18 inches directly over piping.

3.6 CLEANOUT INSTALLATION

- A. Install clean-outs and riser extension from sewer pipe to clean out at grade. Use ductile iron pipefittings in sewer pipes at branches for gravity clean-outs. Install piping so clean-outs open in direction of flow in sewer pipe.
- B. Set clean-out frames and covers in concrete or bituminous paving with tops flush with surface of paving.

3.7 FIELD QUALITY CONTROL

- A. General Requirements: Conduct tests specified herein so that each pipeline and structure installed in Project is tested.
 1. Provide tools, materials (including water), apparatus and instruments necessary for pipeline testing.
 2. Conduct tests in the presence of and to the satisfaction of COTR.
 3. Test reports shall be submitted to the COTR before final invoice.

- B. Alignment Tests General: Contractor shall submit as-built documentation in the form of plan and profile to the COTR for review and approval at the close of each work day. The as-built documentation shall include horizontal and vertical alignment data of the constructed utility. Alignment data to be taken at 50 foot intervals and at alignment changes. Use the table at the end of this section for recording as-built conditions.
- C. Alignment Test for Gravity Sewers: After the mains have been laid, partially back-filled, invert elevations verified, and pipe bedding inspected and tested, a light shall be shined between manholes or manhole locations to determine whether the alignment of the sewer is true and whether any pipe has been displaced, broken or otherwise damaged subsequent to laying. Each sections (manhole to manhole of sewer shall show a full light circle throughout its length. Contractor shall correct all defects to the work to the satisfaction of COTR before work shall proceed. Payment for this work is contingent on the correction of all defects to the satisfaction of the COTR. Contractor shall conduct this test again after backfill and before final acceptance of the sewer work.
- D. Initial Section Test for Gravity Lines: To demonstrate acceptability of installed pipe materials and workmanship, construct and air test one sewer section from manhole to manhole using the pipe provided in the Contract.
1. Conduct Initial Section Test in same manner as Line Acceptance Test specified.
 2. Conduct Initial Section Test for each size and type pipe material used in the Project prior to continued installation of same pipe.
 3. Sewer sections successfully tested, as Initial Section Test will be retested under Line Acceptance Test.
 4. Initial Section Tests shall be incidental to the cost of the pipe installation. No separate payment will be made for these tests.
- E. Line Acceptance Test for Gravity Lines (Leakage tests)
1. After a section of sewer is constructed between adjacent manholes, successfully cleaned, and backfilled, leaving joints exposed perform a low pressure air Line Acceptance Test in accordance with ASTM C 828 and the following:
 - a. Seal and brace sewer piping at upstream and downstream manholes and at all laterals. Test plug seal before actual use by testing plugs outside the trench in one length of pipe pressurized to maximum anticipated testing pressure. Plugs shall hold without bracing and show no movement. After plug is placed in pipe and sealed, brace or protect as insurance against blow out. Protect workers from potential of plug blow out.
 - b. Introduce low-pressure air slowly into sealed sewer section until the internal air pressure is four psig greater than the average ground water pressure acting on the pipe, but in no case higher than 10 psig.
 - c. To determine the internal air pressure for the test, add 3.5 psig to the height in feet of the ground water above the invert of the pipe divided by 2.3. However, the test pressure should not exceed 10 psig. For example, if ground water height is 6.9':
$$3.5 + (6.9 / 2.3) = 6.5 \text{ psig}$$
 - d. Allow no less than 3 minutes for air temperature and pressure to stabilize. Add air only to maintain required test pressure.

- e. After the stabilization period, adjust the test pressure to the required test pressure, and disconnect the air supply. Then measure the time that is required to achieve a 1.0 psig pressure drop.
- f. The line passes if there is zero psig pressure drop in the time designated in Table 1.

TABLE 1			
Nominal Pipe Size	T = Time Minutes/100 feet	Nominal Pipe Size (inches)	T = Time Minutes/100 feet
3	0.2	21	3.0
4	0.3	24	3.6
6	0.7	27	4.2
8	1.2	30	4.8

- 2. After laterals are installed, re-test line in accordance with the above procedure if line is initially tested before the installation of laterals.
- 3. Where lines are live and carry flow, perform Joint Acceptance Test by testing one joint at a time as described in paragraph 4, below.
- 4. Joint Acceptance Test shall test one joint at a time using test apparatus as approved by COTR. Test pressure shall be as determined in paragraph 3.8.D.1.c, above. Consider joint acceptable when the pressure loss is zero psig in one minute. Perform test after one-minute stabilization period.

F. Infiltration Test for Gravity Lines

- 1. Perform the infiltration test after backfill operations have been completed.
- 2. Measure the infiltration rate using a V-Notch Weir. Provide Weir and submit to COTR for written approval.
 - a. Infiltration shall not exceed 100 gallons per day per inch diameter per mile of pipe for any section. Should leakage exceed the amount specified, correct the deficiency.
- 3. Replace faulty or damaged portions of work and retest.
- 4. Gravity Lines shall meet the above requirements before final acceptance will be granted by the COTR.

G. Hydrostatic Testing for Pressure Lines

- 1. Leakage Test Requirements
 - a. The pipe shall be installed and partially back filled with the joints exposed for visual inspection during the test. All newly laid pipe, or any valved section thereof, shall be subjected to the greater of a pressure of 150 pounds per square inch, or 50% in excess of the normal working pressure.
 - b. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled. No pipe installation will be accepted until the leakage is zero gallons per hour.

2. Duration of Test: The duration of the test under pressure shall be two hours.
 - a. Procedure: Each valved section shall be slowly filled with water and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to COTR. The pump, pipe connections, and all necessary apparatus, including gauges, shall be furnished by contractor and approved by COTR. Contractor will make all taps into the pipe, and furnish all necessary assistance for conducting the tests.
3. Expelling Air Before Test: Before applying the specified test pressure, all air shall be expelled from the pipe. If blowoffs are not available at high places, contractor shall make the necessary taps at points of highest elevation before the test is made and insert the plugs after the test has been completed, at no additional cost to Authority.
4. Variation from Permissible Leakage: Should any test of pipe laid disclose leakage greater than that specified above, contractor shall, at his own expense, locate, repair and replace the defective joints, pipe or fittings until the leakage is within the specified allowance.
5. Time for Making Test
 - a. Where any section of a main is provided with concrete reaction backing, the hydrostatic pressure test shall not be made until at least five days have elapsed after the concrete reaction backing was installed. If high early strength cement is used in the concrete reaction backing, the hydrostatic pressure test shall not be made until at least two days have elapsed.
 - b. COTR shall be present during the operating of valves required to fill mains for pressure and leakage test.
 - c. Contractor shall advise COTR of any pressure test and leakage test at least 48 hours in advance. No testing will be authorized unless ambient air temperature is 35o or higher.
 - d. The pressure and leakage tests shall be witnessed by COTR.
 - e. Contractor shall furnish laboratory calibrated test gauges and measuring devices for the leakage test.
 - f. The section under test shall be brought back to test pressure at one-half hour intervals during the testing. COTR will record both the makeup water amount and pressure at each one-half hour re-pressurization.
6. Contractor is responsible for the supply and disposal of water used for testing.

H. Alignment Test for Pressure Lines

1. Prior to back filling of pressure lines, the joint alignment shall be inspected to assure the maximum deflection present in each joint does not exceed the manufacturer's recommendations.
2. Pressure lines that are a portion of a pump discharge system shall be inspected to assure the line is installed at a constant or increasing grade so as to eliminate the possibility for air accumulation at an intermediate high point.
3. Lines shall be installed to a tolerance of 0.01 feet of the lines and grades shown on the drawings.

4. Any and all defects shall be corrected by contractor at no additional cost to Authority prior to back filling.

I. Test gauges used for testing shall be as follows:

1. Tests requiring a pressure 10 psi or less shall utilize a testing gauge having increments of 0.10 psi or less.
2. Tests requiring a pressure greater than 10 psi but less than or equal to 100 psi shall utilize a testing gauge having increments of 1.0 psi or less.
3. Tests requiring a pressure greater than 100 psi shall utilize a testing gauge having increments of 2.0 psi or less.

J. Acceptance: Observation of successful testing of manholes, sewers or force mains by COTR does not constitute acceptance of the system or any portion thereof. Upon completion of any determined portion of a total system, and successful testing thereof, COTR may recommend final acceptance to Authority. Only upon final inspection by Authority or COTR, and upon written acceptance from COTR will the system or portion thereof be considered Substantially Complete. Upon such acceptance, the warranty period as specified for the manholes, sewers or force main will commence.

1. If, during this final inspection, any irregularities are observed, the condition must be corrected at Contractor's expense prior to acceptance.

3.8 TELEVISION INSPECTION

- A. Upon completion of the installation of the sanitary sewer pipeline, experienced personnel trained in location breaks, pipe and joint defects, excessive pipe deflection, poor alignment, and/or infiltration/exfiltration shall inspect all sanitary sewer pipelines 6" in diameter and larger using remote televised cameras.
- B. Video equipment must include a video monitor on-site to observe the operating camera unit. Any significant points of interest must be identified on the tape counter and noted in a logbook.
- C. Video camera shall be capable of providing at least 420 lines of horizontal resolution.
- D. Provide sufficient illumination so that the interior wall of the pipe can be seen, regardless of pipe size.
- E. The camera view head shall have the capability to rotate full 360 degree clockwise or counter clockwise continuously in either direction or stopped at any position by remote control.
- F. The camera shall have sufficient TV cable to provide viewing of an entire stretch of pipe from structure to structure.
- G. Each videotape shall show plainly the location of the television inspection, date, and distance along the pipeline.
- H. The composite videotape shall be on a standard videocassette cartridge.

- I. Submit videotapes to COTR before final invoice.
- J. Videotapes will remain the property of the Authority.
- K. Repair all pipe and/or pipe joint deficiencies discovered by this TV inspection, after repair perform the TV inspection. Repeat process until no deficiencies are discovered.
- L. The COTR will determine if any portion of the inspection tapes are of inadequate quality or coverage. Re-inspect and videotape all areas of inadequate quality or coverage at no additional expense to the Authority.
- M. The finished tape shall be continuous over the entire length of the sewer pipe between two (2) structures and be free of visual defects.

PART 4 - CONTRACTOR’S QUALITY CONTROL

4.1 GENERAL

- A. Comply with applicable provisions of Division 01 Section - Quality Requirements for requirements for Contractor Quality Control Program.

4.2 FIELD QUALITY CONTROL

- A. Specification Section 01 40 00 “Quality Requirements” specifies general requirements for the Contractor’s Quality Control Program.
- B. Field-testing shall conform to the requirements in Article 3.8.
- C. Work shall conform to all requirements of 9 VAC 25-790, Sewage Collection and Treatment Regulations. Including all testing requirements.
- D. Contractor shall submit as-built documentation in the form of plan and profile to the COTR for review and approval at the close of business each day. The as-built documentation shall include horizontal and vertical alignment data of the constructed utility. Alignment data to be taken at least every 100-feet and at significant utility line geometry changes.

DAILY PIPE ELEVATION READINGS					
Project Title:					
Pipe Description:					
DATE	STATION NO	Top of Trench Elevation	Proposed Invert Pipe Elevation	Actual Pipe Elevation	Difference

END OF SECTION 33 31 17

ITEM VDOT-302 DRAINAGE STRUCTURES

DESCRIPTION

302-1.1 DESCRIPTION. This work consists of providing, preparing, and constructing drainage structures and related materials approved by the Engineer in accordance with Section 302 of the Virginia Department of Transportation (VDOT) Road and Bridge Specifications.

MATERIALS

302-2.1 MATERIALS. Provide material in accordance with the following as well as all referenced materials and construction methods within the referenced sections:

Drainage Structures.....	VDOT Section 302
Pipe and Pipe Arches	VDOT Section 232
Structural Steel	VDOT Section 226
Masonry Units	VDOT Section 222
Hydraulic Cement Mortar and Grout.....	VDOT Section 218
Hydraulic Cement Concrete	VDOT Section 217
Subbase and Aggregate Base Material	VDOT Section 208
Joint Materials	VDOT Section 212
Castings.....	VDOT Section 224
Steel Reinforcement.....	VDOT Section 223
Concrete Curing Materials.....	VDOT Section 220
Earthwork	VDOT Section 303
Structure Excavation	VDOT Section 401
Reinforcing Steel.....	VDOT Section 406
Control of Work	VDOT Section 105
Legal Responsibilities	VDOT Section 107
Geosynthetics	VDOT Section 245
Hydraulic Cement Concrete Pavement.....	VDOT Section 316

CONSTRUCTION METHODS

302-3.1 CONSTRUCTION METHODS. All construction methods, equipment, procedures, tolerances, quality control, etc. shall be in accordance with Section 302 of the VDOT Road and Bridge Specifications.

METHOD OF MEASUREMENT

302-4.1 METHOD OF MEASUREMENT. No separate measurement will be made for work under this section.

BASIS OF PAYMENT

302-5.1 BASIS OF PAYMENT. No separate payment will be made for work under this section.

END OF ITEM VDOT-302

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ITEM VDOT-303 EARTHWORK

DESCRIPTION

303-1.1 DESCRIPTION. This work consists of providing, preparing, and constructing earthwork and related materials approved by the Engineer in accordance with Section 303 of the Virginia Department of Transportation (VDOT) Road and Bridge Specifications.

MATERIALS

303-2.1 MATERIALS. Provide material in accordance with the following as well as all referenced materials and construction methods within the referenced sections:

Earthwork	VDOT Section 303
Geosynthetics	VDOT Section 245
Fences.....	VDOT Section 242
Roadside Development Materials	VDOT Section 244
Control of Material.....	VDOT Section 106
Seeding.....	VDOT Section 603
Allaying Dust.....	VDOT Section 511
Clearing and Grubbing.....	VDOT Section 301
Demolition of Buildings and Clearing Parcels.....	VDOT Section 516
Legal Responsibilities	VDOT Section 107
Scope of Work.....	VDOT Section 104
Soil Retention Coverings.....	VDOT Section 606
Subgrade and Shoulders	VDOT Section 305
Demolition of Pavement and Obscuring Roadway	VDOT Section 508
Drainage Structures.....	VDOT Section 302

CONSTRUCTION METHODS

303-3.1 CONSTRUCTION METHODS. All construction methods, equipment, procedures, tolerances, quality control, etc. shall be in accordance with Section 303 of the VDOT Road and Bridge Specifications.

METHOD OF MEASUREMENT

303-4.1 METHOD OF MEASUREMENT. No separate measurement will be made for work under this section.

BASIS OF PAYMENT

303-5.1 BASIS OF PAYMENT. No separate payment will be made for work under this section.

END OF ITEM VDOT-303

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ITEM VDOT-305 SUBGRADE AND SHOULDERS

DESCRIPTION

305-1.1 DESCRIPTION. This work consists of providing, preparing, and constructing subgrade and related materials approved by the Engineer in accordance with Section 305 of the Virginia Department of Transportation (VDOT) Road and Bridge Specifications.

MATERIALS

305-2.1 MATERIALS. Provide material in accordance with the following as well as all referenced materials and construction methods within the referenced sections:

Subgrade and Shoulders VDOT Section 305
Geosynthetics VDOT Section 245

CONSTRUCTION METHODS

305-3.1 CONSTRUCTION METHODS. All construction methods, equipment, procedures, tolerances, quality control, etc. shall be in accordance with Section 305 of the VDOT Road and Bridge Specifications.

METHOD OF MEASUREMENT

305-4.1 METHOD OF MEASUREMENT. No separate measurement will be made for work under this section.

BASIS OF PAYMENT

305-5.1 BASIS OF PAYMENT. No separate payment will be made for work under this section.

END OF ITEM VDOT-305

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ITEM VDOT-308 SUBBASE COURSE

DESCRIPTION

308-1.1 DESCRIPTION. This work consists of providing and constructing subbase course on a surface approved by the Engineer in accordance with Section 308 of the Virginia Department of Transportation (VDOT) Road and Bridge Specifications.

MATERIALS

308-2.1 MATERIALS. Provide material in accordance with the following as well as all referenced materials and construction methods within the referenced sections:

Coarse Aggregate	VDOT Section 203
Subbase Course	VDOT Section 308
Aggregate Base Course.....	VDOT Section 309
Control of Material.....	VDOT Section 106
Constructing Density Control Strips	VDOT Section 304
Subgrade and Shoulders	VDOT Section 305
Subbase and Aggregate Base Material	VDOT Section 208

CONSTRUCTION METHODS

308-3.1 CONSTRUCTION METHODS. All construction methods, equipment, procedures, tolerances, quality control, etc. shall be in accordance with Section 308 of the VDOT Road and Bridge Specifications.

METHOD OF MEASUREMENT

308-4.1 METHOD OF MEASUREMENT. No separate measurement will be made for work under this section.

BASIS OF PAYMENT

308-5.1 BASIS OF PAYMENT. No separate payment will be made for work under this section.

END OF ITEM VDOT-308

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ITEM VDOT-309 AGGREGATE BASE COURSE

DESCRIPTION

309-1.1 DESCRIPTION. This work consists of providing and constructing aggregate base course on a surface approved by the Engineer in accordance with Section 309 of the Virginia Department of Transportation (VDOT) Road and Bridge Specifications.

MATERIALS

309-2.1 MATERIALS. Provide material in accordance with the following as well as all referenced materials and construction methods within the referenced sections:

Subbase and Aggregate Base Material	VDOT Section 208
Aggregate Base Course.....	VDOT Section 309
Control of Material.....	VDOT Section 106
Sodium Chloride and Calcium Chloride	VDOT Section 239
Constructing Density Control Strips	VDOT Section 304
Subgrade and Shoulders	VDOT Section 305
Subbase Course	VDOT Section 308

CONSTRUCTION METHODS

309-3.1 CONSTRUCTION METHODS. All construction methods, equipment, procedures, tolerances, quality control, etc. shall be in accordance with Section 309 of the VDOT Road and Bridge Specifications.

METHOD OF MEASUREMENT

309-4.1 METHOD OF MEASUREMENT. No separate measurement will be made for work under this section.

BASIS OF PAYMENT

309-5.1 BASIS OF PAYMENT. No separate payment will be made for work under this section.

END OF ITEM VDOT-309

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ITEM VDOT-315 ASPHALT CONCRETE PAVEMENT

DESCRIPTION

315.1 DESCRIPTION. This work consists of providing and constructing asphalt concrete pavement and related materials on a surface approved by the Engineer in accordance with Section 315 of the Virginia Department of Transportation (VDOT) Road and Bridge Specifications.

MATERIALS

315-2.1 MATERIALS. Provide material in accordance with the following as well as all referenced materials and construction methods within the referenced sections:

Asphalt Concrete	VDOT Section 211
Asphalt Concrete Pavement	VDOT Section 315
Tack Coat	VDOT Section 310
Asphalt Materials	VDOT Section 210
Subgrade and Shoulders	VDOT Section 305
Prime Coat	VDOT Section 311
Coarse Aggregate	VDOT Section 104

CONSTRUCTION METHODS

315-3.1 CONSTRUCTION METHODS. All construction methods, equipment, procedures, tolerances, quality control, etc. shall be in accordance with Section 315 of the VDOT Road and Bridge Specifications.

METHOD OF MEASUREMENT

315-4.1 METHOD OF MEASUREMENT. No separate measurement will be made for work under this section.

BASIS OF PAYMENT

315-5.1 BASIS OF PAYMENT. No separate payment will be made for work under this section.

END OF ITEM VDOT-316

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ITEM VDOT-316 HYDRAULIC CEMENT CONCRETE PAVEMENT

DESCRIPTION

316-1.1 DESCRIPTION. This work consists of providing and constructing reinforced and non-reinforced Class A4 hydraulic cement concrete pavement on a surface approved by the Engineer in accordance with Section 316 of the Virginia Department of Transportation (VDOT) Road and Bridge Specifications.

MATERIALS

316-2.1 MATERIALS. Provide material in accordance with the following as well as all referenced materials and construction methods within the referenced sections:

Hydraulic Cement Concrete	VDOT Section 217
Hydraulic Cement Concrete Pavement.....	VDOT Section 316
Steel Reinforcement.....	VDOT Section 223
Joint Materials	VDOT Section 212
Concrete Curing Materials.....	VDOT Section 220
Reinforcing Steel.....	VDOT Section 406
Fine Aggregate	VDOT Section 202
Coarse Aggregate.....	VDOT Section 203
Hydraulic Cement	VDOT Section 214
Hydraulic Cement Concrete Admixtures	VDOT Section 215
Water for Use with Cement or Lime	VDOT Section 216
Fly Ash.....	VDOT Section 241

CONSTRUCTION METHODS

316-3.1 CONSTRUCTION METHODS. All construction methods, equipment, procedures, tolerances, quality control, etc. shall be in accordance with Section 316 of the VDOT Road and Bridge Specifications.

METHOD OF MEASUREMENT

316-4.1 METHOD OF MEASUREMENT. No separate measurement will be made for work under this section.

BASIS OF PAYMENT

316-5.1 BASIS OF PAYMENT. No separate payment will be made for work under this section.

END OF ITEM VDOT-316

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ITEM VDOT-501 UNDERDRAINS

DESCRIPTION

501-1.1 DESCRIPTION. This work consists of providing, preparing, and constructing underdrains and related materials approved by the Engineer in accordance with Section 501 of the Virginia Department of Transportation (VDOT) Road and Bridge Specifications.

MATERIALS

501-2.1 MATERIALS. Provide material in accordance with the following as well as all referenced materials and construction methods within the referenced sections:

Underdrains	VDOT Section 501
Drainage Structures	VDOT Section 302
Pipe and Pipe Arches	VDOT Section 232
Coarse Aggregate	VDOT Section 203
Earthwork	VDOT Section 303
Structure Excavation	VDOT Section 401
Geosynthetics	VDOT Section 245

CONSTRUCTION METHODS

501-3.1 CONSTRUCTION METHODS. All construction methods, equipment, procedures, tolerances, quality control, etc. shall be in accordance with Section 501 of the VDOT Road and Bridge Specifications.

METHOD OF MEASUREMENT

501-4.1 METHOD OF MEASUREMENT. No separate measurement will be made for work under this section.

BASIS OF PAYMENT

501-5.1 BASIS OF PAYMENT. No separate payment will be made for work under this section.

END OF ITEM VDOT-302

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ITEM VDOT-507 FENCES

DESCRIPTION

507-1.1 DESCRIPTION. This work consists of providing, preparing, and constructing fences and related materials approved by the Engineer in accordance with Section 507 of the Virginia Department of Transportation (VDOT) Road and Bridge Specifications.

MATERIALS

507-2.1 MATERIALS. Provide material in accordance with the following as well as all referenced materials and construction methods within the referenced sections:

Fences.....	VDOT Section 242
Fences.....	VDOT Section 507
Electrical and Signal Components	VDOT Section 238
Galvanizing.....	VDOT Section 233
Hydraulic Cement Concrete	VDOT Section 217

CONSTRUCTION METHODS

507-3.1 CONSTRUCTION METHODS. All construction methods, equipment, procedures, tolerances, quality control, etc. shall be in accordance with Section 507 of the VDOT Road and Bridge Specifications.

METHOD OF MEASUREMENT

507-4.1 METHOD OF MEASUREMENT. No separate measurement will be made for work under this section.

BASIS OF PAYMENT

507-5.1 BASIS OF PAYMENT. No separate payment will be made for work under this section.

END OF ITEM VDOT-507

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ITEM VDOT-508 DEMOLITION OF PAVEMENT AND OBSCURING ROADWAY

DESCRIPTION

508-1.1 DESCRIPTION. This work consists of demolition and removal of pavements in accordance with Section 508 of the Virginia Department of Transportation (VDOT) Road and Bridge Specifications.

MATERIALS

508-2.1 MATERIALS. Provide material in accordance with the following as well as all referenced materials and construction methods within the referenced sections:

Demolition of Pavement and Obscuring Roadway	VDOT Section 508
Earthwork	VDOT Section 303
Clearing and Grubbing.....	VDOT Section 301

CONSTRUCTION METHODS

508-3.1 CONSTRUCTION METHODS. All construction methods, equipment, procedures, tolerances, quality control, etc. shall be in accordance with Section 508 of the VDOT Road and Bridge Specifications.

METHOD OF MEASUREMENT

508-4.1 METHOD OF MEASUREMENT. No separate measurement will be made for work under this section.

BASIS OF PAYMENT

508-5.1 BASIS OF PAYMENT. No separate payment will be made for work under this section.

END OF ITEM VDOT-309

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ITEM VDOT-512 MAINTAINING TRAFFIC

DESCRIPTION

512-1.1 DESCRIPTION. This work consists of maintaining traffic and providing materials in accordance with Section 512 of the Virginia Department of Transportation (VDOT) Road and Bridge Specifications.

MATERIALS

512-2.1 MATERIALS. Provide material in accordance with the following as well as all referenced materials and construction methods within the referenced sections:

Maintaining Traffic	VDOT Section 512
Retroreflectors	VDOT Section 235
Reflective Sheeting	VDOT Section 247
Delineators	VDOT Section 702
Pavement Marking	VDOT Section 246
Traffic Signs	VDOT Section 701
Control of Work	VDOT Section 105
Traffic Signals	VDOT Section 703
Pavement Markings and Markers	VDOT Section 704

CONSTRUCTION METHODS

512-3.1 CONSTRUCTION METHODS. All construction methods, equipment, procedures, tolerances, quality control, etc. shall be in accordance with Section 512 of the VDOT Road and Bridge Specifications.

METHOD OF MEASUREMENT

512-4.1 METHOD OF MEASUREMENT. No separate measurement will be made for work under this section.

BASIS OF PAYMENT

512-5.1 BASIS OF PAYMENT. No separate payment will be made for work under this section.

END OF ITEM VDOT-512

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ITEM VDOT-517 CONTRACTOR CONSTRUCTION SURVEYING

DESCRIPTION

517-1.1 DESCRIPTION. This work consists of providing all surveying and stakeout and providing materials in accordance with Section 517 of the Virginia Department of Transportation (VDOT) Road and Bridge Specifications.

MATERIALS

517-2.1 MATERIALS. Provide material in accordance with the following as well as all referenced materials and construction methods within the referenced sections:

Contractor Construction Surveying	VDOT Section 517
Maintaining Traffic	VDOT Section 512
Prosecution and Progress of Work.....	VDOT Section 108
Control of Work	VDOT Section 105

CONSTRUCTION METHODS

517-3.1 CONSTRUCTION METHODS. All construction methods, equipment, procedures, tolerances, quality control, etc. shall be in accordance with Section 517 of the VDOT Road and Bridge Specifications.

METHOD OF MEASUREMENT

517-4.1 METHOD OF MEASUREMENT. No separate measurement will be made for work under this section.

BASIS OF PAYMENT

517-5.1 BASIS OF PAYMENT. No separate payment will be made for work under this section.

END OF ITEM VDOT-517

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ITEM VDOT-704 PAVEMENT MARKINGS AND MARKERS

DESCRIPTION

704-1.1 DESCRIPTION. This work consists of establishing the location of pavement markings and installing pavement markings and reflectorized material on specified pavements and providing materials in accordance with Section 704 of the Virginia Department of Transportation (VDOT) Road and Bridge Specifications.

MATERIALS

704-2.1 MATERIALS. Provide material in accordance with the following as well as all referenced materials and construction methods within the referenced sections:

Retroreflectors	VDOT Section 235
Pavement Marking	VDOT Section 246
Pavement Markings and Markers	VDOT Section 704
Glass Beads for Reflectorizing Traffic Markings	VDOT Section 234
Maintaining Traffic	VDOT Section 512

CONSTRUCTION METHODS

704-3.1 CONSTRUCTION METHODS. All construction methods, equipment, procedures, tolerances, quality control, etc. shall be in accordance with Section 704 of the VDOT Road and Bridge Specifications.

METHOD OF MEASUREMENT

704-4.1 METHOD OF MEASUREMENT. No separate measurement will be made for work under this section.

BASIS OF PAYMENT

704-5.1 BASIS OF PAYMENT. No separate payment will be made for work under this section.

END OF ITEM VDOT-704

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