Smithsonian Institution

Office of Planning, Design & Construction

SPECIFICATIONS

PROJECT NO.: **2533105**

PROJECT TITLE: **Construct Arabian Leopard Facility (ALF)**

FACILITY: **National Zoological Conservation Biology Institute (NZCBI)**

PACKAGE: **Phase 1 - Issued for Bid - Addendum 1**

DATE: May 11, 2026

This project is approved as being in conformance with applicable provisions of the Smithsonian Directive (SD) 410.

Michael J. Carrancho, P.E., Deputy Director Date

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TABLE OF CONTENTS

COVER SHEET
TABLE OF CONTENTS

NOTE: SECTIONS NOTED WITH ** ARE WRITTEN AND PROVIDED BY SMITHGROUP CONSULTANTS

NOTE: SECTIONS NOTED IN ***BOLD ITALICS*** ARE ISSUED AS PART OF AMENDMENT 1.

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 0107 – SEALS PAGE
SECTION 01 1000 – SUMMARY (SI)
SECTION 01 2300 – ALTERNATES / OPTIONS (SI)
SECTION 01 2500 – SUBSTITUTION PROCEDURES (SI)
SECTION 01 2600 – CONTRACT MODIFICATION PROCEDURES (SI)
SECTION 01 2900 – PAYMENT PROCEDURES (SI)
SECTION 01 3100 – PROJECT MANAGEMENT AND COORDINATION (SI)
SECTION 01 3200 – CONSTRUCTION PROGRESS DOCUMENTATION (SI)
SECTION 01 3233 – PHOTOGRAPHIC DOCUMENTATION (SI)
SECTION 01 3300 – SUBMITTAL PROCEDURES (SI)
SECTION 01 4000 – QUALITY REQUIREMENTS (SI)
SECTION 01 4200 – REFERENCES (SI)
SECTION 01 5000 – TEMPORARY FACILKITIES AND CONTROLS (SI)
SECTION 01 5639 – TEMPORARY TREE AND PLANT PROTECTION (SI)
SECTION 01 5713 – TEMPORARY EROSION AND SEDIMENT CONTROL (SI)
SECTION 01 5715 – TEMPORARY NOISE AND VIBRATION CONTROLS
SECTION 01 6000 – PRODUCT REQUIREMENTS (SI)
SECTION 01 7300 – EXECUTION REQUIREMENTS (SI)
SECTION 01 7419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL (SI)
SECTION 01 7700 – CLOSEOUT PRCEDURES (SI)
SECTION 01 7823 – OPERATION AND MAINTENANCE DATA (SI)
SECTION 01 7839 – PROJECT RECORD DOCUMENTS (SI)
SECTION 01 7900 – DEMONSTTRATION AND TRAINING (SI)
SECTION 01 8113.15 – SUSTAINABLE DESIGN REQUIREMENTS – LEED (SI)
SECTION 01 9113 – COMMISSIONING (SI)

DIVISION 02 - EXISTING CONDITIONS

SECTION 02 4116 - STRUCTURE DEMOLITION
SECTION 02 4119 – SELECTIVE DEMOLITION **

DIVISION 26 - ELECTRICAL

SECTION 26 0400 – COMMON WORK RESULTS FOR ELECTRICAL (A-1)
SECTION 26 0519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (A-1)
SECTION 26 0543 – UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL (A-1)

DIVISION 31 - EARTHWORK

SECTION 31 1000 – SITE CLEARING **
SECTION 31 2300 – EARTHWORK **

DIVISION 33 - UTILITIES

SECTION 33 1415 – SITE WATER DISTRIBUTION PIPING **
SECTION 33 4200 – STORMWATER CONVEYANCE **

END OF TABLE OF CONTENTS

SECTION 01 1000 - SUMMARY

PART 1 - GENERAL

1.1 PROJECT INFORMATION

A. Project Identification: Construct Arabian Leopard Facility (ALF)
SF Project No. 2533105
NZP-DC: Smithsonian's National Zoo and Conservation Biology Institute (NZCBI)
3001 Connecticut Avenue, NW
Washington, D.C. 20008

B. Smithsonian Institution Contacts:
Contracting Officer (CO) address for Fed Ex and UPS delivery: Smithsonian Institution
Attn: Virginia Chan
Office of Contracting
600 Maryland Avenue, SW, Suite 500E
Washington, DC 20024

Contracting Officer (CO), address for USPS delivery: Smithsonian Institution
Office of Contracting
MRC 1200
P.O. Box 37012
Washington, DC 20013-7012

Contracting Officer's Technical Representative (COTR), address for Fed Ex, USPS, and UPS delivery:
Smithsonian Institution
Attn: Ryan Swanier
Office of Planning, Design & Construction
General Services Building (GSB)
Basement Level
National Zoological Park
3001 Connecticut Avenue, NW
Washington, DC 20008

All references on drawings and in specifications to 'Owner,' 'SI,' 'National Zoological Park,' 'National Zoo,' 'Zoo,' or 'NZP' refer to COTR.

1.2 SUMMARY OF WORK

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. The Contractor shall furnish all supervision, labor, materials, and equipment needed to complete the Construct Arabian Leopard Facility Project located at Smithsonian Institution's National Zoological Park at 3001 Connecticut Avenue NW as set forth on the Drawings for OPDC Project No. 2533105 and in these specifications, both dated April 2, 2026 and as noted below.

The Work includes: The Phase 1 (Early Site) for the Arabian Leopard Facility (ALF) that will be located southeast of the Connecticut Avenue entrance to the National Zoo. It will replace the former Bison Habitat and the existing Zoo in Your Backyard, which is situated along the historic Olmsted Walk, across from the Africa Trail Exhibit (currently under renovation), just north of the Elephant House, and abuts the Panda Habitat.

2. Critical Elements of the Work: The successful Contractor shall be fully qualified to install critical elements of the Work. Upon request of the Contracting Officer, bidders shall submit a statement of qualifications to address the following critical elements of the Work:

    a. Working within an occupied historic campus active with public, staff and animals
    b. Coordination of specialty trades within a small site footprint
    c. Coordination and installation of multiple subsurface utility systems in a congested area
    d. Coordination and installation of subsurface drainage and water conveying systems.
    e. Mitigation of sound and vibration during demolition and construction so as not to harm animals in adjacent habitats
    f. Coordination of construction activities with Zoo operations to align with feeding schedules, DC zoning community noise regulations, Zoo hours, known and unknown animal welfare issues, veterinary care, and public events

3. Related Documents include:
    a. Construct ALF Ph 1 – Early Site Drawings ISSUED FOR BID, dated 4/2/2026
    b. Construct ALF Ph 1 – Early Site Specifications ISSUED FOR BID, dated 4/2/2026
    c. Construct ALF Ph 1 – Early Site Drawing Clarifications, dated 4/21/2026
    d. Construct ALF – Preliminary Acoustic Narrative, dated 1/22/26
    e. Construct ALF – Geotechnical Engineering Study, dated 3/13/25

4. As-built documentation, previous project design drawings, geotechnical/soils reports, structural analysis, surveys, and other materials may be provided for supplemental reference only. Accuracy of any information provided is not guaranteed. Any information contained therein may affect the project and must be field verified.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

C. Contract Time for Completion:

1. Work under this contract shall begin by the Contractor within ten (10) calendar days after the Notice to Proceed, unless stated otherwise in the Notice to Proceed issued by the Contracting Officer and shall be completed within the total contract time of **272** calendar days. All work, including project close-out activities, shall be completed in every respect within the contract time.

2. The start date and completion date shall be as stated in the Notice to Proceed issued by the Contracting Officer.

1.3 BIDDER EXAMINATION OF SITE

A. Every effort has been made to indicate all work necessary to complete the project as identified. All bidders shall carefully examine the premises during the bid period and satisfy themselves as to the extent, nature, and location of the work, general and local conditions, particularly those bearing on transportation, disposal, handling and storage of materials, access routes, availability of labor, water, electric, uncertainties of the weather, type of equipment and facilities needed for the successful execution of the work.

B. Pre-Bid Conference and Site Visit. Before or during the bidding period, a scheduled pre-bid conference and site visit will be announced by the COTR. The purpose of the scheduled meeting is to provide an opportunity for all bidders to review the project site. Any comments, information or discussion during the site visit shall not modify the contract documents.

C. This project requires special arrangements for access to a non-public area. Access to the site may be restricted at times other than during the scheduled visit.

1.4 ACCESS TO SITE

General: Contractor shall have limited use of project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

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

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

a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.5 COORDINATION WITH OCCUPANTS

A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Obtain a Certificate of Occupancy from authorities having jurisdiction before any partial Owner occupancy.

1.6 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on public use and with other requirements of authorities having jurisdiction.

B. Work Restrictions, Adjacent Panda Habitats

1. Anticipated Stop Work Events – Due to the proximity of active panda habitats and associated care facilities to the Arabian Leopards project area, the Contractor shall anticipate any Stop Work Notices issued by the Contracting Officer’s Technical Representative (COTR) as required by animal care staff to protect animal welfare. Stop Work Notices shall be considered a normal and expected part of project execution and shall not constitute grounds for additional cost or time.
2. Potential Panda Relocations – Depending on the nature, duration, and intensity of adjacent construction activities, pandas may require temporary relocation to alternate enclosure spaces. Such relocations require advance notice, schedule coordination, and enhanced communication between the Contractor and the animal care team. The Contractor shall plan work sequencing to support these relocations and shall incorporate required coordination into the project schedule.
3. Means and Methods Affecting Panda Behavior – The Contractor shall submit detailed means and methods for any construction activities that may influence panda behavior, including but not limited to noise, vibration, visual disturbance, equipment movement, or changes in access patterns.
4. Daily Coordination Requirements for Sensitive Work – In addition to standard two week look ahead schedules, the Contractor shall conduct a daily coordination meeting with designated animal care team members prior to the start of sensitive work. This requirement

applies especially to but not limited to high decibel, high impact, or otherwise disruptive activities. The purpose of the meeting is to confirm planned work; review required mitigations and resolve any animal care concerns before work begins.

C. On-Site Work Hours: Limit work in the project area to normal business working hours of 6 a.m. to 3:30 p.m., Monday through Friday, unless otherwise indicated.

1. Weekend Hours: Contractor shall seek approval from COTR.
2. Early Morning Hours: Contractor shall seek approval from COTR
3. Hours for Utility Shutdowns: Shall occur during "OFF HOURS" as determined by the COTR.

D. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and only after providing temporary utility services according to requirements indicated:

1. Shall occur during "OFF HOURS" as determined by the COTR.
2. Existing emergency generators are not available for contractor's required power shutdowns.

E. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify **Owner** not less than **three** days in advance of proposed disruptive operations.

F. Smoking is only allowed in COTR approved designated contractor locations. Contractor shall keep the area clean.

G. Traffic Control. The GC is to provide a flagger with SI issued badge for controlling access and managing all traffic entering NZP property SI\NZP staff will need access to occupied areas adjacent to but outside of the project construction zone, such as the Kudu yard See drawing C140 for additional requirements. Contractor will provide at least one traffic control professional at **each unlocked project vehicle / staff entrance during construction operating hours**. During off hours the entire work area shall be fenced off and locked.

1. **TRAFFIC PERSONNEL.** The Contractor shall provide all necessary personnel for traffic control. The following personnel shall be required:

(1) TRAFFIC SAFETY OFFICER. The Contractor shall provide a competent traffic safety officer. The traffic safety officer shall be thoroughly experienced in and qualified for maintenance of traffic safety control work. Prior to commencing work requiring traffic control management, the Contractor shall certify in writing that the proposed Traffic Control Officer, and any designated substitute, has been certified by the American Traffic Safety Services Association (ATSSA). The Contractor shall submit a certificate verifying successful completion of the ATSSA course and a summary of the Traffic Safety Officer's field experience in the operation of work zone traffic control. Training provided by DDOT, or private firm may be approved provided that the following minimum requirements are met:

a) Successful completion of a comparable work zone traffic control course including evidence of passing a written examination on the material presented in the course.
b) A minimum of one year of documented field experience in work traffic control.

The traffic safety officer or an approved substitute, in case of forced absence, is expected to perform the duties on a regular basis and ensure that all traffic maintenance operations are running smoothly at all times by conducting regular inspections for the duration of the project, particularly during peak hours. The traffic safety officer's prime duty but not sole duty shall be the responsibility for the Contractor's maintenance of traffic operations.

Duties shall include, but not be limited to, the following:

(a) Understand the requirements of the contract provisions.
(b) Be responsible for assuring compliance of the Contractor's maintenance and protection of traffic relative to the requirements of the contract provisions.
(c) Be responsible for assuring that all deficiencies are corrected.
(d) Be responsible for coordinating maintenance of traffic operations with the COTR.
(e) Supervise the installation and removal of all temporary traffic control devices and pavement markings.
(f) Be responsible for daily inspection of the work zone traffic control devices. Inspection results shall be recorded in a Traffic Control Device Inspection Log.
(g) Monitor traffic flows to confirm that delays in the work zone are kept to a minimal duration for Zoo traffic.

(2) FLAGGERS. Contractor shall provide all necessary flaggers required to properly maintain traffic through the work zone. Flaggers shall have completed flagger training and shall be certified by ATSSA or another approved agency or firm.

a) Contractor must submit certification of individuals prior to working on the site.
b) Flaggers shall properly use all required safety gear (vests, flags, cones, tape, flashlights, etc.)

4.2 USE OF PREMISES

A. Use of Site: During the construction period, the Contractor shall have full use of the majority of the premises for construction operations within the "Limits of Construction." The Contractor's use of the premises will be limited by the Smithsonian Institution's right to perform work as indicated below. Security of the construction site is the responsibility of the Contractor.

1. Staff operations within buildings surrounding the project site
2. Contractor Parking: One parking space will be assigned to the Contractor for use during the contract period. The space will be located as close to the project site as possible. Coordinate with COTR.
3. The assigned space can only be used by the company vehicle. The vehicle must be clearly marked with company name and/or logo. The permit shall be displayed on the vehicle dashboard on the driver's side. Vehicles not in compliance with this clause are subject to ticketing and towing by the NZP police. Costs associated with parking violations shall be the sole responsibility of the Contractor.
4. Parking spaces will not be provided for the Contractor's employees. Employees will be required to comply with the NZP's pay parking regulations.
5. Personnel Vehicles may not be parked on the jobsite or roadways.
6. The Contractor is expected to provide whatever means necessary to protect persons and property from work activities.

B. Use of Utilities: Existing utilities are available for the Contractor's use. See Division 01 Section 01500 "Temporary Facilities and Controls."

C. Off-Hours Work and Overtime: For each occasion, the Contractor chooses to work on Saturdays, Sundays, or Smithsonian holidays, or during hours other than 6:00AM – 3:00PM, obtain written permission from the COTR at least 5 working days in advance. The Zoo is located in neighborhood community surroundings, which greatly limits the option to work off hours.

D. Temporary Construction Barriers: The contractor shall coordinate installation with the COTR at least 5 working days prior to the scheduled construction barrier installation.

E. Work Stoppages and Deferrals for Animal Issues: Any issue posing a risk to zoo animal welfare may be considered equivalent to a safety hazard for humans.

4.3 CONTRACTOR BEHAVIOR

A. Dress and Deportment: Contractors and subcontractors on SI-property shall conduct themselves in a manner appropriate to a public place and animal care facility, abiding by all federal, state, and local laws and ordinances, as well as Smithsonian Institution directives. Contractor and subcontractor personnel shall be fully and appropriately clothed at all times. The COTR may require immediate removal of any individual from the premises and Project for:

1. Unacceptable dress, demeanor, disruptive conduct or
2. Unauthorized interaction, feeding, or harassment of any zoo animals or
3. Unauthorized entry into animal containment or non-public area or
4. Tampering with any animal containment barrier, device, gate, or lock.

B. The consumption of alcoholic beverages by the Contractor's personnel is prohibited in/on all Smithsonian property, buildings, or leased space.

C. Smoking or carrying lighted tobacco products is prohibited in all Smithsonian buildings and exhibition/public spaces, in areas where hazardous materials are stored or handled. Acceptable areas for smoking are outside of buildings as designated by the Smithsonian.

D. The possession, sale, or use of narcotic or other illegal substances or contraband by Contractor employees is strictly prohibited in/on all Smithsonian property, facilities, and leased spaces. Working on the project under the influence of alcohol or illegal substances is strictly prohibited.

4.4 JOB-SITE SAFETY AND RELATED SUBMITTALS

A. Safety Coordinator: The Contractor shall designate a person responsible and accountable for personnel safety at both corporate and project level at the project site for the duration of the project. Contracts specifically requiring safety or industrial hygiene personnel shall include a copy of their resumes. Qualifications for the Safety Coordinator shall include the OSHA 30-hour course or equivalent course.

B. SUBMITTALS:

1. Job-Site Safety Plan: Submit a Job-Site Safety Plan that addresses safe construction operations by the contractor within 30 calendar days of the Contract Award and at least 10 calendar days prior to mobilization to the site for approval by the COTR. Detail the procedures, designated persons, instructions, and reports to be used to assure job-site safety for all contractors, subcontractors, Smithsonian personnel, the public, and others on the site. Safety plan shall include adherence to all applicable provisions of Smithsonian Directive 419 (SD419) and all safety standards issued by the Safety Officer of the National Zoological Park.

5. Site Specific Safety Plan: Upon award of this contract, the contractor shall provide a Site-Specific Safety Plan (SSSP). The SSSP is a safety and health policy and program document and outlines how the contractor will safely conduct their work. This plan shall be job-specific and shall also address any unusual or unique aspects of the project or activity for which it is written. The SSSP shall interface with the employer's overall safety and health program, and a copy shall be available on the work site. Any portions of the employer's overall safety and health program that is referenced in the SSSP shall be included as appropriate. The plan shall include but not limited to the following:

a. Signature Sheet that must include plan concurrence (e.g., Chief of Operations, Corporate Chief of Safety, Corporate Industrial Hygienist, project manager or superintendent, project safety professional, project QC). Provide concurrence of other applicable corporate and project personnel (Contractor).
b. Background Information that must include Brief project description, description of work to

be performed, and location; phases of work anticipated these will require a Job Hazard Analysis (JHA's). OSHA 3071

c. Statement of Safety and Health Policy
d. Responsibilities and lines of Authority
e. Subcontractors and Suppliers
f. Training
g. Safety and Health inspections that include assignment of responsibilities for a minimum daily/weekly job site safety and health inspection during periods of work activity level of technical proficiency needed to perform the inspections, proof of inspector's training/ qualifications.
h. Accident Reporting
i. Plans (programs, procedures) required by the Safety Manual. Based on a risk assessment of contracted activities and on mandatory OSHA compliance programs, the Contractor shall address all applicable occupational risks and compliance plans. Using the 29 CFR 1926 and/or current and accepted procedures in the EM 385-1-1 as a guide.
j. Risk Management Processes Detailed project-specific hazards and controls shall be provided by a Job Hazard Analysis (JHA) for each major phase/activity of work, including but not limited to work involving confined space, fall protection, trenching/excavation, crane/rigging, steel erection, hot work, protection of the public, scaffolding, and other activities that involve high risk potential.
k. Jobsite supervisor/superintendent shall sign safety plan and JHA submissions with a final approved copies kept on the jobsite for operational references.
l. Project Evaluation for OSHA's silica standard (29 CFR 1926.1153) focuses on reducing exposure to respirable crystalline silica 12.
   Key requirements include:
   i. Lowering the permissible exposure limit (PEL) from 250 ug/m3 TWA to 50 ug/m3 TWA.
   ii. Implementing engineering controls, respiratory protection, a written plan, proper training, ongoing medical surveillance, and oversight by a competent person.

A. Occupational Safety and Health: This contract is subject to Title 29 of the Code of Federal Regulations, Part 1910 "Occupational Safety and Health Standards" and Part 1926 "Safety and Health Regulations for Construction" pursuant to the Occupational Safety and Health Act (OSHA) of 1970 administered by the US Department of Labor, Occupational Safety and Health Administration.

B. Emergency Assistance: Post at the site telephone numbers for reporting emergencies, including the Smithsonian Office of Protection Services (OPS), ambulance, police, fire department, gas utility, electric utility, water/sewer utility, poison prevention aid, and hazardous- waste handling. Post this information in a conspicuous location within the project area prior to the start of any work at the site.

C. Safety Signs: Post legible accident prevention signs in construction areas in accordance with OSHA standards. Safety signs shall conform to ANSI 235.1, and 235.2 Vehicular traffic control devices, barricades, and signals shall conform to ANSI D6.1.

D. Report of Accident or Illness: In the event of any accident or illness for which medical assistance is required, any criminal actions, or any fire, notify the appropriate authority (ambulance, police, and fire department), Smithsonian Security, and the COTR.

E. Emergency Evacuation: Post evacuation routes and facility emergency/self-protection plans at the site and train all employees in emergency procedures. In the event of a fire, immediately activate the alarm at the nearest fire alarm pull station and notify Zoo Police at (202) 633-4111. Upon the activation of the audible alarm, the building will be evacuated. No personnel shall reenter the facility until security personnel signal that the building is safe.

F. Contractor Personnel to be contacted: Submit a written list of 24-hour emergency telephone

numbers and names of persons to contact for the General Contractor superintendent and for each major sub-contractor working on the project site. The initial list shall be submitted to the COTR at the Preconstruction Meeting. Update and resubmit this list to the COTR as changes occur.

1.10 TOXIC AND HAZARDOUS SUBSTANCES

A. Submit to the COTR, at least thirty (30) working days prior to their intended use, a written list of toxic and hazardous substances that will be used on the project and an NZP Material Approval Form for each. Submit a "Material Safety Data Sheet" similar to OSHA Form No. 20 for these substances to identify the following information:
1. Product Identification
2. Hazardous Ingredients
3. Physical Data
4. Fire and Explosion Hazard Data
5. Health Hazard Data
6. Emergency and First Aid Procedures
7. Reactivity Data
8. Spill or Leak Procedures
9. Special Protection Information
10. Special Precautions

B. Monitor the use of all toxic and hazardous substances to ensure that the specified Threshold Limit Values (TLV's) and/or Permissible Exposure Limits (PEL's) are not exceeded. Exposure of the Contractor's personnel and Smithsonian Institution employees and visitors to air-borne or any other physical contact with any substance shall not exceed allowable concentrations specified in:

1. "Threshold Limit Values and Biological Exposure Indices" of the American Conference of Governmental Industrial Hygienists, and
2. Title 29 CFR Part 1910, Subpart Z - "Toxic and Hazardous Substances" of the Occupational Safety and Health Standards.

C. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances and pollutants produced by construction operations. Remove contaminated waste in compliance with applicable laws and regulations.

D. All containers used for hazardous chemicals shall be properly labeled. Labels should list at least the chemical identity, appropriate hazard warnings, and the name and address of the manufacturer, importer, or other responsible party.

E. To achieve compliance with the requirements of this section, administration or engineering controls shall first be implemented whenever feasible. When such controls are not feasible to achieve full compliance, protective equipment or other protective measures shall be used to keep exposure of all persons within the prescribed limits. Descriptions of equipment or technical measures to be used for this purpose must be submitted to the COTR for approval. The Contractor's requirements for compliance with all applicable local, federal, and state regulations remain in force.

1.11 PERSONAL PROTECTIVE EQUIPMENT

A. Personal protective equipment for eyes, face, ears, nose, head, extremities, and/or full body shall be provided, used, and maintained by the Contractor whenever necessitated by reasons of hazards encountered in a manner capable of causing illness, injury, or impairment in the function of any part of the body.

B. Persons required to use personal protective equipment shall be thoroughly trained. Training

programs shall, as a minimum, meet OSHA and EPA requirements where applicable. The Contractor shall submit proof and criteria for employee training as requested.

1.12 GENERAL SECURITY REQUIREMENTS

A. Prior to the start of work on the site, submit to the COTR, a list of the names, and phone numbers of all Contractor and subcontractor employees. Identify the Prime Contractor and each subcontractor and trade. Update list as necessary to accurately identify all workers who will be working on the site during the Project.

B. Provide the name and telephone number of the Contractor's Superintendent and authorized alternate individual who can be reached on a 24-hour basis at the Preconstruction Meeting.

C. After Beneficial Occupancy, Contractors working inside those areas of the project shall display SI- provided ID badges and sign - in and – out at the zoo police station and other appropriate security checkpoints.

1.13 DRILLING, WELDING, TORCH, AND ARC CUTTING, AND OPERATIONS THAT PRODUCE AIRBORNE CONTAMINANTS

A. Daily Permit: When welding, torch or arc cutting, or other heating operations are to occur inside existing structures, the Contractor shall obtain a daily “Burn Permit.” When work produces dust or other airborne contaminants, e.g., spray painting that could impair existing fire suppression or detection system(s), the Contractor shall obtain a daily “Fire System Impairment Permit.” Each permit must be obtained at least two working days in advance from the Building Manager’s Office through the COTR and posted at the job site prior to beginning the scheduled work.

B. Fire Watch: No welding, torch, or arc cutting shall be performed unless adequate fire protection is provided. The Contractor shall maintain a fire watch for the duration of welding, cutting, and heating operations and for at least 30 minutes after the ‘hot’ work has stopped. A fire extinguisher (minimum 10 pounds, dry-chemical type, typical) shall be on hand when drilling, welding, or cutting.

C. In lieu of SI’s Daily Permit, the Contractor may request the use of Contractor’s job site oversight permit process, confirming that it meets all SI oversight and safety requirements.

1.14 SAFETY

A. All operations shall be conducted in accordance with all national and local fire and safety codes, laws, rules, and regulations.

B. Warning Signs and Barricades: All roadways shall remain open to the public unless approved by the COTR. The Contractor shall provide, erect, and maintain all necessary signs, barricades, traffic cones, warning and danger signals and signs, and provide enough security guards and flaggers to insure the safe flow of traffic, protection of the work area and the safety of the public and staff.

1.15 SPECIFICATION, DRAWING CONVENTIONS, AND ELECTRONIC DATA

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

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

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

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on the Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

1.16 MISCELLANEOUS PROVISIONS

A. Units of Measure: Perform all layout, construction, fabrication, and installation in accordance with the units of measure given in the Contract Documents. This project may be designed, dimensioned, and specified as an imperial project.

1. All Contractor and sub-contractor personnel working on the site shall possess and use appropriate measuring equipment for all work shown. Conversion of dimensions shown on contract documents for use of non-compliant measuring equipment is prohibited.
2. All submittals shall display appropriate measurements to ensure conformance with the Contract Documents. Project-specific shop drawings shall be prepared in preferred appropriate drawing scales and shall display appropriate dimensions.
3. All correspondence shall use appropriate units exclusively. All cost data submitted by the Contractor in a proposal or any other submission shall be in appropriate units.
4. All Operations and Maintenance (O&M) material shall be submitted with appropriate units and dimensions that clearly demonstrate conformance with the contract drawings and specifications.
5. When permits or approvals are required by outside state or local agencies and/or utilities, provide submittals to these authorities in the format, scale, and measurement system they require. Annotate these submittals with parenthetical equivalents of critical size and location dimensions to facilitate the review of the submittal in comparison to the Contract Documents.

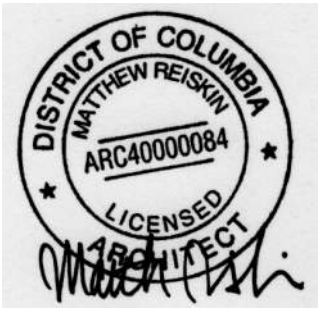
B. Hazardous Materials: Notify the COTR immediately if any suspected asbestos-containing materials, lead paint, PCBs, or other hazardous materials other than those indicated in the construction documents are uncovered during Work.

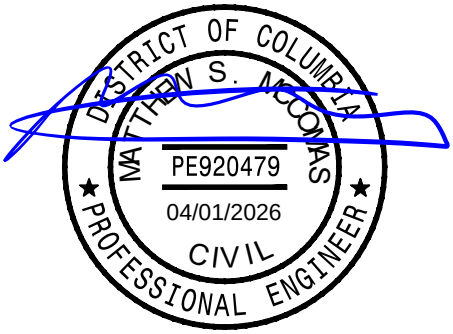
1.17 CONSTRUCTION APPROVAL

A. Final approval and direction shall be provided by the Contracting Officer (CO) or Contracting Officer's Technical Representative-Construction Management (herein COTR). The Authority Having Jurisdiction is SI-Office of Safety, Health, and Environmental Management (OSHEM) and they shall provide direction through the CO or COTR. The owner's agent is the COTR. All references within the construction documents to other entities providing approval shall mean initial approval or recommendation prior to COTR final approval.

END OF SECTION 011000

DOCUMENT 010107 - SEALS PAGE

Architect SmithGroup, Inc. Washington, DC  	Structural Engineer TYLin Washington, DC
Fire Protection Engineer SmithGroup, Inc. Washington, DC	Mechanical Engineer SmithGroup, Inc. Washington, DC
Electrical Engineer SmithGroup, Inc. Washington, DC	Plumbing Engineer SmithGroup, Inc. Washington, DC

Civil Engineer Sorba Engineering Dulles, VA  	Landscape Architect SmithGroup, Inc. Washington, DC
Habitat Designer SHR Studios Bainbridge Island, WA	Geotechnical Engineer Haley Aldrich Annapolis, MD
IT/AV/Telecom Engineer BrightTree Studios Pittsburgh, PA	Electronic Security M2H Protection Middletown, MD

Acoustic Engineer Metropolitan Acoustics Philadelphia, PA	Irrigation Hines Inc. Washington, DC

END OF DOCUMENT

SECTION 01 2300 – ALTERNATES / OPTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents in their entirety, including the Drawings, Specifications, Construction Contract Clauses, and any other documents issued as part of the Contract, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates/options.

1.3 DEFINITIONS

A. Alternate/Option: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates/Options described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate/option is the net addition to or deduction from the Contract Sum to incorporate alternate/option into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate/option into Project.

1. Include as part of each alternate/option, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate/option.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate/option. Indicate if alternates/options have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates/options.

C. Execute accepted alternates/options under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates/options is included at the end of this Section. Drawings and Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate/option.

END OF SECTION 012300

SECTION 01 2500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 016000 “Product Requirements” for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or COTR that are not required in order to meet other Project requirements but may offer advantage to Contractor or COTR.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit each request electronically in Portable Document Format (.pdf) to the COTR for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use CSI Form 13.1A or similar document information wise.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication, or installation cannot be provided, if applicable.
b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by COTR 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.
d. Include annotated copy of applicable Specification Section.
e. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

f. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
g. Samples, where applicable or requested.
h. Certificates and qualification data, where applicable or requested.
i. List of similar installations for completed projects with project names and addresses and names and addresses of architects and COTRs.
j. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
k. Research reports evidencing compliance with building code in effect for project, from ICC-ES.
l. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
m. Cost information, including a proposal of change, if any, in the Contract Sum.
n. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
o. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. If necessary, COTR will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. COTR will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if COTR does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: 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:

   a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
   b. Substitution request is fully documented and properly submitted.
   c. Requested substitution will not adversely affect Contractor's construction schedule. e. Requested substitution has received necessary approvals of authorities having Jurisdiction.
   d. Requested substitution is compatible with other portions of the Work.
   e. Requested substitution has been coordinated with other portions of the Work. h. Requested substitution provides specified warranty.
   f. 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.

B. Substitutions for Convenience: Not allowed

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 01 2600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Section 012500 “Substitution Procedures” for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 MINOR CHANGES IN THE WORK

A. COTR will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions" (ASI).

1.4 PROPOSAL REQUESTS

A. The Smithsonian Institution-Initiated Proposal Requests: COTR will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by COTR are not instructions either to stop work in progress or to execute the proposed change.
2. As detailed in the proposed change request letter, submit a proposal noting the sum and the duration if any, necessary to execute the change.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include costs of labor and supervision directly attributable to the change.
d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an Extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to COTR.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.5 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Section 012100 “Allowances” for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

1.6 CHANGE ORDER PROCEDURES

A. After the COTR approval of a Proposal Request, the Change Order is submitted to the Office of Contracting for processing.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: COTR may issue a Construction Change Directive. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 012600

SECTION 01 2900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Related Requirements:
1. Section 012600 “Contract Modification Procedures” for administrative procedures for handling changes to the Contract.
2. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
4. The Smithsonian Institution Provided Supplemental Contract Documents.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing the 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. Coordinate 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. Submittal schedule.
c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the schedule of values to COTR at earliest possible date, but no later than seven Days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Specifications 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. Contractor's name and address.
c. Date of submittal.

d. Smithsonian Facilities Project Number
e. Construction Contract Number

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. Change Orders (numbers) that affect value.
   d. Dollar value of the following, as a percentage of the Contract Sum to nearest one- hundredth percent, adjusted to total 100 percent.
      1) Labor.
      2) Materials.
      3) Equipment.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Specifications table of contents. Provide multiple line items for principal subcontract amounts in excess of 1 percent of the Contract Sum.

   a. Include separate line items under Contractor and principal subcontracts for and other Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored but not yet installed.

   a. Differentiate between items stored on-site and items stored off-site. If required, 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 Applications for Payment shall be complete.

   a. 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, at Contractor's option.

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

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as approved by the COTR. .

B. Scheduling of the work: By the 25th of each month, inspect the work with the COTR to

determine percentages complete for each item, projected through the end of the month. In the event of a disagreement the COTR will determine the percentage complete.

C. Payment Application Times: (By the last day of the month, submit an Application for Payment based on the determined percentages complete for each item)

D. Application for Payment Forms: Use forms provided by The Smithsonian Institution for Applications for Payment.

E. Application Preparation: Complete every entry on form. Execute by a person authorized to sign legal documents on behalf of the contractor. The COTR will return incomplete applications without action.
1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule.
2. Include the amounts of the Modifications executed before the last day of the construction period covered by application.

F. Stored Materials: Include in Application for Payment the amounts applied for materials or equipment purchased or fabricated and stored but not yet installed. Differentiate between items stored on-site and items stored off-site.
1. Provide certificate of insurance, evidence of transfer of title to The Smithsonian Institution, and consent of surety to payment, for stored materials.
2. Billed Off-Site Material must comply with the applicable Federal Acquisition Regulations (FAR).
3. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
4. Provide summary documentation for stored materials indicating the following:
   a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
   b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
   c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

G. Electronic Submission: Submit signed original copies of each Application for Payment to COTR by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.
1. Attach one complete set of copies of certified weekly payroll data for the period covered by the Application for Payment.
2. Attach the current and up to date Construction Progress Schedule.
3. Attach a Change Order Status Report showing the following information for each approved Modification: Proposal Number, Modification Number (if applicable), affected activity numbers for each proposal, and the approved price for each Modification.
4. Assignment of Claims: Assignment of Claims are subject to the approval of the Contracting Officer. Any Assignment of Claim or subsequent re-assignment shall meet the requirements of the Smithsonian Institution Contract Clause, "Assignment of Claims". All documents for assignments shall be written in the English language and display original ink signatures of the Contractor and the Assignee. All monies shall be in US dollars.
5. Submit copies of Waste Diversion logs in accordance with Section 017419.
6. Submit Construction Photos in accordance with section 013233.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
5. Products list (preliminary if not final).
6. Submittal schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of preconstruction conference.
13. Certificates of insurance and insurance policies.
14. Performance and payment bonds.
15. Data needed to acquire The Smithsonian Institution's insurance.
16. Certified Payroll Documents.

I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. Contractor's Affidavit of Release of Liens.
5. Evidence that claims have been settled.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900 SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Related Requirements:
1. Section 012600 “Contract Modification Procedures” for administrative procedures for handling changes to the Contract.
2. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
4. The Smithsonian Institution Provided Supplemental Contract Documents.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing the 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. Coordinate 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. Submittal schedule.
c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the schedule of values to COTR at earliest possible date, but no later than seven Days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Specifications 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. Contractor's name and address.
c. Date of submittal.
d. Smithsonian Facilities Project Number
e. Construction Contract Number

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. Change Orders (numbers) that affect value.
d. Dollar value of the following, as a percentage of the Contract Sum to nearest one- hundredth percent, adjusted to total 100 percent.
1) Labor.
2) Materials.
3) Equipment.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Specifications table of contents. Provide multiple line items for principal subcontract amounts in excess of 1 percent of the Contract Sum.

a. Include separate line items under Contractor and principal subcontracts for and other Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored but not yet installed.

a. Differentiate between items stored on-site and items stored off-site. If required, 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 Applications for Payment shall be complete.

a. 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, at Contractor's option.

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

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as approved by the COTR. .

B. Scheduling of the work: By the 25th of each month, inspect the work with the COTR to determine percentages complete for each item, projected through the end of the month. In the event of a disagreement the COTR will determine the percentage

complete.

C. Payment Application Times: (By the last day of the month, submit an Application for Payment based on the determined percentages complete for each item)

D. Application for Payment Forms: Use forms provided by The Smithsonian Institution for Applications for Payment.

E. Application Preparation: Complete every entry on form. Execute by a person authorized to sign legal documents on behalf of the contractor. The COTR will return incomplete applications without action.
1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule.
2. Include the amounts of the Modifications executed before the last day of the construction period covered by application.

F. Stored Materials: Include in Application for Payment the amounts applied for materials or equipment purchased or fabricated and stored but not yet installed. Differentiate between items stored on-site and items stored off-site.
1. Provide certificate of insurance, evidence of transfer of title to The Smithsonian Institution, and consent of surety to payment, for stored materials.
2. Billed Off-Site Material must comply with the applicable Federal Acquisition Regulations (FAR).
3. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
4. Provide summary documentation for stored materials indicating the following:
   a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
   b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
   c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

G. Electronic Submission: Submit signed original copies of each Application for Payment to COTR by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.
1. Attach one complete set of copies of certified weekly payroll data for the period covered by the Application for Payment.
2. Attach the current and up to date Construction Progress Schedule.
3. Attach a Change Order Status Report showing the following information for each approved Modification: Proposal Number, Modification Number (if applicable), affected activity numbers for each proposal, and the approved price for each Modification.
4. Assignment of Claims: Assignment of Claims are subject to the approval of the Contracting Officer. Any Assignment of Claim or subsequent re-assignment shall meet the requirements of the Smithsonian Institution Contract Clause, "Assignment of Claims". All documents for assignments shall be written in the English language and display original ink signatures of the Contractor and the Assignee. All monies shall be in US dollars.
5. Submit copies of Waste Diversion logs in accordance with Section 017419.

6. Submit Construction Photos in accordance with section 013233.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
   1. List of subcontractors.
   2. Schedule of values.
   3. Contractor's construction schedule (preliminary if not final).
   4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
   5. Products list (preliminary if not final).
   6. Submittal schedule (preliminary if not final).
   7. List of Contractor's staff assignments.
   8. List of Contractor's principal consultants.
   9. Copies of building permits.
   10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
   11. Initial progress report.
   12. Report of preconstruction conference.
   13. Certificates of insurance and insurance policies.
   14. Performance and payment bonds.
   15. Data needed to acquire The Smithsonian Institution's insurance.
   16. Certified Payroll Documents.

I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
   1. Evidence of completion of Project closeout requirements.
   2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   3. Updated final statement, accounting for final changes to the Contract Sum.
   4. Contractor's Affidavit of Release of Liens.
   5. Evidence that claims have been settled.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 01 3100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1. General coordination procedures
2. Coordination, including items to Salvage and The SI Furnished Contractor Installed items
3. Coordination Drawings
4. Requests for Information (RFIs)
5. Project Meetings
6. Conservation and Salvage
7. Permits, Licenses, and Fees
8. Pre-Condition Survey of the Site
9. Equipment Coordination

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:

1. Division 01 Section 013200 “Construction Progress Documentation” for preparing and submitting the Contractor's Construction Schedule.
2. Division 01 Section 013233 “Photographic Documentation” for preparing and submitting Pre-Condition of the Site Survey.
3. Division 01 Section 013300 “Submittal Procedures” for submittal formats.
4. Division 01 Section 015000 “Temporary Facilities and Controls” for additional Site Utilization Plan submittal requirements.
5. Division 01 Section 017300 “Execution Requirements” for procedures for coordinating general installation and field- engineering services, including establishment of benchmarks and control points, coordination of the trades, and salvage.
7. Division 01 Section 017700 “Closeout Procedures” for coordinating Contract closeout.
8. Various sections of Divisions for specific coordination efforts between the trades.

1.3 COORDINATION

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

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.

3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Pre-installation conferences.
7. Project closeout activities.

C. Correspondence: Correspond with the COTR for all matters related to this construction project, unless otherwise directed. Sign and date all correspondence and reference the project title, Smithsonian Project Number, and the Construction Contract Number.

D. Conservation: Coordinate construction activities to ensure that operations are conducted with consideration given to conservation of energy, water, and materials.

E. Salvage: Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

1. SI assumes no responsibility for salvage value or any loss or damage to materials or structures on the site for which the Contractor may have reflected a salvage value in the bid/offer except as specifically stated in the Contract Documents. Construction materials, equipment, or other items that are to be removed and neither re-used under this Contract nor reserved as property of SI, shall become the property of the Contractor. Remove from the premises and dispose of properly. Any items removed and sold by the Contractor cannot be identified being from the Smithsonian Institution and/or the National Zoo.

F. Salvage: Salvage materials and equipment for The Smithsonian Institution Salvage items identified on drawings to be delivered to the Smithsonian Institution , including but not limited to the following:

1. Salvage and store items identified on drawings to be reinstalled as part of the Contractor's work,

G. Permits, Licenses, and Fees: The Contractor is responsible for verifying all permitting requirements, fees, licenses, and estimated costs associated with the applicable local authorities and utilities. Keep the SI indemnified against all penalties and liability for breach of provisions of any national, or city ordinance, or law, and the regulations and by-laws of any local or other duly constituted authority which may be applicable to the Work, and with such rules and regulations of public bodies and companies.

a. This is a federal project; federal projects are generally exempt from some permitting requirements. However, the following permits or costs are known to be required and are the responsibility of the Contractor: DC storm water management requirements, sediment and erosion control permit, off-site disposal, and transportation related permits, and permits related to asbestos and lead as applicable.
b. Obtain and pay for all applicable permits and licenses required by regulating agencies, including but not limited to permits for pedestrian and road markings and barricades, Construction fences, sidewalk cuts, utility company connections, elevator certificates, Waste containers, and other required items.
c. Pay all duties, fees, taxes, and other charges and file all notices necessary and incidental to the due and lawful execution of the Work.
d. Provide temporary constructions at the site as necessary to maintain safe access, if required, for persons with disabilities. All provisions for temporary access shall be Subject to the approval of the COTR.

H. The Smithsonian Institution (SI) Furnished Contractor Installed Items and Installations:

1. The Contractor shall be responsible for coordinating and monitoring delivery, and for the

installation of SI-Furnished items as part of the overall construction schedule.

2. The Contractor shall coordinate with standard procedures, special events, and other requirements imposed by SI/NZP.

1.4 SUBMITTALS

A. Coordination Drawings: Prepare drawings to ensure building systems and components are compatible and fit together in the space available at appropriate tolerances.

1. See Division 01 Section "Submittal Procedures" for information on preparation of Shop Drawings, formats, quantities, review requirements.
2. See Division 01 Sections "Execution Requirements" and "Project Management and Coordination" for coordinated geometry and utility drawings.

B. Site Utilization Plan: Develop a Site Utilization Plan discussing Contractor's proposed plan for working in and using the Premises for this project. Submit the Site Utilization Plan for approval no less than 5 working days prior to the Pre-construction Conference. No on-site work will be permitted until Contractor receives approval of the Site Utilization Plan. Address interactions with other agencies, contractors, tenants, the public, and any others reviewing this project and/or making use of the site and surrounding areas. Submit a Plan that both graphically and narratively describes at a minimum:

C. Locations of overlap in use of the site by the Contractor and others, including work areas, delivery points, access/egress areas, staging and office space, if applicable

1. Specific items of work by others required to support critical milestones in the Contractor's schedule.
2. Completion or delivery of work by others that may impact the Contractor's schedule.
3. Portions of the Work that create special hazards or disturbances.
4. Portions of the Work that affect utilities, fire protection or detection systems, or security systems.
5. Protection to be provided by the Contractor for work complete by others either before or during the Project.
6. Coordination between all components and disciplines.
7. Traffic control as required to maintain safe construction operation and safe pedestrian travel.
8. Contractor staging area and their recommended solution to address contractor and staff areas of overlap.
9. Traffic Control Plan for this area per Manual on Uniform Traffic Control Devices (U.S. Department of Transportation, Federal Highway Administration, latest edition), including but not limited to proposed plans, durations, and methods for any lane closures, including certified flaggers, barriers, traffic signals, and safe passage of pedestrians near the construction site.

D. Staff Names: Within 10 days after award of construction operations, submit a list of principal staff assignments, including project manager for construction, superintendent, and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers (see also Division 01 Section "Temporary Facilities and Controls"). Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

E. Subcontract List: Within 30 days of starting construction operations, prepare and submit 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.

1. Name, address, and telephone number of entities 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.

F. Key Personnel Names: Within 10 days of starting construction operations, submit a list of key personnel assignments, including Project Manager for construction, superintendent, and other

personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates 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 list current at all times.

1.5 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify COTR of scheduled meeting dates and times.
   2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
   3. Reporting: Record significant discussion and agreements achieved. Attach any updated schedules or other documentation discussed. Distribute the meeting minutes to everyone concerned. Copies for SI personnel and SI consultants shall be delivered to the COTR for distribution. Meeting minutes should be prepared within **5** working days of the meeting.

B. Preconstruction Conference: The COTR will schedule a preconstruction conference before starting construction, at a time convenient to the Contractor, but no later than 10 working days after execution of the Agreement. The conference will be held at Project site or another convenient location at a time coordinated with the COTR. The COTR will conduct the meeting to review responsibilities and personnel assignments.
   1. Attendees: Authorized representatives of the SI and COTR, Architect/Engineer, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   2. Agenda: Discuss items of significance that could affect progress, including the following:

      a. Contract Time: Construction Notice-to-Proceed date and Completion date.
      b. Tentative construction schedule. Phasing.
      c. Critical work sequencing.
      d. Dimensional controls and role of surveyor.
      e. Mobilization and Staging.
      f. Designation of responsible personnel; emergency procedures and phone numbers.
      g. Procedures for processing RFI's, field decisions, and Change Orders/Contract Modifications.
      h. Procedures for processing Applications for Payment.
      i. Distribution of the Contract Documents.
      j. Submittal procedures.
      k. Preparation of Record Documents.
      l. Use of the premises: utility interruptions; building systems interruptions, including fire protection; accessibility requirements; preservation of vegetation, wildlife, and natural resources; responsibility for temporary facilities and controls; office, work, and storage areas; equipment deliveries and priorities; access to loading dock, haul routes, Contractor deliveries.
      m. Parking availability.
      n. First aid.
      o. Security and Fire Protection requirements.
      p. Progress cleaning and housekeeping.
      q. Pre-condition of the site survey.
      r. Rough-in inspections.
      s. Testing.

t. Quality Assurance.
u. Frequency and scheduling of Progress Meetings.

C. Pre-Submittal and Pre-installation Conferences: Conduct pre-submittal and pre-installation conferences at Project site before each coordinated shop drawing and construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the COTR of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
   a. Contract Documents.
   b. Options.
   c. Related Change Orders.
   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. Regulations of authorities having jurisdiction.
   s. Testing and inspecting requirements.
   t. Required performance results.
   u. Protection of construction and personnel.

3. Record significant conference discussions, proposals, agreements, and disagreements.
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. Progress Meetings: Conduct progress meetings at weekly intervals or as scheduled by COTR. Coordinate dates of meetings with preparation of payment requests. (Progress Meetings may evolve into Project Close-out Meetings at a mutually agreed-upon point in the project.)

1. Attendees: In addition to representatives of the SI, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
   a. Safety issues or concerns.
   b. 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.

c. Review present and future needs of each entity's present, including the following:
   1) Interface requirements.
   2) Dimensional and survey issues.
   3) Sequence of operations.
   4) Status of submittals & RFI's.
   5) Deliveries.
   6) Off-site fabrication.
   7) Access.
   8) Site utilization.
   9) Temporary facilities and controls.
   10) Work hours.
   11) Hazards and risks.
   12) Progress cleaning.
   13) Quality and work standards.
   14) Change Orders.
   15) Documentation of information for payment requests.

3. 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.

E. Special Topic and Coordination Meetings: Conduct special topic and coordination meetings when technical issues or immediate needs require them. Schedule time, place, and appropriate attendees with the COTR. Special topic and coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and pre-installation conferences. Provide minutes of meetings for distribution within **5** working days.

1. Fire Alarm Contractor shall walk the Project Site with the SI OSHEM Fire Protection Engineer before proceeding with work to determine final mounting height and location for the exit signs.
2. Animal care team meeting to review and select final locations of viewing ports in fence lines.
3. Animal care team meeting to review and select final locations and arrangements of deadfall items.

F. Monthly Executive Project Review Meetings: The COTR will conduct monthly executive meetings at the site established in the Preconstruction Conference for the purpose of briefing senior SI personnel on construction progress.

1. Attendees: In addition to representatives of the SI (as invited by the Contracting Officer and the COTR) and the Architect/Engineer, the Contractor's Project Manager, Superintendent, Quality Assurance Representative, Project Executive (as needed), other necessary Contractor personnel, and major or otherwise critical subcontractor personnel, shall attend.

   a. Agenda: Review and correct or approve minutes of the previous meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
   b. Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined 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.
   c. Schedule Updating: Revise Combined Contractor's Construction Schedule after each

coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.

d. Review present and future needs of each contractor present, including the following:

1) Interface requirements between SI activities and construction activities.
2) Special events.
3) Access.
4) Site utilization and security.
5) Hazards and risks.
6) Progress cleaning.
7) Quality and work standards.
8) Change Orders.
9) Other items significant to the participants' responsibilities.

e. Site Tours: Meetings may conclude with a tour of the construction site. Provide an authorized Contractor's representative to lead tour and ensure safety of participants.

1.6 PRE-CONDITION SURVEY OF THE SITE

A. After the Preconstruction Meeting and prior to start of the Work on site, inspect the project site (i.e., Building, its contents, grounds, and equipment) with major subcontractors, the COTR and other SI personnel as required for the purpose of verification of the existing conditions. Any damages or defective equipment will be noted at this time, and this survey will serve as the basis for the establishment of the pre- construction conditions. The Contractor and the Smithsonian Institution will jointly establish the identification of pre-construction conditions. Written and Photographic Documentation: Prepare a typewritten and photographic report to identify damages or defects of materials, equipment, and/or the site, in accordance with the requirements in Division 01 Section "Photographic Documentation". Retain one report and submit one report electronically to the Contracting Officer and the COTR.

B. Video Documentation: Video the observations made during the survey of the existing conditions for the buildings, improvements, finishes, utilities, interior surfaces, construction, and other systems, components, or materials which might be affected by the Work, including sidewalks, streets, and adjacent facilities, in accordance with the requirements in Division 01 Section "Photographic Documentation." Submit documentation electronically to the COTR.

1.7 PAINT COORDINATION

A. Coordinate marking and painting of mechanical and electrical items. The COTR will provide a paint matrix for reference and coordination between systems.

1.8 COORDINATION DRAWINGS

A. Coordination Drawings, General: Drawings prepared by Contractor which superimpose Work of several trades, including but not limited to architectural, structural, mechanical, plumbing, fire protection, fire alarm, and electrical Work. Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as

applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe the relationship of various systems and components.
b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.

f. Indicate required installation sequences.
g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to the COTR indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract. Contractor shall utilize GIS / CAD to capture all utilities within project site and shall adhere to ASCE/CI 75-22

E. Review: COTR will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If COTR determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the COTR will inform the Contractor, who shall make changes as directed and resubmit.

1. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."

F. Special Design Considerations:

1. Locate any device requiring periodic maintenance or access in walls in non-public, non- animal areas or above accessible ceilings.

1.9 CONSTRUCTION LAYOUT

A. Description of Work
1. Furnish surveying and dimension control for Project.
2. Locate per Civil Drawings. Maintain benchmarks throughout construction operations.
3. Maintain central file of dimensional information that is updated weekly with information on actual field measurements.
4. Lay out structural walls and major utilities.

B. Contractor Responsibilities
1. Contractor is responsible for properly laying out Work and for lines, measurements, and locations of Work.
2. Contractor is responsible for coordinating actual field dimensions with subcontractors.
3. Notify COTR of issues that arise related to actual dimensions of installed work and include proposed corrective measures.

1.10 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. COTR will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. RFI number, numbered sequentially.
6. RFI subject.
7. Specification Section number and title and related paragraphs, as appropriate.
8. Drawing number and detail references, as appropriate.
9. Field dimensions and conditions, as appropriate.
10. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
11. Contractor's signature.
12. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. COTR will review each RFI, determine action required, and respond. Allow ten working days response for each RFI.

1. The following Contractor-generated RFIs will be returned without action:
    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of The COTR's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. COTR action on RFIs that may result in a change to the Contract Time, or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

    a. If the RFI response warrants change in the Contract Time or the Contract Sum, notify COTR in writing within 2 days of receipt of the RFI response.

D. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly**.** Include the following Software log with not less than the following:

1. Project name.
2. Name and address of Contractor.
3. RFI number including RFIs that were returned without action or withdrawn.
4. RFI description.

5. Date the RFI was submitted.
6. Date COTR response was received.

E. On receipt of COTR action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify COTR within 24 hours if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.11 PROJECT FILES

A. On completion of Project, provide **one** complete archive copy of all Project files in PDF and original document format.

1. Attendees: Authorized representatives of The Smithsonian Institution, The Smithsonian Institution's Commissioning Authority, Construction Manage**r,** Architect, and their consultants; Contractor and its superintendent and LEED coordinator; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Closeout Conference: Contractor shall schedule and conduct a project closeout conference, at a time convenient to The Smithsonian Institution and Architect.
3. Conduct the conference to review requirements and responsibilities related to Project closeout.
4. Attendees: Authorized representatives of The Smithsonian Institution, The Smithsonian Institution's Commissioning Authority, 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.
5. Agenda: Discuss items of significance that could affect or delay Project closeout, including:
   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.
   e. Requirements for preparing operations and maintenance data.
   f. Requirements for delivery of material samples, attic stock, and spare parts. g. Requirements for demonstration and training.
   h. Preparation of Contractor's punch list.
   i. Procedures for processing Applications for Payment for final payment.
   j. Submittal procedures.
   k. Coordination of separate contracts.
   l. The Smithsonian Institution's partial occupancy requirements.
   m. Installation of The Smithsonian Institution's furniture, fixtures, and equipment.
   n. Responsibility for removing temporary facilities and controls.
6. Minutes: Entity conducting meeting will record and distribute meeting minutes. Revise "Progress Meetings" Paragraph below if Project requires holding progress meetings at different intervals. Insert special intervals such as "every third Tuesday" to suit special circumstances.

F. Coordination Meetings: Conduct Project coordination meetings at required intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and pre-installation conferences.

1. Attendees: In addition to representatives of the COTR, each contractor, subcontractor,

supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of project.

    a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 01 3200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's construction schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Special reports.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting schedules and reports.
2. Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely Affecting the planned Project completion date.

G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file, where indicated.
2. PDF electronic file.

B. Startup construction schedule.

1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.

F. Construction Schedule Updating Reports: Submit with Applications for

Payment. G. Daily Construction Reports: Submit at weekly intervals.

H. Material Location Reports: Submit at monthly intervals.

I. Site Condition Reports: Submit at time of discovery of differing

conditions.

J. Special Reports: Submit at time of unusual event.

K. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of COTR's request.

A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing, work stages, area separations, interim milestones and partial Owner occupancy and site use.
4. Review submittal requirements and procedures.
5. Review time required for review of submittals and resubmittals.
6. Review requirements for tests and inspections by independent testing and inspecting agencies.
7. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
8. Review and finalize list of construction activities to be included in schedule.
9. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for commencement of the Work and/or the Notice to Proceed (indicate both if different), to date of final completion.
1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
1. Activity Duration: Define activities so no activity is longer than **20**days, unless specifically allowed by the COTR.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in Schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than 14 days for startup and testing.
5. Punch List and Final Completion: Include not more than **30** days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 “Summary." Delivery dates indicated stipulate the earliest possible delivery date.
6. Work Restrictions: Show the effect of the following items on the schedule:
   a. Coordination with existing construction.
   b. Limitations of continued occupancies.
   c. Uninterruptible services.
   d. Partial occupancy before Substantial Completion.
   e. Use of premises restrictions.
   f. Provisions for future construction.
   g. Seasonal variations.
   h. Environmental control.
   i. NZP Special Events Impacting Site Access
   j. Government Holidays

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
   a. Subcontract awards.
   b. Submittals.
   c. Purchases.
   d. Mockups.
   e. Fabrication.
   f. Sample testing.
   g. Deliveries.
   h. Installation.
   i. Tests and inspections.
   j. Adjusting.
   k. Curing.
   l. Building flush-out.
   m. Startup and placement into final use and operation.
   n. establishment of planting

8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
   a. Structural completion.
   b. Temporary enclosure and space conditioning.
   c. Permanent space enclosure.
   d. Completion of mechanical installation.

e. Completion of electrical installation.
f. Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

F. Recovery Schedule: When periodic update indicates the Work is **7** or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

H Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction.

C. CPM Schedule: Prepare Contractor’s construction schedule using a cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.

a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the

following activities:

a. Preparation and processing of submittals.
b. Mobilization and demobilization.
c. Purchase of materials.
d. Delivery.
e. Fabrication.
f. Utility interruptions.
g. Installation.
h. Work by Owner that may affect or be affected by Contractor's activities.
i. Testing and commissioning.
j. Punch list and final completion.
k. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
   a. Sub networks on separate sheets are permissible for activities clearly off the critical path.
5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.

6. Changes in total float or slack time.
7. Changes in the Contract Time.

H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests, coordinate timing with progress meetings.

a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
b. Submit value summary printouts before each regular scheduled progress meeting.

2.3 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (see special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project 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 materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.4 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within **one** day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the work, prepare and submit a special report. List chain of events, persons participating, and response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.

1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

C. Distribution: Distribute copies of approved schedule to COTR, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction Activities.

END OF SECTION 013200

SECTION 01 3233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents in their entirety, including the Drawings, Specifications, Construction Contract Clauses, and any other documents issued as part of the Contract, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:
1. Preconstruction photographs.
2. Periodic construction photographs.
3. Final completion construction photographs.
4. Preconstruction video recordings.
5. Periodic construction video recordings.
6. Web-based construction photographic documentation.

B. Related Requirements:
1. Section 013300 "Submittal Procedures" for submitting photographic documentation.
2. Section 017700 "Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.
3. Section 017900 “Demonstration and Training” for submitting video recordings of demonstration of equipment and training of Owner's personnel.
4. Section 024119 "Selective Structure Demolition" for photographic documentation before selective demolition operations commence.
5. Section 311000 “Site Clearing” for photographic documentation before site clearing Operations commence.

1.3 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names, and addresses of architects and owners, and other specified information.

B. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each **photograph.** Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

C. Construction Photographs: Submit one digital file of each photographic view within ten working days of taking photographs.
1. All images, digital media, contact sheets, photographs, and negatives, including the copyright thereto, are the sole property of the Smithsonian Institution and shall be submitted to the COTR before Final Payment processing. The Contractor shall not use Smithsonian Institution property except as authorized in writing by the Contracting Officer.
2. Digital Images: Submit a complete set of digital image electronic files. Identify electronic media with date photographs were taken. Submit images that have the same aspect ratio as the sensor, un-cropped.
3. Submit a minimum of 10 digital photo files per week.

1.4. QUALITY ASSURANCE

A. Photographer Qualifications: An individual with advanced camera skills and professional quality equipment.

1.5. COORDINATION

A. Auxiliary Services: Cooperate with the photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities including temporary lighting.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPEG format, with minimum sensor size of 8 megapixels format transmitted electronically to the COTR.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. Pre-construction Photographs: Before starting construction, take color photographs of project site and surrounding areas from different vantage points, as directed by the COTR. This will serve as the basis for the establishment of pre-construction conditions. See also Division 01 Section "Project Management and Coordination", Article 1.6.
1. Take photographs to show existing conditions adjacent to the property before starting the Work.
2. Identify damages or defects of materials, equipment, and the site. Retain one copy and submit one copy to the COTR electronically.

B. Periodic Construction Photographs: Take a minimum of 10 color photographs per week, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. The actual number and location of views shall be directed by the COTR. Take photographs at the start and finish of various construction activities as directed by the COTR. Select vantage points to best show status of construction and progress since the last photographs were taken.

C. Final Completion Construction Photographs: The COTR will discuss with the photographer for desired vantage points.

1. Upon completion of the project, provide pictures of the entire project documenting all of the project's highlights and features.

D. All references to photo documentation is for electronic format submissions. All documentation submitted will
become the property of SI for SI's duplication and distribution.

END OF SECTION 013233

SECTION 01 3300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents in their entirety, including the Drawings, Specifications, Construction Contract Clauses, and any other documents issued as part of the Contract, apply to this Section. All submittal documentation shall be submitted in a PDF format plus program file and hard copies as requested.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Division 01 Section 012500 “Substitution Procedures” and “Product Requirements” for substitutions.
2. Division 01 Section 012900 “Payment Procedures” for submitting Applications for Payment.
3. Division 01 Section 013100 “Project Management and Coordination” for submitting reports and coordination drawings.
4. Division 01 Section 013200 “Construction Progress Documentation” for submitting schedules and reports, including Contractor's Construction Schedule Submittals Schedule.
5. Division 01 Section 013233 “Photographic Documentation” for submitting construction photographs.
6. Division 01 Section 014000 “Quality Requirements” certifications and for erecting mockups.
7. Division 01 Section 017700 “Closeout Procedures” for submitting warranties.
8. Division 01 Section 017839 “Project Record Documents” for submitting Record Drawings, Record Specifications and Record Product Data.

1.3 DEFINITIONS

A. Shop Drawings: Detailed drawings, schedules, diagrams, and illustrations prepared specifically for this project by the Contractor, or any subcontractor, manufacturer, supplier, or distributor to illustrate fabrication and/or installation of a portion of the Work.

B. Schedule: A detailed tabulation of components, items, or parts to be furnished for use on this project.

C. Statement: An affirmation prepared by the Contractor, the installer, or manufacturer of a material, product, or system, to satisfy a requirement defined in a technical section.

D. Factory Test Report: A written report of the findings of a test performed by the Contractor on an actual portion of the Work or prototype prepared for this project before it is shipped to the site.

E. Field Test Report: A written report of the findings of a test performed by the Contractor on a portion of the Work during or after installation.

F. Certificate of Compliance: A written statement, signed by an authorized official of the manufacturer of a product or system or supplier of a material attesting that the product, system, or material meets the requirements of the contract documents. The certificate of compliance must be dated after the award of this Contract and must name the project and cite the specification section, paragraph, and requirements which it is intended to address.

G. Product Data: Illustrations, standard schedules, performance charts, instructions, brochures, diagrams, manufacturer's descriptive literature, and catalog information illustrating a material, product, or system to be installed on this project.

H. Color Charts: Pre-printed brochures showing the color range of a material.

I. Test Reports: Reports verifying that a material, assembly, system, process, or laboratory meets requirements established in the Contract Documents. Reports shall indicate compliance by naming and describing the test method and test results. Testing must have occurred within three years of the date of award of this contract.

J. Samples:

1. Physical examples of materials, equipment, assemblies, or workmanship establishing standards for evaluating finished Work.
2. Color/Texture Selection Sample ("range set"): Samples of an available range of textures and/or colors of a material formed of the actual finish material over a substrate identical to that which will be used in the field.

K. Testing Mock-Ups:

1. Provide full scale assemblies of components specified as test specimens. Simulate actual construction conditions as accurately as possible.
2. Provide extra materials required to replace any which fail during tests, except intentional failure tests beyond specified performance requirements. Provide sufficient stock of Replacement materials at test site to complete tests without delay.
3. See relevant Specification Sections for testing requirements.
4. Shipping mock-up to test site:

    a. Assemble test specimens in shop to verify completeness and adequacy.
    b. Dismantle test specimens and ship to test site using same packing, loading procedures and mode of transportation as used for components shipped directly to Project site.

5. Assembling mock-ups at test site:

    a. Retain same installer as will be assembling components at project site to assemble test specimens at test site.
    b. When possible, use personnel assigned to Project site to do assembly.

L. Sample Panels:
1. A sample panel specially erected near Project site or, upon COTR's approval or direction, at a remote location that incorporates several specified materials.
2. Sample panels display color range, texture, bond, joinery, tolerances, mortar color and workmanship expected of materials incorporated in Work.
3. Sample panels will be used by COTR for final material selection.
4. Maintain approved sample panels in good condition until completion of relevant work and use as standard for work.
5. Remove sample panels from project site at completion of project.

M. Shop Production Samples:

1. A sample panel specially erected at fabricator's shop that incorporates specified materials or components.
2. Construct shop production samples prior to commencing fabrication of component.
3. Shop production samples display color range, texture, bond, joinery, fabrication tolerances, mortar color and workmanship expected of materials incorporated in work.
4. Maintain approved shop production samples in good condition until completion of relevant work and use as standard for work.
5. Finished and maintained shop production samples may be incorporated into work.

N. Mockups (Sample Installations):

1. Definition: A partial installation of selected materials for COTR's approval of workmanship, installation tolerances and visual acceptance of materials.
2. Construct mockups prior to pre-installation conferences.
3. Maintain mockups during construction as a standard for work.
4. Finished and maintained mockups may be incorporated into work, unless they are specifically indicated to be removed from project site at completion of project.

O. Material Safety Data Sheets: Instructions, warnings, and recommended and required handling and use procedures for individual hazardous materials published by the product manufacturer.

1.4 SUBMITTALS

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual specification sections. Types of submittals are indicated in individual specification sections.

1. The Contractor shall provide electronic submittals as PDF electronic files directly to the COTR for distribution to the A/E team. See below for hard copy requirements.
2. The COTR will return a memorandum containing applicable comments with an annotated file, if applicable.
3. The Contractor is to annotate and retain one copy of the file as an electronic project record.

B. Certificates and certifications submittals: Provide a statement that includes the signature of the entity responsible for preparing the certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

C. Construction Drawings: Prepare and submit on a bi-weekly basis. Files shall be submitted in CAD / GIS format. . Construction drawings shall contain objects and data required to purchase, fabricate, and install project elements and graphically indicate construction progress.

D. As-Built Drawings: After installation of all elements, update and submit As-Built drawings to document the condition of the facility upon completion of construction. Files shall be submitted in CAD / GIS format. In addition, SI expects to receive final approved PDF As-Built Drawings electronically.

E. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. 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. The COTR reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
3. Submittals shall be complete for each Specification Section in order to be considered for Review by the COTR, with the exception of installation and post-installation tests and reports. Incomplete submittals will be rejected by the COTR.

F. Submittals Schedule and Control Log: Comply with requirements in Division 01 Section “Construction Progress Documentation” for list of submittals and time requirements for scheduled performance of related construction activities.

G. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on the COTR’s receipt of submittal.

1. Initial Review: Allow 15 working days for initial review of each submittal. Allow additional time if processing must be delayed permitting coordination with subsequent submittals. The COTR will advise Contractor when a submittal being processed must be delayed for coordination.
2. If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Allow 10 working days for each re-submittal.
4. 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 time for Resubmission of items which are initially rejected due to improper submission or non- Compliance with the Contract Documents.
5. Provide COTR with 2 weeks' notice of proposed visits to remote sites to review shop production samples.

H. 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 adequate space on label or beside title block to record Contractor's review and approval markings, COTR/Engineer's submittal stamp, and the COTR's submittal stamp. On submittals requiring delegated-design responsibility, provide room for Professional Engineer's stamp and signature.
3. Include the following information on label for:

   a. Project name.
   b. Project Number.
   c. Date.
   d. Name and address of Contractor.
   e. Name and address of subcontractor.
   f. Name and address of supplier.
   g. Name of manufacturer.
   h. Unique identifier, including revision number.
   i. Specification Section number, title, and full paragraph number of appropriate specifications.
   j. Drawing number and detail references, as appropriate.
   k. Other necessary identification.

I. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

J. Requests for Substitutions: Submit requests for substitutions for items identified by manufacturer, brand name, make, catalog number, etc. in the Construction Documents, in accordance with the Smithsonian Institution Construction Contract Clauses. After award of the Contract, Contractor requests for substitutions may be considered and accepted by the SI at the discretion of the Contracting Officer. See also Division 01 Section "Product Requirements."

K. 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.

L. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. COTR will discard submittals received from sources other than Contractor.

1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by the COTR on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.

2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
3. Transmittal Form: Provide locations on form for the following information:

    a. Project name.
    b. Date.
    c. Destination (To:).
    d. Source (From:).
    e. Names of subcontractor, manufacturer, and supplier.
    f. Category, type, and number of submittals.
    g. Submittal purpose and description.
    h. Submittal and transmittal distribution record.
    i. Remarks.
    j. Signature of transmitter.
    k. Quality certification, certifying submittal meets all Contract Document requirements.

M. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, and installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

N. Use for Construction: Use only final submittals with mark indicating action taken by the COTR in connection with construction.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals via email as PDF electronic files directly to the COTR, and other project stakeholders, as directed by the COTR.

    a. COTR will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

    a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
    b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard 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.
o. PDF electronic file

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

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Dimensions.
b. Identification of products.
c. Fabrication and installation drawings.
d. Roughing-in and setting diagrams.
e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
f. Shopwork manufacturing instructions.
g. Templates and patterns.
h. Schedules.
i. Design calculations, with Professional Engineer’s stamp as required.
j. Compliance with specified standards.
k. Notation of coordination requirements.

2. Submit Shop Drawings in the following format:

a. PDF electronic file.

D. Coordination Drawings: Comply with requirements in Division 01 Section “Project Management and Coordination.” Submit in same format and quantity as Shop Drawings.

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 applicable Specification Section.
e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal

of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.

4. 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 undamaged condition at time of use.

b. Samples not incorporated into the Work, or otherwise designated as COTR's property, are the property of Contractor.

5. 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 2 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.

6. 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 one Sample set; remainder will be returned to Contractor with submittal response. Contractor to retain one returned Sample set as a project record sample.

1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

F. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.
5. Submit product schedule in the following format:
   a. PDF electronic file.

G. Professional Certification Submittal: Comply with requirements in Division 01 Section “Quality Requirements.” Shop drawings, calculations, and other submittals that are required by the technical specifications to be prepared and/or reviewed by a registered, licensed design professional shall display the stamp/seal, registration/license number, and signature of the individual taking responsibility. Individuals must be registered/licensed in the state or jurisdiction in which the Project is located. Contractor’s Construction Schedule: Comply with requirements in Division 01 Section “Construction Progress Documentation.”

H. Submittals Schedule: Comply with requirements in Division 01 Section “Construction Progress Documentation.”

I. Application for Payment: Comply with requirements in Division 01 Section “Payment Procedures.”

J. Schedule of Values: Comply with requirements in Division 01 Section “Payment Procedures.”

K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names, and addresses of architects and COTRs, and other specified information.

L. Certificates:

1. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements
2. 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.

2. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project

4. Manufacturer Certificates: Prepare written statements on manufacturer’s letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
5. Material Certificates: Prepare written statements on manufacturer's letterhead certifying That material complies with requirements.

M. Test Reports:

1. 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
2. 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.

3. 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.
4. 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
5. 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, if required, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation
3. Time period when report is in effect.
4. Product and manufacturers' names.

5. Description of product.
6. Test procedures and results.
7. Limitations of use.

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 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 manufacturers. 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 comply with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

S. Insurance Certificates and Bonds: Prepare written information indicating the current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and the term of the coverage.

T. Construction Photographs and Videotapes: Comply with requirements in Division 01 Section "Photographic Documentation."

U. Material Safety Data Sheets: Submit information to COTR as required by technical specifications.

2.2 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to COTR.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for compliance with the Construction Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to the COTR.

1. Assure that all submittals use the appropriate units of measure. All drawings and technical data shall be in metric units for projects designed in metric units.
2. Transmit all required submittals for a technical specification section at the same time unless prior written waiver of this requirement has been provided by the COTR.
3. Transmit submittals to the COTR in a logical and orderly sequence in accordance with the Submittal Schedule to prevent project delays or adversely impact work by the Smithsonian Institution, its consultants, or other Contractors.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 COTR ACTION

A. The COTR will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Submittals: The Architect/Engineer will review each submittal, make marks to indicate corrections or modifications required, and return it. The Architect/Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken (and recommended to the COTR). The COTR reviews the action recommended by the A/E and provides official action taken on the submittal to the Contractor on the Smithsonian Institution submittal stamp as follows:

1. Approved
2. Approved as noted
3. Revise and Resubmit
4. Rejected

C. Informational Submittals: The COTR and Architect/Engineer will review each submittal and will not return it or will reject and return it if it does not comply with requirements. The COTR will forward each submittal to appropriate party.

D. Submittals not required by the Construction Documents may not be reviewed and may be discarded.

E. Submittals not in the appropriate system of measurement will be rejected without review. Pre- printed literature may be annotated. Shop drawings prepared for this project must be in appropriate scale(s).

F. Submittal approval by the COTR shall not relieve the Contractor of responsibility for submittal errors, omissions, or deviations from the Contract Documents. Approval of submittals does not constitute acceptance of substitutions, except as covered under subparagraph “Request for Substitutions,” above.

3.3 SUBSEQUENT CONTRACTOR’S ACTION

A. Correct and resubmit submittals, as necessary, according to response from the COTR.

B. Commence Work on items requiring submittals only after all related submittals are reviewed and approved by the COTR. All work shall conform to Contract Documents and approved submittals.

C. Retain copies of all approved submittals in their entirety for use in compiling Project Record Documents. See Division 01 Section "Project Record Documents."

END OF SECTION 013300

SECTION 01 4000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. All Tests and inspections required under the project's contract documents, even ones explicitly assigned to Owner are the Contractor's responsibility to provide with an independent approved subcontractor.
1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Construction Document requirements.
3. Requirements for Contractor to provide quality-control services required by the COTR or authorities having jurisdiction are not limited by provisions of this Section.
4. Specific test and inspection requirements are not specified in this Section.

C. Related Sections include the following:
1. Division 01 Section 013200 "Construction Progress Documentation" for developing a schedule of required tests and inspections.
2. Division 01 Section 013300 "Submittal Procedures."
3. Testing and Inspection Services identified in other specification sections.
4. Division 01 Section 017300 "Execution" for repair and restoration of construction disturbed by testing and inspecting activities and for the installation or performance of other components of the Work.

1.3 DEFINITIONS

A. Quality Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the work and completed construction comply with requirements. Services do not include contract enforcement activities performed by the COTR.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility

to verify performance characteristics.

2. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of 10 previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 PROFESSIONAL CERTIFICATIONS

A. Construction Document Performance and Design Criteria: Where professional design services or certifications (e.g., design calculations and/or shop drawings signed, stamped, and sealed by a professional, licensed engineer) 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 the COTR.
2. Shop drawings, calculations, and other submittals that are required by the technical specifications to be prepared and/or reviewed by a registered, licensed design professional shall display the stamp/seal, registration/license number, name, and signature of the individual holding responsibility. The individual must be registered/licensed in the state or jurisdiction in which the Project is located.

1.5 REGULATORY REQUIREMENTS

A. Copies of Regulations: Obtain or provide access to copies of governing regulations upon request. Retain copies of regulations, as reasonable, at Project site to be available for reference.

1.6 SUBMITTALS

A. Qualifications: Submit evidence of fabricator, installer, manufacturer, or other representative experience as described below and required in the individual Specification sections.

B. Professional Certification Submittal: In addition to Construction Documents, Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

C. Permits, Licenses, and Certificates: For Smithsonian Institution's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance. If required by the individual specification section, installers must be acceptable to and/or authorized by product/system manufacturer.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

E. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

1.8 QUALITY CONTROL

A. Smithsonian Institution Responsibilities: Inspection of the Work may be done on a daily basis by the COTR. The SI will have appropriate personnel available to witness Owner System Performance Verification (OSPV) tests.

B. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction. Ensure that the Work complies with the quality and workmanship requirements in the technical specifications. Ensure that representatives from all

applicable subcontractors and manufacturers are available during multiple systems commissioning and Owner System Performance Verification tests.

C. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting. Coordinate construction activities and planning with existing conditions.

D. Contactor shall notify COTR at least 24 hours prior to any concealment activities to give SI the opportunity to schedule any pre-concealment inspections or documentation desired.

1.9 Paragraph below may resolve issues that sometimes arise when using referenced standards due to conflicting requirements in the Contract Documents. Coordinate with Conditions of the Contract. Revise to suit Project, office policy, and Owner's requirements.

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to COTR for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements.

1.10 ACTION SUBMITTALS

A. Shop Drawings: For mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.

1. Indicate manufacturer and model number of individual components.
2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.11 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force- resisting system quality-assurance plan prepared by Architect.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of

a recent report on the inspection of the testing agency by a recognized authority.

A. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of tests and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.12 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within **10** days of **Notice to Proceed**, and not less than **five** days prior to preconstruction conference. Submit in a format that is acceptable to the Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and specified inspection. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including a log of approved and rejected results. Include work COTR Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.13 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and re-inspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the

following:

1. Name, address, and telephone number of technical 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 comply with requirements.
6. Statement weather conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance comply with requirements.
4. Statement weather conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.14 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful service performance, as well as

sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

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

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to **ASTM E 329**;

and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, which is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:
   a. Provide test specimens representative of proposed products and construction.
   b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
   c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.

d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
f. When testing is complete, remove test specimens, assemblies, do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to COTR. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by COTR.
2. Notify COTR **seven** days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain COTR approval of mockups before starting work, fabrication, or construction.
   a. Allow **seven** days for initial review and each re-review of each mockup.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed unless otherwise indicated.

L. Integrated Exterior Mockups: Construct integrated exterior mockup **according to approved Shop Drawings.** Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

1.15 QUALITY CONTROL

A. Contractor Responsibilities: All Tests and inspections, even ones explicitly assigned to Owner/COTR are the Contractor's responsibility for coordination and compensation within the contract's award amount. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
3. Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. All Testing and inspecting requested by Contractor and are required by the Contract Documents are solely the Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction.

B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

C. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical

representative to observe and inspect the work. Manufacturer's technical representative's services include participation in pre-installation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

D. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify COTR and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and - control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

G. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents **as a component of Contractor's quality-control plan**. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to COTR testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.16 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: At the COTR's request a qualified **testing agency** to conduct special tests and inspections.

B. Special Tests and Inspections: Conducted by a qualified **testing agency** as required and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying COTR and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to COTR with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and re-inspecting corrected work.
7. Clearly indicate on all report submissions COMPLIANT or NON-

COMPLIANT. PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for **COTR,** reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or match existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

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

3.3 NON-CONFORMING WORK

A. Remove portions of the Work that fail to conform to quality-control requirements of the Contract Documents.

B. Replace defective portions of the Work as directed by the COTR. No adjustment will be made to Contract Sum nor Contract Time.

END OF SECTION 014000

SECTION 01 4200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

A. The Contract Documents in their entirety, including the Drawings, Specifications/Project Manual, Construction Contract Clauses, and any other documents issued as part of the Contract, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": The term "approved," when used in conjunction with COTR's action on Contractor's submittals, applications, and requests, is limited to COTR's duties and responsibilities as stated in the Conditions of the Contract. When using terms such as those in "Approved" and "Directed" paragraphs below, do not extend Architect's responsibility into Contractor's area of means, methods, and techniques of construction. See Evaluations.

B. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by COTR, requested by COTR, and similar phrases.

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

J. "Installer": An installer is Contractor or another entity engaged by Contractor, as an employee, subcontractor, or contractor of lower tier, to perform a particular construction operation, including installation, erection, application, and similar operations.

K. The term "experienced," when used with the term "installer," means having successfully completed a minimum of **five** previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.

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.

1.3 INDUSTRY STANDARDS

A. SI Codes, Standards and Guidelines, current edition, shall cover the production of Construction Documents.

B. Publication Dates: Comply with codes and standards in effect as of the date of the Contract Documents, unless otherwise indicated.

C. Conflicting Requirements: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the COTR for a decision before proceeding.

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 the requirements. Refer uncertainties to the COTR for a decision before proceeding.

D. Copies of Codes and Standards: Each entity engaged in construction on Project must 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 the required design or construction activity, obtain copies directly from the publication source and make them available on request.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

C. Abbreviations and Names: Abbreviations and acronyms are frequently used in the Specifications and other Contract Documents to represent the name of a trade association, standards- developing organization, authorities having jurisdiction, or other entity in the context of referencing a standard or publication. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of these entities.

Refer to Gale Research's "Encyclopedia of Associations" or Columbia Books' "National Trade & Professional Associations of the U.S.," which are available in most libraries.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.

4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
8. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
9. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
10. AF&PA - American Forest & Paper Association; www.afandpa.org.
11. AGA - American Gas Association; www.aga.org.
12. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
13. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
14. AI - Asphalt Institute; www.asphaltinstitute.org.
15. AIA - American Institute of Architects (The); www.aia.org.
16. AISC - American Institute of Steel Construction; www.aisc.org.
17. AISI - American Iron and Steel Institute; www.steel.org.
18. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
19. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
20. ANSI - American National Standards Institute; www.ansi.org.
21. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
22. APA - APA - The Engineered Wood Association; www.apawood.org.
23. APA - Architectural Precast Association; www.archprecast.org.
24. API - American Petroleum Institute; www.api.org.
25. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
26. ARI - American Refrigeration Institute; (See AHRI).
27. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
28. ASCE - American Society of Civil Engineers; www.asce.org.
29. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
30. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
31. ASME – ASME International; (American Society of Mechanical Engineers); www.asme.org.
32. ASSE - American Society of Safety Engineers (The); www.asse.org.
33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34. ASTM - ASTM International; (American Society for Testing and Materials International); www.astm.org.
35. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
36. AWEA - American Wind Energy Association; www.awea.org.
37. AWI - Architectural Woodwork Institute; www.awinet.org.
38. AWMAC – Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
39. AWPA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
40. AWS - American Welding Society; www.aws.org.
41. AWWA - American Water Works Association; www.awwa.org.
42. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
43. BIA - Brick Industry Association (The); www.gobrick.com.
44. BICSI - BICSI, Inc.; www.bicsi.org.
45. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
46. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
47. BOCA - BOCA; (Building Officials and Code Administrators International Inc.); (See ICC).
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bwfbadminton.org.
49. CDA - Copper Development Association; www.copper.org.
50. CEA - Canadian Electricity Association; www.electricity.ca.

51. CEA - Consumer Electronics Association; www.ce.org.
52. CFFA - Chemical Fabrics & Film Association, Inc.; www.chemicalfabricsandfilm.com.
53. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
54. CGA - Compressed Gas Association; www.cganet.com.
55. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
56. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
57. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
58. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
59. CPA - Composite Panel Association; www.pbmdf.com.
60. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
61. CRRC - Cool Roof Rating Council; www.coolroofs.org.
62. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
63. CSA - Canadian Standards Association; www.csa.ca.
64. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa- international.org.
65. CSI - Construction Specifications Institute (The); www.csinet.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
68. CWC - Composite Wood Council; (See CPA).
69. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
70. DHI - Door and Hardware Institute; www.dhi.org.
71. ECA - Electronic Components Association; www.ec-central.org.
72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECA).
73. EIA - Electronic Industries Alliance; (See TIA).
74. EIMA - EIFS Industry Members Association; www.eima.com.
75. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
76. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
77. ESTA - Entertainment Services and Technology Association; (See PLASA).
78. EVO - Efficiency Valuation Organization; www.evo-world.org.
79. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
80. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
81. FM Approvals - FM Approvals LLC; www.fmglobal.com.
82. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
83. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
84. FSA - Fluid Sealing Association; www.fluidsealing.com.
85. FSC - Forest Stewardship Council U.S.; www.fscus.org.
86. GA - Gypsum Association; www.gypsum.org.
87. GANA - Glass Association of North America; www.glasswebsite.com.
88. GS - Green Seal; www.greenseal.org.
89. HI - Hydraulic Institute; www.pumps.org.
90. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
91. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
92. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
93. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
94. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
95. IAS - International Approval Services; (See CSA).
96. ICBO - International Conference of Building Officials; (See ICC).
97. ICC - International Code Council; www.iccsafe.org.
98. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
99. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
100. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
101. IEC - International Electrotechnical Commission; www.iec.ch.
102. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.

103. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
104. IESNA - Illuminating Engineering Society of North America; (See IES).
105. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
106. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
107. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
108. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
109. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
110. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
111. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
112. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
113. ISO - International Organization for Standardization; www.iso.org.
114. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
115. ITU - International Telecommunication Union; www.itu.int/home.
116. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
117. LMA - Laminating Materials Association; (See CPA).
118. LPI - Lightning Protection Institute; www.lightning.org.
119. MBMA - Metal Building Manufacturers Association; www.mbma.com.
120. MCA - Metal Construction Association; www.metalconstruction.org.
121. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
122. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
123. MHIA - Material Handling Industry of America; www.mhia.org.
124. MIA - Marble Institute of America; www.marble-institute.com.
125. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); www.wmmpa.com.
126. MPI - Master Painters Institute; www.paintinfo.com.
127. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
128. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
129. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
130. NADCA - National Air Duct Cleaners Association; www.nadca.com.
131. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
132. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
133. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
134. NCMA - National Concrete Masonry Association; www.ncma.org.
135. NEBB - National Environmental Balancing Bureau; www.nebb.org.
136. NECA - National Electrical Contractors Association; www.necanet.org.
137. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
138. NEMA - National Electrical Manufacturers Association; www.nema.org.
139. NETA - InterNational Electrical Testing Association; www.netaworld.org.
140. NFHS - National Federation of State High School Associations; www.nfhs.org.
141. NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
142. NFPA - NFPA International; (See NFPA).
143. NFRC - National Fenestration Rating Council; www.nfrc.org.
144. NHLA - National Hardwood Lumber Association; www.nhla.com.
145. NLGA - National Lumber Grades Authority; www.nlga.org.
146. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
147. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
148. NRCA - National Roofing Contractors Association; www.nrca.net.
149. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
150. NSF - NSF International; (National Sanitation Foundation International); www.nsf.org.
151. NSPE - National Society of Professional Engineers; www.nspe.org.

152. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
153. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
154. NWFA - National Wood Flooring Association; www.nwfa.org.
155. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
156. PDI - Plumbing & Drainage Institute; www.pdionline.org.
157. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
158. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
159. RFCI - Resilient Floor Covering Institute; www.rfci.com.
160. RIS - Redwood Inspection Service; www.redwoodinspection.com.
161. SAE - SAE International; (Society of Automotive Engineers); www.sae.org.
162. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
163. SDI - Steel Deck Institute; www.sdi.org.
164. SDI - Steel Door Institute; www.steeldoor.org.
165. SEFA - Scientific Equipment and Furniture Association; www.sefalabs.com.
166. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
167. SIA - Security Industry Association; www.siaonline.org.
168. SJI - Steel Joist Institute; www.steeljoist.org.
169. SMA - Screen Manufacturers Association; www.smainfo.org.
170. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
171. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
172. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
173. SPIB - Southern Pine Inspection Bureau; www.spib.org.
174. SPRI - Single Ply Roofing Industry; www.spri.org.
175. SRCC - Solar Rating and Certification Corporation; www.solar-rating.org.
176. SSINA - Specialty Steel Industry of North America; www.ssina.com.
177. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
178. STI - Steel Tank Institute; www.steeltank.com.
179. SWI - Steel Window Institute; www.steelwindows.com.
180. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
181. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
182. TCNA - Tile Council of North America, Inc.; (Formerly: Tile Council of America); www.tileusa.com.
183. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
184. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
185. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
186. TMS - The Masonry Society; www.masonrysociety.org.
187. TPI - Truss Plate Institute; www.tpinst.org.
188. TPI - Turfgrass Producers International; www.turfgrasssod.org.
189. TRI - Tile Roofing Institute; www.tileroofing.org.
190. UBC - Uniform Building Code; (See ICC).
191. UL - Underwriters Laboratories Inc.; www.ul.com.
192. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
193. USAV - USA Volleyball; www.usavolleyball.org.
194. USGBC - U.S. Green Building Council; www.usgbc.org.
195. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
196. WASTEC - Waste Equipment Technology Association; www.wastec.org.
197. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
198. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
199. WDMA - Window & Door Manufacturers Association; www.wdma.com.
200. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of

California); www.wicnet.org.
201. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
202. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
203. WPA - Western Wood Products Association; www.wwpa.org.

D. 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. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

E. 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. Information is subject to change and is up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; http://dodssp.daps.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; http://eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeia; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

F. 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. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from Department of Defense Single

Stock Point; http://dodssp.daps.dla.mil.

a. Available from Defense Standardization Program; www.dsp.dla.mil.
b. Available from General Services Administration; www.gsa.gov.
c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.

6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

G. 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. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF - State of California; Department of Consumer Affairs; Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR - California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS - California Department of Health Services; (See CDPH).
4. CDPH - California Department of Public Health; Indoor Air Quality Program; www.cal- iaq.org.
5. CPUC - California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD - South Coast Air Quality Management District; www.aqmd.gov.
7. TFS - Texas Forest Service; Forest Resource Development and Sustainable Forestry; http://txforestservice.tamu.edu

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 01 5000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents in their entirety, including the Drawings, Specifications, Construction Contract Clauses, and any other documents issued as part of the Contract, apply to this Section.

1.2 SUMMARY

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

B. Temporary utilities include, but are not limited to, the following:
1. Sewers and drainage.
2. Water service, metering, 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. Electric power service – temporary backup generator.
8. Lighting.
9. Telephone service

C. Support facilities include, but are not limited to, the following:
1. Temporary roads, paving and markings
2. Excavation support, shoring and temporary bridging.
3. Wash racks.
4. Dewatering facilities and drains.
5. Project identification and temporary signs.
6. Waste disposal facilities.
7. Field offices.
8. Storage and fabrication sheds.
9. Lifts and hoists.
10. Temporary stairs and ramps.
11. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities include, but are not limited to, the following:
1. Environmental protection.
2. Stormwater, sediment, and erosion controls control.
3. Tree, plant, and animal protection.
4. Pest control.
5. Site enclosure fence (maintenance of and modifications to existing).
6. Security enclosure and lockup.
7. Additional Security for Special Events.
8. Barricades, warning signs, and lights. This includes traffic control on the North Road as well as interior systems.
9. Covered walkways.
10. Temporary enclosures.
11. Temporary partitions.
12. Noise control.
13. Weather protection.
14. Fire protection.

15. Sediment and erosion control, including permit.

E. Related Requirements:
1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.
2. Section 312319 "Dewatering" for disposal of ground water at Project site.
3. Section 321216 "Asphalt Paving" for construction and maintenance of asphalt pavement for temporary roads and paved areas.
4. Section 321313 "Concrete Paving" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.
5. Division 01 Section 013100 “Project Management and Coordination” for additional Site Utilization Plan submittal requirements.
6. Division 01 Section 013300 “Submittal Procedures” for procedures for submitting copies of implementation and termination schedule and utility reports.
7. Division 01 Section 017300 “Execution Requirements” for progress cleaning requirements.

1.3 DEFINITIONS

A. Permanent Enclosure: As determined by the 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: Cost or use charges for temporary facilities are not chargeable to the Smithsonian Institution and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:

1. SI Staff and construction forces.
2. Occupants of Project.
3. SI-provided office trailers.
4. SI’s designated parking.
5. Testing agencies.
6. Personnel of authorities having jurisdiction.
7. Storm Water Management Permit Fees

B. Utilities: SI will provide all utility services. Contractor is responsible for all temporary connections, load sizing and protection based upon available service and full restoration of any changes to permanent utilities. The contractor shall implement basic conservation measures, otherwise they will be charged for utility usage.

C. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost.

D. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections, extensions and temperature protection of services as required for construction operations.

E. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations per code requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

D. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.

1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
1. Locations of dust-control partitions at each phase of work.
2. HVAC system isolation schematic drawing.
3. Location of proposed air-filtration system discharge.
4. Waste handling procedures.
5. Other dust-control measures.

F. Implementation and Termination Schedule: Within 15 days of date established for submittal of Contractor's Construction Schedule, submit a schedule indicating implementation and termination of each temporary utility.

G. Plan for Construction Facilities, Temporary Controls, and Protection of the Site, to be part of the Site Utilization Plan per Section 013100 “Project Management and Coordination” and as stated

below: Submit a Plan that both graphically and narratively describes the proposed facilities, temporary controls, and protection of the site to the COTR for approval no less than 5 working days prior to the Preconstruction Conference. The plan shall address construction sequencing as required by Section 011000 “Summary”, Article 1.5A Work Sequence. At a minimum, include the following in the Plan:

1. Proposed method, location, materials, and construction of temporary structures, facilities, walkways, utilities, field offices, storage sheds, trailers, toilet facilities, storage areas, fencing, enclosures, barriers, dust/noise partitions, identification and directional signage, and other temporary controls.
   a. Provide approved and appropriate barriers for the protection and containment of the animal collection if applicable.
2. Routes of vehicular and pedestrian access and egress for Contractor personnel, SI personnel, the public (where applicable), including those for people with disabilities (where applicable), including temporary striping where required.
3. Location and maintenance of emergency exits.

4. Methods of protection of existing surfaces, occupants, utilities, and other SI property, including protection of existing historic fabric and the North Road.
5. Means of connection of temporary enclosures/controls to existing historic materials.
6. Incorporating all existing site conditions and constraints.

Traffic Control Plan per Manual on Uniform Traffic Control Devices (U.S. Department of Transportation, Federal Highway Administration, latest edition) to maintain at a minimum one single lane of synchronized traffic at all times. The plan shall address barricade size, type and configuration, the minimum lane width (13'), controlled Contractor access into the work zone, any barricade cones or barrels before the traffic barricades, signage, temporary lane markings, The traffic control plan shall be prepared and signed by a Licensed Professional Engineer in the District of Columbia.

H. Material Safety Data Sheets (MSDS): Submit Material Safety Data Sheets for all toxic and/or hazardous substances proposed for temporary controls prior to use of any such substances. Submit NZP material approval request form and required data for all hazardous materials.

I. Professional Project Sign: Submit a shop drawing indicating proposed construction, mounts and or posts, materials, colors, font, letter sizes, graphics, etc. to scale of the required Project Sign.

1.6 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1

D. 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. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

E. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work

1. Keep temporary services and facilities clean and neat. Operate in a safe and efficient manner.
2. Relocate temporary services and facilities as required by progress of the Work.
3. Take necessary fire-prevention measures.
4. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on site.
5. Take measures to prevent rodent infestation of waste and stored materials. Empty food trash daily.
6. Comply with Division 01 Section "Indoor Air Quality Requirements."

C. Sanitary Facilities: Contractor personnel may not use existing Smithsonian restrooms on the premises. Provide temporary facilities on site in accordance with requirements set forth in Parts 2 and 3 below.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high required at the Limits of Disturbance perimeter 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 rails. Gates and posts are to be mounted into the ground.
   a. Wrap the entire fence with a printed fabric banner.
      i. Banner content provided by Smithsonian Institution Exhibits
      ii. Banner fabric density sufficiently open to prevent wind loads from exceeding 40 lbs. square foot.

B. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

C. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.

D. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

E. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by the COTR. Provide materials suitable for use intended.

F. Pavement: Comply with Division 32.

G. Temporary backup generator including associated controls, wiring, cables, switchgear, and fuel as required.

H. All temporary fences (like new) full height with printed images on fabric. Fence structure that is not used for animal containment or protection shall be supported to resist 40 mph winds.

I. Standard SI Construction Fence: Install new, as needed, and maintain the existing standard SI construction fence as detailed on the Drawings.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading. Contractor to provide submission for COTR's approval. Contractor responsible for all temporary connections.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate

materials and equipment for construction operations.

1. Store combustible materials apart from building. (Submit for COTR approval)

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self- contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction and marked for intended location and application.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of **8** at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures".

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shut off. Configure to run continuously.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of complete permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, COTR, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

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.

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 municipal system as directed by sewer department officials.

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.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment from that specified that will 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.

2. Maintain a maximum temperature of 95 deg F in permanently enclosed portions of building for normal construction activities, and 86 deg F for finishing activities and areas where finished Work has been installed.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity as specified in the documents. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient conditions required and minimize energy consumption.

G. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner 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.

H. Temporary Power Service: Provide temporary power generator as required by the Contractor to complete the Work.

1. Install temporary backup power distribution cabling and wiring overhead; rise vertically where least exposed to damage.

2. Install temporary backup power generator controls and switchgear where least exposed to damage.

I. Electric 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 or manufacturer recommendations.
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. Install and operate temporary lighting that fulfills security, emergency egress, and protection requirements without operating entire system. (1 foot candle)

3.3 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 within the approved designated areas.
2. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
3. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use

permanent facilities, under conditions acceptable to the COTR.

B. Traffic and Pedestrian Controls: Provide temporary traffic controls at junction of temporary roads with public roads. Include warning signs for public traffic and "STOP" signs for entrance onto public roads.

1. Provide safety barricades in accordance with the District of Columbia Building Code and applicable OSHA regulations. Provide barricades, subject to the approval of the COTR, to deter passage of persons and/or vehicles into construction areas as specified or necessary.
2. When construction activities impact on the public right-of-way (e.g., public sidewalks), provide barricades as necessary to create a safe passage for pedestrians around the obstacles and separate from vehicular traffic lanes. Provide appropriate directional signs and certified signalers.
3. See Section 013100 “Project Management and Coordination” for Site Utilization Plan and Traffic Control Plan requirements.

C. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas **as indicated** on the Drawings.

1. Provide dust-control treatment that is nonpolluting and non-tracking. Reapply treatment as required to minimize dust.

D. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas

according to Section 312000 "Earth Moving."

3. Recondition base after temporary use, including removing contaminated material, regrading, proof rolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt case-course pavement before installation of final course according to Section 321216 “Asphalt Paving."

E. Traffic Management to be provided by the Contractor.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.
3. Address Public Pedestrian and Vehicle Traffic in vicinity of project

F. Parking. NO PARKING areas for construction personnel will be provided on site or campus.

G. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulation and impairment of construction operations within the limits of construction.

H. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

I. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs where indicated to inform public and persons seeking entrance to Project. Do not permit installation of any unauthorized signs. Submit all sign designs to the COTR for approval.

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 thicknesses indicated. Support on 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. For project identification sign, see diagram at end of this Section for construction, materials, colors, required wording, and use of logos. Camera-ready artwork for logos will be provided by the COTR.
6. Maintain and touchup signs so they are legible at all times.

J. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

K. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to manage waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

L. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

M. Temporary Stairs, Boardwalks, and Ramps: Until permanent stairs are available, provide temporary stairs, boardwalks, or ramps where ladders or walkways are not adequate. Cover finished permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations that minimize possible air, waterway, subsoil contamination, pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 011000 "Summary."

C. Temporary Erosion and Sedimentation Control: Comply with authorities having jurisdiction, Requirements specified in Section 311000 "Site Clearing."

D. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and the authorities having jurisdiction, whichever is more stringent.

1. Based upon contract documents submit, pay fees, oversee, and maintain all related to Temporary Erosion and Sedimentation Control measures to comply with authorities having jurisdiction's requirements.
2. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
3. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
4. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
5. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

E. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around

excavations and subgrade construction to prevent flooding by runoff of storm water from heavy rains.

F. Tree and Plant Protection: Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection."

G. Pest Control: Implement practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion.

Pest Control: ALL PEST CONTROL MUST BE COORDINATED WITH THE NZP PEST CONTROL OFFICER. Contractor shall follow Best Management Practices regarding site management and cleanup to minimize vermin or pest infestations for the duration of the project. No extermination materials are to be used on this project without the written approval of the NZP Pest Control Officer.

H. Site Enclosure Fence: Before construction operations begin, furnish, and install site enclosure fence

in a manner that will prevent people and animals from easily entering site except by entrance gates. If fence needs to be modified or relocated to accommodate current construction activities, submit a request and description of modification to COTR at least 24 hours in advance.

1. Extent of Fence: As required to enclose entire Project site as indicated on Drawings.
2. Maintain security and restrict access to authorized personnel only.
3. Lock shall be a combination lock, not a keyed lock.
4. Maintain security by limiting distribution of lock combination to authorized personnel. Provide COTR with lock combination.

I. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

J. 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. Provide easily identifiable, accessible walkways around construction activities and obstacles. Post directional signs at decision points to prevent unnecessary travel along changed routes and to dead ends. Erect and dismantle barriers in phases so that a clear route is always available. Provide security hardware on doors to construction areas to prevent entry by unauthorized persons.

1. For exterior safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch-thick exterior plywood and structurally appropriate dimensional lumber. Provide appropriate supports to prevent overturning. Paint both sides and maintain in good condition, repainting as necessary, for the duration of use.

K. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

L. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities For IT equipment to remain in the Police Station basement.

M. Scaffolding and Platforms: Erect temporary scaffolding in accordance with OSHA 29 CRF 1926.451 and ANSI A10.8.

1. Provide landing platforms with stairways or ladders for proper access and egress to and from all work areas.
2. For all frame scaffolding greater than 13 feet in height, submit shop drawings, signed, and sealed by a Professional Engineer registered and licensed in jurisdiction of the project, to the COTR a minimum of 10 working days prior to erection.
3. During non-working hours, close and lock scaffolding with a physical barrier to prevent Access by unauthorized persons.

4. Submit daily installation inspection documentation, signed by qualified personnel

N. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weather tight enclosure for building exterior.

1. Temporary enclosures for people (public and non-public).

a. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

b. Vertical Openings: Close openings of 25 sq. ft. or less with plywood or similar materials.
c. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load bearing, wood-framed construction.
d. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.
e. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use fire- Retardant-treated material for framing and main sheathing.

O. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
   a. Contractor 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 where convenient and effective for their intended purpose; provide not less than one extinguisher per work area and near each entry

And exit.

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. 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.
6. Provide hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed buildings.
2. Keep interior spaces reasonably clean and protected from water damage.

3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace, or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.

D. Temporary Facility Changeover: 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 facilities. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. 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 street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.

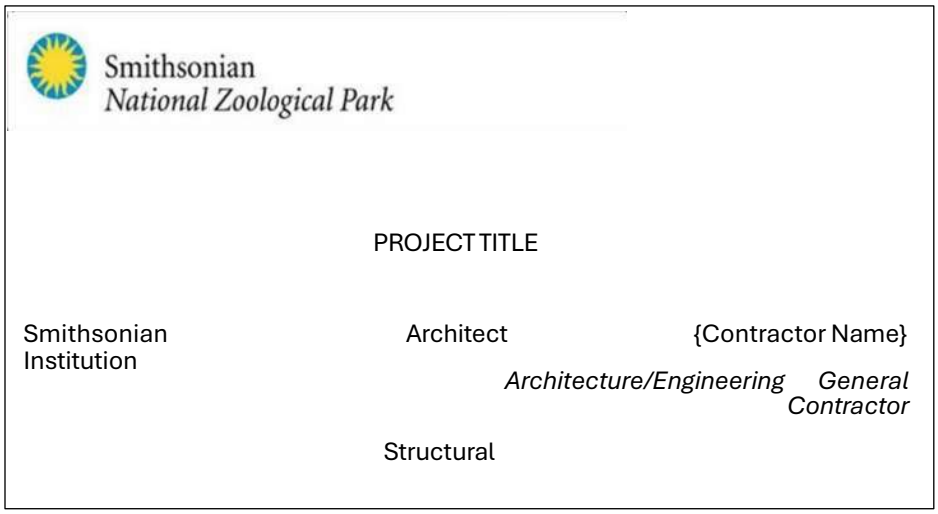
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

3.7 PROJECT SIGN

A. Contractor shall provide two signs (4 feet by 8 feet) installed on posts sufficient to resist 40 mph winds without damage. All materials used shall be exterior grade quality, be resistant to direct sun and ultraviolet light, and designed to last a minimum of five years.

B. In the event a sign is damaged or fades during the contract period, provide a new replacement sign. Contractor will also be responsible for any required sign relocation due to site conditions.

C. See sketch of sample sign below. Layout of sign to be approved by COTR prior to installation. Locate installed sign as directed by COTR.



Sample Sign (8 feet x 4 feet)

END OF SECTION 015000

SECTION 01 5639 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1 RELATED DOCUMENTS

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

1.1 SUMMARY

A. This Section includes the protection and stress reduction of existing trees and vegetation that interfere with, or are affected by, execution of the work, whether temporary or permanent. Work is to be coordinated with Site & Landscape Improvements and Tree Preservation Plan. Refer to the Tree Protection Action Key (TPAK) to referencing pertinent work for each tree. Not every application is relevant on this site currently.

B. The following specifications apply to work of the Contract Arborist related to Protection and Stress Reduction Measures and coordination and oversight of the Tree Protection and Preservation Program by the Design Team Arborist. This work includes but is not limited to the following:

1. Submittals from the General Contractor
2. Pre- Construction Meeting and Onsite Monitoring of Tree Preservation.
3. Selective tree removals for “Removal by Arborist” (RBA) (Contract Arborist) Within Tree Protection Areas (TPAs).
4. Temporary Site and Tree protection fencing and temporary sign installation
5. Root Protection Matting for temporary construction access in TPAs
6. Composted Mulching
7. Liquid subsurface fertilization
8. Tree Growth Regulator (Paclobutrazol)
9. Soil Nutrient Testing
10. Super Silt Fence / Silt Fence “Trenchless Attachment” to Root Protection Matting (RPM) and Root Aeration Matting (RAM)
11. Temporary Limb Guying or Clearance Pruning for construction access
12. Seasonal Supplemental Watering
13. Monitoring and Treatment of Tree Health
14. Supersonic Air Tool (SSAT) and Hand Excavation within the Critical Root Zones (CRZs)

1.1 DEFINITIONS

A. Certified Arborist: Credential of an individual arborist issued and administered by the International Society of Arboriculture (ISA). This credential must be current and valid to qualify to use the copyrighted designation of "Certified Arborist". Refer to www.isa- arbor.com for additional information.

B. Design Team Arborist: Consulting firm contracted to provide planning and design services, technical assistance and advice to the COTR and design team. Duties include but are not limited to the following: design phase tree inventories, assessments, and root investigations, etc.; develop tree preservation plans, methods, details and specifications; and provide site monitoring, construction submittal document review, and monitoring of the Contract Arborist. Design Team Arborist is contracted directly to the Issues.

C. Contract Arborist: Arboricultural contracting firm implementing the approved tree preservation plans on site. All crews conducting arboricultural operations on site shall consist of at least one Certified Arborist who directly oversees all work by that crew. Arboricultural operations include, but are not limited to, pruning, tree protection device installation and maintenance (fence, matting, etc.), root pruning, air tool root excavation/exploration (SSAT), soil care activities, soil testing, mulch application, tree inspections, pesticide/chemical applications and tree removal. Special qualifications submittal is required for review and approval below. Contract Arborist will be sub-contracted by the general contractor or COTR, at the COTR's discretion.

D. Tree Protection Area (TPA): Area indicated on Drawings surrounding individual trees or groups of trees to be protected during construction.

E. Critical Root Zone (CRZ): Area shown on Drawings for all trees within scope of this project with a circle. Estimated area is based upon an industry standard "rule of thumb" of 1.5 feet of radius per inch of diameter at breast height (DBH). CRZ is described as the minimum area of tree roots required to be protected to maintain tree health. Any impact within the CRZ must be mitigated based on severity up to and including tree removal if the impact or disturbance is severe.

F. Tree Protection Action Key (TPAK): Matrix provided on Plan sheets for each tree indicating designated protection and stress reduction measures specified in this document.

G. Supersonic Air Tool (SSAT): Handheld tool designed to focus highly compressed air (90-125 psi) provided from a large air compressor (185-375 cfm) at speeds close to 1400 mph at the tip of the tool. Widely used by arboricultural firms and consultants for multiple purposes including but not limited to: root collar investigation, CRZ investigation, root pruning (especially large roots > 1.5" diameter or were existing underground cables or conduits are located), radial mulching and restoration of compacted soils, excavation for utilities within protected CRZs to minimize root damage from construction.

H. Tree Removal by Arborist: Action whereby the Contract Arborist removes trees designated for "Removal by Arborist" selected from inside the TPAs. Trees shall be taken down by hand sectionally or fall directionally to minimize damage to adjacent tree canopies, root systems, or adjacent structures. Roots and stump are not disturbed unless so designated in TPAK.

I. Root Pruning: Action indicated on Drawings to provide a more suitable cut for protected tree roots to minimize ripped or torn roots during excavations and grading with standard construction equipment. Various methods may be used as specified.

K. Root Protection Mat (RPM): The purpose of the temporary RPM is to reduce compaction, rutting, and contamination of soils and root systems of trees to be retained should staging, temporary stockpile, or equipment access be required within the CRZ areas due to extreme site constraints.

1. RPM shall be used for all access within CRZ areas of trees to remain. Matting is not required where existing pavement or concrete will remain undisturbed.

L. Mulching of Trees: Application of a wood mulch product to areas surrounding designated trees. Mulch

increases moisture-holding capacity, helps mitigate soil compaction, and increases soil organic composition needed.

M. Soil Amendments: Various product components applied to existing soil environment of protected trees, as indicated on Plan notes.

N. Tree Growth Regulator (*Paclobutrazol*): Products applied to designated trees used to regulate plant growth in such a way as to restrict canopy growth and free stored or produced energy for other uses in the tree. For highly impacted trees, more energy may be made available for fibrous root growth (to

combat root loss), thicker darker leaves (allowing for increased photosynthesis, and increased drought tolerance), and pest tolerance (often an issue with construction stressed trees), among other potential benefits.

O. Limits of Disturbance (LOD) (also called Limits of Construction): Specific outer limits of all construction activities for the entire project.

P. DBH (Diameter at Breast Height): Tree trunk diameter measured at 4.5 feet above grade.

1.2 SUBMITTALS

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

B. Shop Drawings for specific protection work within tree critical root zones. These are as follows.

a) Root protection matting

b) Method of supplemental watering for tree protection areas.

C. Documentation of work: For each phase, the Contract Arborist shall document that for each tree designated to remain, the required protection measures have been implemented prior to or during construction according to construction documents.

D. Qualification Data: For Contract Arborist Firm Qualifications, submit firm and individual qualifications as follows.

a) Submit a minimum of two resumes and detailed qualifications from staff or team individuals assigned to this project as detailed under Quality Assurance below. Due to the complexity of this project, standard arboricultural experience may not qualify.

b) Provide references for above from a minimum of three commercial, non-governmental or governmental projects for whom similar tree preservation programs have been successfully implemented. Include the following information:
   a. Project name, size and scope
   b. Number and principal species of trees involved.
   c. Relevant photos or aerials.
   d. Tree preservation budget.
   e. Scope of services provided.
   f. Name and contact for project COTR, designer, or contractor.

E. Pedestrian/Property Protection Plan: Contract Arborist to submit a written plan describing all protective measures proposed to be used to minimize potential impact to pedestrians, parked cars, workers and other public and private property.

a) Protection measures shall be required for all on-site tree care activities including but not limited to Supersonic Air Tool excavation, root pruning, canopy pruning, etc.

F. Maintenance Prescription: Design Team Arborist (or Contract Arborist) shall submit seasonal/monthly recommendations for maintenance and stress reduction measures as a result of construction, changes in weather patterns or events, and response in health from individual trees during and after completing the work.

G. Soil Samples: Submit soil sample for analysis during site work phase of this project. Take

the samples between April through October. The sample shall be a combined mix of representative soil samples from all areas of protected trees (landscape areas and street tree planting pits where pertinent). Samples and procedures per local cooperative extension shall be followed. Forward reports to Architect and Project Arborist.

H. Soil Amendments: Contract Arborist shall submit specific fertilizer formulations, application rates and methods for review by Project Arborist. All fertilization and soil amendments shall be in conformance with soil test results.

I. Site Documentation: Submit monthly reports to COTR and Project Arborist containing documentation of all tree protection work for each tree. These activities include but not limited to root pruning, tree protection fencing, excavation within critical root zones, temporary root protection or root aeration matting. Documentation shall include tree numbers of trees and plan markup. Representative photos of each activity are also required.

J. Existing Conditions: Upon installation of designated protection measures the Contract Arborist shall submit documentation of existing trees and plantings indicated to re- main, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

a) Use sufficiently detailed photographs, tree numbers, or videotape.

b) Include plans and notations to indicate specific prior wounds, root disturbance, damage, or conditions of each tree or other plants designated to remain.

1.3 QUALITY ASSURANCE

A. On-site Arborist (individual) Qualifications: An arborist certified by the International Society of Arboriculture (ISA) and licensed in the jurisdiction where project is located. All work performed by Contract Arborist including any oversight and documentation work, shall be performed or directly supervised by at least one on-site arborist with these minimum qualifications.

B. Contract Arborist Firm Qualifications:

1. Established business with documented experience of at least five years.
2. Experience working on a minimum of three commercial, nongovernmental or governmental projects where similar tree preservation programs have been successfully implemented.
3. Properly licensed and insured to perform arboricultural work in the jurisdiction where the project is located.

Provide names of each individual to comply with the following:

4. Minimum BS or AS degree in forestry, arboriculture, or related field.
5. Certification by ISA (Certified Arborist or Board-Certified Master Arborist).
6. Maryland Licensed Tree Expert # as pertinent.
7. TRAQ qualifications.
8. Resumes should reflect combined 10 years' full-time experience on similar tree preservation projects.
9. Provide individual(s) names, certifications, and each anticipated role in this project. "Role(s)" shall be defined as one or more of the following:
   a) Project Manager
   b) Technical oversight
   c) Field Arborist / Technician

For each staff member, list a minimum of three construction projects and a minimum three years' experience in the following technical applications:

10. Soil amendment prescriptions and applications.
11. Supersonic Air Tool Excavations for underground utilities equal to or exceeding 24" depth.
12. Root Protection Matting or similar applications.
13. Construction oversight and monitoring on large projects.
14. Coordination of arboricultural activities with construction project managers on large projects.

C. Publications listed herein are part of this work to extent referenced:
   a) ANSI A300 Standard Practices for Trees, Shrubs, and Other Woody Plant Maintenance
   b) Part 1-2001, Tree Pruning;
   c) Part 2-3004, Fertilization;
   d) Part 3-2000, Cabling, Bracing, Guying of Established Trees;
   e) Part 4-2002, Lightning Protection Systems.
   f) ANSI Z133.1 - 1994 and most recent updates, Tree Care Operations - Safety Requirements

D. Fertilizer and pesticides will be applied in strict accordance with the manufacturers label instructions and applicable federal, state, and local requirements. Fertilizer, soil conditioners, and pesticide applications must be approved by the COTR prior to application. Material Safety Data Sheets (MSDS) will be available for fertilizers and pesticides in the Contract Arborists' possession while on the site.

E. Preconstruction Meeting: Conduct meeting at the project site prior to commencement of any project related site activities.

1. Contract Arborist, Design Team Arborist, Project Design Team, COTR and Contractors shall attend. As well as the local agency inspector as applicable.

2. Walk the site limits to review methods and procedures related to tree protection and preservation including, but not limited to, the following:
   a) Construction schedule - verify availability of materials, personnel, and equipment needed to make progress and avoid delays.
   b) Enforcement of requirements for tree protection areas.
   c) Responsibilities of all parties, including coordination, access and timing requirements.
   d) Field quality control.
   e) Mark tree removals
   f) Review and mark locations of root pruning, root protection mat- ting, and special demolition within tree protection areas.
   g) Review sequencing of demo and excavation work near trees.
   h) Review location and sequencing of shoring for excavation near trees.

1.4 PROJECT CONDITIONS

A. The following practices are prohibited within all tree protection areas except as specifically indicated herein:
   a) Storage or stockpiling of construction materials, chemicals, debris, or excavated materials
   b) Parking vehicles, trailers or equipment
   c) Foot traffic
   d) Erection of sheds or structures

e) Impoundment or discharge of water
f) Excavation or other digging unless otherwise indicated
g) Attachment of signs or other materials to, or wrapping materials around trees or plants unless otherwise indicated

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Temporary Light Duty Root Protection Matting (RPM): geo-composite material comprised of a tri-planar geonet structure with thermally bonded nonwoven geotextiles on both sides.

1. Material shall be SynTec ROADRAIN T-7 or approved equivalent.
2. For short duration applications (1-2 pass/1-3 day or less), AlturnaMATS® or 1" thick steel plates may be used in lieu of RPM.
3. Submit shop drawings / cut sheets and material samples for review by Project Arborist and project civil.

B. Temporary Trunk/Limb Protection W rap: to provide specific protection to tree trunks when construction activities are expected to be in proximity.

1. Material shall be SynTec ROADRAIN T-7 or approved equivalent.
2. Alternative methods and materials may be submitted for review.
3. Chain-Link Fence: Galvanized steel chain-link fence fabric of 10 - 12-gauge wire fabric; 6 feet high; with 1.9-inch- diameter line posts; 2-3/8 inch - diameter terminal and corner posts; with tie wires, hog ring ties, gates, and other accessories for a temporary fence system.
4. Site Fence: Exact specifications per civil specifications.
5. Welded W ire Fence: 48" height, 14 gauge, 4"x2" galvanized fabric with 6' steel T-posts, metal wire clips, tree protection signs.

C. Woven Silt Tube: A three-dimensional tubular sediment control and storm water runoff filtration de- vice typically used for perimeter control of sediment and soluble pollutants (such as phosphorus and petroleum hydrocarbons), on and around construction activities. This method of sediment control provides a non-invasive approach when used within tree protection zones there is no root disturbance.

1. Refer to manufacturer's instructions for materials and installation: www.fil- trexx.com or equivalent.

D. Wood Chip Mulch

1. Double ground whole tree hardwood aged a minimum 6 months from production, free from deleterious materials. Green chips or mulch aged less than 6 months shall not be used. Walnut mulch shall not be used. Submittal shall include original material source(s), number and type of grindings/chippings, duration of aging, timing of turning /aeration.

E. Hardwood Destructive Borer /Beetle Control: Bifenthrin, such as *Onyx* or equivalent. Applied per label.

F. Tree Growth Regulator (*Paclobutrazol*)

1. Paclobutrazol is a compound used to regulate plant growth in such a way as to restrict canopy growth and free stored or produced energy for other uses in the tree. For highly impacted trees, this means more energy may be made available for fibrous root growth (to combat root loss), thicker darker leaves (allowing for increased photosynthesis, and increased drought tolerance), and pest suppression (often an issue with construction stressed trees); among countless other potential benefits. Trade name Cambistat® or equal.

G. Soil Care/Soil Amendments

1. Fertilizer and soil amendment selection shall be based upon soil test results and recommendations.

PART 3 - EXECUTION

1.1 TREE REMOVAL

A. All trees and shrubs or hedges designated for removal shall be marked red for review and approval by COTR.

B. All trees designated for removal, shall be taken down sectionally, or directionally felled to minimize damage to adjacent tree canopies or root systems by a qualified Contract Arborist. Gouges in turf from impacts shall be filled with topsoil and seeded at the direction of the COTR. Damage to adjacent trees shall be reviewed by Project Arborist and COTR for remedial recommendations or replacement.

C. All work shall be done by hand, bucket truck, or crane operated equipment.

D. Motorized equipment shall operate on existing pavement and not enter tree preservation areas without prior approval. Temporary root protection matting may be required for such access to prevent rutting and compaction.

E. Stumps shall be ground to 8” below grade and grindings raked and removed from site; backfill holes with approved topsoil and mulch or seed per COTR. Coordinate with underground utilities locators prior to grinding. All stump grinding shall be per- formed by the Contract Arborist.

1. For tree pits where a new tree is proposed, the stump may be ground out completely (as determined by the Contract Arborist) to allow the proposed tree to be planted. Backfill as above.
2. Only trees with stumps within deep excavations may have stumps removed by excavator. Stump excavation to be performed by Site Contractor and under the direct supervision of the Contract Arborist.

F. Removal of shrubs and hedges designated for removal for each phase shall be cut and stumps ground out or hand dug to remove stumps. Prior to removal, verify with COTR.

G. Remove all wood debris from site promptly. All wood debris shall be removed each day unless directed otherwise by COTR.

1.2 TREE PROTECTION AND STRESS REDUCTION MEASURES -

1. General

A. Refer to the TPAK and drawings sheet, detail sheet, and notes sheet for specific

measures determined for each tree.

B. Installation/implementation of the following measures shall be performed in the field by an ISA Certified Arborist as provided by the Contract Arborist.
C. All work, substitutions and/or modifications shall be subject to review and approval by the COTR and Project Arborist.
D. All work shall conform to applicable federal, state and local regulations and industry standards.
E. The Contract Arborist shall be responsible for all items in this section.

2. Coordination of Temporary Tree and Plant Protection. The work of the Contract Arborist coordination to include but not limited to the following:

A. Existing underground utility marker conflicts brought to the attention of the Contractor for resolution as well uncovered underground utilities as a result of work.
B. Coordinate necessary survey layout of proposed construction elements in order to provide accurate locations for tree protection measures.
C. Layout location of designated tree protection based upon proposed construction and methods of construction for that area.
D. Site walk with Design Team Arborist and Site Superintendent to verify lo- cation of all tree protection measures prior to execution.
E. Notify Site Superintendent and Design Team Arborist if construction adjacent to tree protection does not appear to follow specifications or prior agreement or conflicts with tree protection seem eminent.
F. Coordinate with Site Superintendent, Construction Managers, COTR, and Security for access of deliveries, crews, equipment, start up, and clean-up of each item of work.
G. Provide “as built” of any change to location of tree protection.
H. Attend progress meetings as requested.
I. Provide submittals as required.
J. Notify Superintendent and Project Arborist of any breach or damage to tree protection requiring attention.

3. Temporary Tree Protection Fence

A. Type and placement of fence to be designated on Plans and Details.
B. Attach tree protection area signs @ 30' spacing facing construction LOD. For fences lower than 6’ in height, attach minimum 3 strips glow-flagging 2' long for each fence panel.
C. Tree protection area signs shall be high visibility and all weather to last the duration of the project / Phase. Phone number of responsible contacts per- son shall be included on sign.
D. Install after root pruning if shown, and prior to demolition, clearing & excavation.
E. Install at 6”-12” outside (construction side) of the Root Prune line or within the Root Prune trench.
F. Silt fence will be outside (construction side) the tree protection fence; un- less super silt fence is used in lieu of tree protection. Trenchless installation method shall be employed per Detail if Root Protection Matting is designated.
G. Exact placement of fence will be determined in walk through with Contractor, Project Arborist, Contract Arborist, Architect and COTR.
H. Sequencing of the tree protection fence will be determined during the initial site walk. In any case, no construction activities shall occur in each phase or section until approved protection is installed.

4. Root Protection Mat (RPM)
A. The purpose of the RPM is to reduce compaction, rutting, and contamination of soils and root systems of trees to be retained should staging, temporary stockpile, or equipment access be required within the CRZ areas due to extreme site constraints.
B. RPM shall be used for all access within CRZ areas of trees to remain. Matting is not required

where existing pavement or concrete will remain undisturbed.

C. Shop drawings indicating the placement and types of panels and layers to be used, and method of removal shall be submitted.

D. Light Duty RPM is for tree protection for construction access receiving temporary or minimally repetitive materials staging, foot traffic, or light equipment access within protected root zone. Wood chip mulch 2-3" may be installed under matting to further protect soils and roots if indicated on drawings.

E. If short duration access is needed, such as one week or less, the use of "AlturnaMATS", 1" steel plate, or approved equal may be needed to avoid rutting and compaction. These materials may be shifted and re-used as work progresses.

F. Medium Duty RPM for rubber tracked equipment access and staging is not anticipated to cause rutting. A combination of 4-6" wood chip mulch, triple-ply geocomposite, Alturnamats, steel plates of other matting can be used.

G. Extreme Duty RPM is for all-weather staging, stockpile, or other repetitive construction operations may require 12" stone layer over RPM to allow heavy vehicles have the potential to cause dynamic compaction yet with- out rutting original surface soils and roots. In this situation, the stone may be contained by silt fence or super silt fence where adjacent to or within a TPA.

H. All temporary RPM areas to be used beyond a single day or beyond continuous on-site supervision of the Contract Arborist shall be surrounded by temporary tree protection fence as per specifications.

I. For temporary staging of soils beyond 24 hours "trenchless" silt fence fabric shall be installed on the lower / downhill side or as directed by the Project Arborist.

J. If Silt Fence is required for Erosion Control in RPM areas, installation of silt fence shall be coordinated with the Contract Arborist and must be per- formed by the Contract Arborist to prevent damage to tree roots from trenching operations. Erosion control socks may be used in lieu of silt fabric if approved by the COTR.

5. Supersonic Air Tool (SSAT) Excavation

A. Refer to "Hand Excavation within Tree Protection Areas" specification in this section for additional requirements.

B. At a minimum, all SSAT work shall include the use of a barrier system such as temporary walls or tents to protect property and pedestrians from flying debris.

C. Excavate along the edge of the proposed trench closest to the trees to be protected as shown on the plans. Roots shall be uncovered, and care taken to avoid damage to roots and bark.

D. Excavation shall proceed per the "Hand Excavation within Tree Protection Areas" specification in this section.

6. Wood chip mulch

A. Mulching for the duration of construction for protection and stress reduction. Mulching will increase moisture-holding capacity, minimize soil compaction, and increase needed organic composition.

B. Mulch area options:

1. For individual trees designated on the TPAK within the TPA or curvilinear TPA install mulch to a radius equal to trunk diameter inches equated to mulch ring diameter in feet (24" trunk diameter = 24' diameter mulch ring). Where planting pit areas are restricted by hardscape or other restrictions, mulch the greatest area possible.
2. For linear TPAs along LOD Install mulch strips a minimum 10' wide the length of critical root zones along the outside of the LOD/ Root Prune line (just inside the Tree Protection Zone) for designated significant trees impacted by proposed construction.
3. Either option may be used as appropriate for the area.

B. For privately owned trees, any installation is contingent upon receipt of COTR's permission. COTRs may decline.

C. Motorized equipment shall not enter the TPA unless specifically approved by the Project Arborist and specific conditions met (RPM, AlturnaMATS, etc.). Any such motorized equipment shall be operated by a certified arborist while inside the TPA.

D. Do not allow mulch to contact trunk/root flare.

E. Mulch depth shall be 3" – 4".

F. Mulch shall remain for the duration of construction and may remain permanently if the COTR approves.

G. If the mulch is to be removed after construction, it must be removed by hand only. No equipment may be used.

7. Tree Growth Regulator (Paclobutrazol):

A. Paclobutrazol is a compound used to regulate plant growth in such a way as to restrict canopy growth and free stored or produced energy for other uses in the tree. For highly impacted trees, more energy may be made available for fibrous root growth (to combat root loss), thicker darker leaves allowing for increased photosynthesis, and increased drought tolerance.

B. Specific methods and dosages are contained on the label and are deter- mined by size and species and applied by a state licensed pesticide applicator. Designated trees are shown on the TPAK.

8. Supplemental Watering

A. This action is for high impact trees of significance during seasonal drought times of project construction. Based upon the number and size of trees various strategies can be considered to maintain adequate soil moisture during these times. These strategies may include but are not limited to the following:

1. Fire hydrant connection battery powered timer and drip irrigation hose / tubing.
2. Water tank trunk and hand applied as directed;
3. Temporary above grade poly tank with battery-powered timers for drip or soaker hoses at each TPA.
4. 30-50-gallon watering cans with 6-8 drilled holes in bottom to allow slow seeping of water; spacing and rotation to reach desired gallons. Equivalent means of effectively watering trees as approved by Architect or Project Arborist

B. Trees requiring this treatment are indicated in the TPAK. Other trees will not receive this treatment.

C. Drought times shall be defined as:

1. Periods during the growing season of two weeks or longer, where daytime high temperatures reach 80 degrees Fahrenheit or higher and less than ¾" rainfall is recorded per week. Or,
2. Periods during the growing season designated as "abnormally dry" or "drought" of any severity, by the U.S. Drought Monitor: (http://droughtmonitor.unl.edu/). Or,
3. Any period of extraordinary circumstance, as determined by the Project Arborist or COTR.

D. A prescription for the number of gallons and strategy for watering designated trees will be developed. Large mature trees with impacts to root systems require as much as 100- 250 gallons per week during 90-degree days during summer drought times.

E. Periodic inspections by an ISA Certified Arborist (provided by the Contract Arborist) at this time are critical. Depth of moisture in soils shall be deter- mined by soil sample tube or other exploratory means.

F. Minimum watering shall be 6 applications per growing season typically July through October with the exact timing and duration to be determined by the ISA Arborist in conjunction with the COTR. Additional unit costs per watering designated trees at prescribed rates.

9. Overhead Clearance

A. Trees to remain shall be assessed prior to construction for overhead clearance for construction activities. Contract Arborist shall recommend either canopy pruning, temporary guying/typing of select limbs, or alternative construction methods.
B. Pruning for clearance shall not remove branches above 12' or over 6" diameter.
C. All pruning proposed by the Contractor and/or Contract Arborist shall first be reviewed and approved by the COTR and Project Arborist.
D. Equipment exhaust should be directed away from trees as much as possible. Stationary equipment shall not be exhausted directly under or towards trees.
E. The contractor shall use appropriate equipment near trees to ensure that trees are not damaged by construction. Contractor shall provide any specialized equipment needed at no additional cost to the COTR.
F. Any pruning shall also conform to the pruning specifications in this section.

10. Soil Tests and Soil Care/Fertilization

A. Initial soil testing within tree protection areas is required. Conduct individual soil tests for separate tree protection areas (small adjacent areas may be tested together). Soil test shall be a representative sample from each area. Soil testing shall include a texture analysis (sand, silt, and clay percentages), soluble salts, and sodium tests.
B. Treatments to the tree protection areas for specified trees (see TPAK) shall be based on the results of the soil analysis. Fertilization should be consistent with the recommendations of the ANSI A-300 (Part 2) Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices (Fertilization) 2004, except as described herein.
C. Application rates shall not exceed a rate of 1 pound of actual nitrogen per 1,000 square feet annually. Fertilizer used should include humic acids, soluble seaweed extracts and soil biological inoculants (mycorrhizae, etc.).
D. Applications to confined areas (i.e. street tree planting pits) should be made by soil injection. In areas where adequate application rates cannot be achieved, injection should be made to the point of refusal.

11. SSAT Landscape Planting Excavation

A. Proposed landscape planting of B&B plants within critical root zones within TPAs shall be reviewed by the Contract Arborist, contractor, and COTR in the field to determine potential for damage to priority roots of select trees and layout the limit of work.
B. Pre-watering of the proposed areas of excavation during summer and fall months is recommended to maintain root / soil moisture.
C. The Contract Arborist shall provide a qualified arborist crew experienced with the SSAT and landscape planting excavation to protect adjacent natural resources and construction work, open the excavation, hand prune minor roots, and identify and protect priority roots to remain. Coordination with the appropriate sub-contractor shall be made to determine appropriate width, depth, and sequencing.

3.3 FIELD QUALITY CONTROL AND MONITORING

A. Tree Condition Monitoring

1. An ISA Certified Arborist (provided by the Contract Arborist) shall perform monitoring twice

per month year-round to monitor insects, disease, soil moisture levels, weather, and health changes on all trees designated on Tree Protection Action Key.

2. The monitoring will include a report that details problematic areas that have been addressed, treatments provided to reduce the problem, and anticipated treatments forecast for 30 days. This report will be forwarded to the Project Arborist, Architect and COTR for documentation.
3. Any treatments recommended by the Contract Arborist not already included in the project scope shall be noted in the reports for review by the Project Arborist, Architect and COTR. No additional work is to be performed unless approved in writing by the COTR.

B. Construction Oversight by Contract Arborist

1. Any work within CRZs of retained trees shall be directly supervised by the Contract Arborist.
2. If roots are encountered during excavations, work shall progress as directed by the Contract Arborist. Contract Arborist, in coordination with the construction and design teams, shall determine appropriate means and methods to address the roots. Options may include, but not be limited to, severing the roots, hand or SSAT excavation. Contractor shall not cut roots.
3. Refer to "Hand Excavation within Tree Protection Areas" specification in this section.
4. All work shall be documented thoroughly, including photo documentation. Refer to site documentation submittal requirements.

3.4 CONTRACTOR DAMAGES AND PENALTIES

A. Remedial Measures

1. Any damage caused to the trees by the work of this contract through negligence by the contractor shall be immediately remedied by the contractor. Contractor shall be responsible for any associated costs.
2. Remedial work may include pruning, cabling, or any other measures up to and including removal and replacement, as determined by the Project Arborist and COTR.
3. Remedial work shall be performed by the Contract Arborist, as approved by the Project Arborist and COTR.
4. All required remedial work shall be performed to the satisfaction of the Project Arborist and COTR, at no additional cost to the COTR.

B. Tree Replacement

1. If damage to any tree is severe, because of negligence by the contractor as determined by the Project Arborist and COTR, it shall be replaced with a new tree of equal size caliper and species as that of the damaged tree.
2. If a replacement tree of equal size caliper is not possible as determined by the Project Arborist and COTR, it shall be replaced on an inch for inch basis with new trees of a minimum caliper size of 2-3".
3. Replacement trees shall be supplied and installed at no additional costs to the COTR, including all incidental costs including the costs of inspection of the tree at the nursery and any other incidental costs associated with tree replacement

END OF SECTION 015639

SECTION 01 5713 – TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes requirements for temporary erosion and siltation control measures.

1.3 APPLICABLE SPECIFICATIONS

A. DOEE Construction Standards and Specifications.

B. DOEE Erosion and Sediment Control Manual

C. DOEE Erosion and Sediment Control Details

1.4 INFORMATIONAL SUBMITTALS

A. Erosion and Sedimentation Control Plan: Prior to the start of the work the Contractor shall prepare and submit a plan for applying temporary and permanent erosion and siltation control measures. The plan shall include, but is not limited to, the operations of clearing and grubbing, stripping of topsoil, grading, stabilizing cleared areas, dewatering, and the construction of structures at watercourses. Construction work shall not commence until the schedule of work, and the methods of operations have been reviewed and approved by the Engineer.

B. Temporary measures shall be coordinated with the construction of permanent drainage facilities and other contract work to the extent practicable to ensure economical, effective, and continuous erosion and sediment control, and to prevent any damage, clogging, or other negative impacts upon the Work or other property.

1.5 PROJECT CONDITIONS

A. Retain this article to impose responsibility for maintenance and protection of permanent services and facilities used to provide temporary service and facility. Unless otherwise specified, the Contractor is responsible for obtaining and complying with any and all applicable State, Federal, and Local permits which are required for construction.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Materials shall be at the Contractor’s option with the approval of the Engineer in Accordance with DOEE.

PART 3 - EXECUTION

3.1 Installation and Maintenance of erosion and Sediment Control

A. Contractor shall pull DOEE permits, coordinate DOEE site inspections, DOEE site approvals and pay all DOEE related fees as per jobsite site requirements.

B. No grading operations will be allowed until temporary sediment and erosion control measures have been installed in accordance with the approved plan.

C. Control measures shall be periodically cleaned of silt and maintained. Immediately after every rainstorm, all control measures shall be inspected and any deficiencies corrected by the Contractor.

D. DOEE reserves the right to order the performance of other temporary measures not specifically described herein to correct an erosion or siltation condition.

E. Temporary control measures may be removed when the area has been stabilized.

3.2 EXTENT OF GRADING OPERATIONS

A. The Contractor shall limit the surface area of earth material exposed by grubbing, stripping of topsoil and excavation to that which is necessary to perform the next operation within a given area.

B. Unless specifically authorized by the Engineer, the grubbing of root mat and stumps shall be confined to the area over which excavation is to be actively prosecuted within 30 days following the grubbing operations.

C. The stripping of topsoil shall be confined to the area over which excavation is to be actively prosecuted within 7 days following the stripping operations; and excavation and embankment construction shall be confined to the minimum area necessary to accommodate the Contractor's equipment and work force engaged in the earth moving work.

D. No disturbed area, is to remain denuded longer than 7 days without temporary seeding or otherwise stabilizing the area.

3.3 DEWATERING AND DISCHARGES

A. All dewatering operations shall be conducted in a manner that prevents or minimizes the amount of sediment or other pollutants which discharge to the storm sewer system, which includes curb and gutter, or any open watercourse. Any discharge from dewatering operations shall be properly filtered prior to being discharged. Dewatering activities shall not create any erosion nor flooding. A dewatering plan must be included as part of the Erosion and Sediment Control plan with sufficient detail to ensure that the proposed dewatering will meet all applicable requirements.

B. All non-stormwater discharges to the DC Water's storm sewer system, which includes curb and gutter, or any open watercourse must comply regulations. Contaminants, including but not limited to, volatile organic compounds, petroleum products, metals, PCBs/Pesticides, shall not be discharged to the DC Waters storm sewer system without approval from DC Water.

C. Contractors shall not dump or dispose of anything in a storm drain, street, stream, or riparian area that could cause adverse conditions. Contractors shall employ good housekeeping and pollution prevention measures at work sites at all times. Work areas, including staging or stockpile areas, shall be kept clean and free of trash and debris to the maximum extent possible. Construction materials shall be properly stored and secured. Stockpiled materials shall be kept covered and

perimeter controls shall be employed to minimize exposure to wind, precipitation, and runoff. Equipment and vehicle washing shall not be permitted onsite without proper controls and facilities to collect all sediment and/or pollutants. Spill kits and appropriate tools for cleanup shall be kept on-site at all times. Spills shall be cleaned immediately using absorbent materials or other appropriate measures which will prevent any pollutants from entering a storm drain or open watercourse.

END OF SECTION 01 5713

SECTION 01 5715 - TEMPORARY NOISE AND VIBRATION CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary acoustic walls and associated structures.

1.2 REFERENCES

A. “The Smithsonian National Zoo – Arabian Leopard Enclosure: Preliminary Acoustic Narrative” Metropolitan Acoustics, January 22, 2026

1.3 SUBMITTALS

A. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary measures as described in this section.

B. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel integrated with temporary noise barrier indicated on the site plan.

C. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the project site or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:
   1. Methods used to meet the goals and requirements of the Owner.
   2. Concrete cutting method(s) to be used.
   3. Location of construction devices on the site.
   4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
   5. Indicate activities that may disturb adjacent building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.
   6. Indicate locations of sensitive areas or other areas requiring special attention as identified by Owner. Indicate means for complying with Owner's requirements.

D. Product Data: Provide product data sheet clearly indication height, color, and composition of acoustic canvas panels. Structure from which panels will be hung to also be provided.

E. Warranty Documentation

F. Shop Drawings:
   1. Clearly indicate layout of individual panels integrated on the site coordinated and located on a site plan.
   2. Engineer sealed drawings of structural system from which acoustic canvas panels to be hung to be provided showing typical elevation, member sizes, plan, etc.

1.4 MOCKUPS

A. Pre-installation Meeting: Pre-installation meeting to take place with Owner and Architect prior to installation of in-place mockup.

B. In-place Mockup: Provide on-site mockup of no less than (2) panels in place on site.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acoustic Canvas Panels (Temporary Noise Barrier Fence):
   1. Manufacturers:
      a. SoftdB (Basis of Design)
      b. Environmental Noise Control Sound Walls
      c. Noise Monitoring Services Temporary Sound Walls
   2. Material: PVC fabric, ultrasonic welded, reinforced with fiberglass, encasing 50mm Rockwool acoustic insulation and high-density noise reduction vinyl sheet.
      a. UV resistant and watertight.
   3. Sound Attenuation: minimum STC-34
   4. Warranty: Minimum 1-year
   5. Face Weight: Minimum 4 PSF
   6. Height: 15 Feet
   7. Length: 160 feet (see Preliminary Acoustic Narrative for additional information)
   8. Support Structure: As specified by Contractor/Manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
   1. Locate facilities to limit site disturbance as specified in Section 01 1000 "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Site Enclosure Fence and Temporary Noise Barrier: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.

3.3 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 7700 "Closeout Procedures."

END OF SECTION

SECTION 01 6000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Division 01 Section 013300 "Submittal Procedures."
2. Division 01 Section 014200 "References" for applicable industry standards for products specified.
3. Division 01 Section 017700 "Closeout Procedures" for submitting warranties for contract closeout.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," 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 additional manufacturers named in the specification.

C. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Construction Documents and proposed by Contractor.

D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

E. Special Warranty: Written warranty required by or incorporated into the Construction Documents, either to extend time limit provided by manufacturer's warranty or to provide more

rights for Owner.

1.4 SUBMITTALS

A. Product List: Submit a list, in tabular form, 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 the 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 Construction 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.

3. Completed List: Within 60 days after date of commencement of the Work, submit 5 copies of completed product list. Include a written explanation for omissions of data and for variations from Construction requirements.
4. COTR's Action: COTR will respond in writing to Contractor within 21 days of receipt of completed 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 Construction Documents.

B. Substitution Requests: Substitutions may be considered only in accordance with the procedures indicated in the "Brand Name or Equal" Contract Clause. Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Substitution Request Form: Submit request on Supplier/Subcontractor letterhead, accompanied by cover letter on General Contractor's letterhead.
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 Owner and separate contractors that will be necessary to accommodate proposed substitution.
C. Detailed comparison of significant qualities of proposed substitution with those of the work specified. 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 Sum.

K. Contractor's certification that proposed substitution complies with requirements in the Construction 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. Any additional costs incurred by SI (e.g., travel, site visit, AE investigation, etc.) related to the substitution shall be borne by the Contractor.

3. COTR's Action: If necessary, COTR will request additional information or documentation for evaluation within one week of receipt of a request for substitution. COTR will notify Contractor of acceptance or rejection of proposed substitution within 21 days of receipt of request, or 15 days of receipt of additional information or documentation, whichever is later.

a. Form of Acceptance: Letter from COTR and/or Change Order/Contract Modification, if necessary.
b. Use product specified if COTR cannot make a decision on use of a proposed substitution within time allocated.
c. Substitution request should not result in basis for Contract Time extension.

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

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

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, Ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturers' disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

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

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully

in similar situations on other projects.

3. COTR 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 provided by the COTR.
6. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

7. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
   a. Substitutions may be considered as provided in “Brand Name or Equal” Clause.
   b. Contractor shall provide all additional labor and materials consequential to the approval of any substitution or component thereof.
2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements. Substitutions may be considered only as provided in the “Brand Name or Equal” Clause.
3. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements. Substitutions may be considered only as provided in the “Brand Name or Equal” Clause.
4. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Substitutions may be considered only as provided in the “Brand Name or Equal” Clause.
5. Available Products: Where Specification paragraphs or subparagraphs titled "Available Products" introduce a list of names of both products and manufacturers, provide one of the products listed or another product that complies with requirements. Comply with provisions in "Comparable Products" Article (“Brand Name or Equal” Clause) to obtain approval for use of an unnamed product.
6. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article (“Brand Name or Equal” Clause) to obtain approval for use of an unnamed product.
7. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer. Comply with provisions in “Product Substitutions" Article (“Brand Name or Equal” Clause).
8. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of- Design Products" are included and also introduce or refer to a list of manufacturers' names, provide either 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 "Comparable Products" Article (“Brand Name or Equal” Clause) to obtain approval for use of an unnamed product.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches sample. COTR’s decision will be final on whether a proposed product matches

satisfactorily.

a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching 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 (and manufacturer) 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, 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, or texture from

manufacturer's product line that includes both standard and premium items.

11. Codes, Standards, and Regulations: Select products that are in compliance with the Project specifications and SI standards, as well as with construction standards and all applicable codes and regulations.
12. Performance Requirements: Provide products that comply with specific performances indicated and are recommended by the manufacturer (in published product literature or by individual certification) for the application indicated.
13. Prescriptive Requirements: Provide products that have been produced in accordance with prescriptive requirements, using specified ingredients and components, and comply with specified requirements for mixing, fabricating, curing, finishing, testing, and other operations in the manufacturing process.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: COTR will consider requests for substitution. Substitutions may be considered only in accordance with the procedures indicated in the “Brand Name or Equal” Contract Clause.

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 offers SI a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities SI must assume.
2. Requested substitution is consistent with the Construction 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.

2.3 COMPARABLE PRODUCTS

A. “Brand Name or Equal” Clause governs. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of

an unnamed product:

1. Evidence that the proposed product does not require revisions to the Construction Documents that it is consistent with the Construction Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications or commonly referenced in the industry. Significant qualities include, but are not limited to, attributes such as performance, weight, size, durability, material construction, maintainability, sustainability, compatibility, aesthetic and visual effect, texture, toxicity, consequential effects of use, 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.

PART 3 - EXECUTION (Not

Used)

END OF SECTION 016000

SECTION 01 7300 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.
9. Correction of the Work.

B. Related Requirements:

1. Division 01 Section 013100 “Project Management and Coordination” for procedures for coordinating field engineering with other construction activities.
2. Division 01 Section 013300 “Submittal Procedures” for submitting surveys.
3. Division 01 Section 017700 “Closeout Procedures” for submitting final property survey with Project Record Documents, recording of SI-accepted deviations from indicated lines and levels, and final cleaning.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor and professional engineer.

B. Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.

C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance

and other significant visual elements.

3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

    a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

E. Certified Surveys: Submit one hard, CAD / GIS, and PDF copies signed by professional engineer.

F. Final Site Survey: Submit one hard, CAD / GIS, and PDF copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify C O T R of locations and details of cutting and await directions from COTR before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
    a. Primary operational systems and equipment.
    b. Fire separation assemblies.
    c. Air or smoke barriers.
    d. Fire-suppression systems.
    e. Mechanical systems piping and ducts.
    f. Control systems.
    g. Communication systems.
    h. Fire-detection and -alarm systems
    i. Electrical wiring systems.
    j. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, which results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

Other construction elements include but are not limited to the following:

a. Water, moisture, or vapor barriers.
b. Membranes and flashings.
c. Exterior curtain-wall construction.
d. Sprayed fire-resistive material.
e. Equipment supports.
f. Piping, ductwork, vessels, and equipment.
g. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

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

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with requirements in Section 018113.13 "Sustainable Design Requirements - LEED for New Construction and Major Renovations."

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping, underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. 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 services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

D. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

E. 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. Coordinate with authorities having jurisdiction.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by SI or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify COTR not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without COTR's written permission.

C. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify COTR promptly.

B. General: Engage a professional engineer to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify COTR when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and layout site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by COTR.

3.4 FIELD ENGINEERING

A. Identification: COTR will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval 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. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide

temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a professional engineer to prepare a final property survey showing significant features (real property) for the Project. Include a certification on the survey, signed by a professional engineer, that certifies the metes, bounds, lines, and levels are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements, and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute templates, to the party’s involved, for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by COTR.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, which are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials that won't void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering, and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond- core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to

be removed. Cap, valve, or plug and seal remaining portions of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, prepare substrate, apply primer, and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 SUBMITTALS

A. Cutting and Patching Proposal: For areas not indicated to be cut and patched in the Construction Drawings, submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. 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. Utilities: 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.

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. Do not cut or alter structural members except where noted on the drawings, without approval of
7. the cutting and patching proposal and authorization of the COTR.COTR's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.
8. Torch or Arc cutting, burning, welding and penetrations through fire separations must be coordinated with the COTR and submitted for prior approvals and permits.

3.8 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 operating elements and related components in a manner that results in reducing their capacity to perform as intended or that result in increased maintenance or decreased operational life or safety.

C. 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.

D. Call unknown conditions exposed by removal of existing work that do not match new finishes or align with new work to the COTR's immediate attention. Necessary corrective work directed by the COTR will be subject to adjustment provisions as stated in the Contract.

3.9 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.

END OF SECTION 017300

SECTION 01 7419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Reduce construction and demolition waste on job site and minimize waste sent to landfills through implementation of Construction Waste Management Plan as required by USGBC's LEED® 2009 for New Construction & Major Renovations and as outlined within this Section and in the Sections referenced herein

B. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous waste.
2. Recycling nonhazardous waste.
3. Disposing of nonhazardous waste.

C. Related Requirements:
1. Section 024119 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements**.**
2. Section 042000 "Unit Masonry" for disposal requirements for masonry waste.
3. Section 311000 "Site Clearing" for disposition of waste resulting from site clearing and removal of above - and below-grade improvements.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

A. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling as required for percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials **including the following:**
1. Demolition Waste:
a. Asphalt paving.

b. Concrete.
c. Concrete reinforcing steel.
d. Brick.
e. Concrete masonry units.
f. Wood studs.
g. Wood joists.
h. Plywood and oriented strand board.
i. Wood paneling.
j. Wood trim.
k. Structural and miscellaneous steel.
l. Rough hardware.
m. Roofing.
n. Insulation.
o. Doors and frames.
p. Door hardware.
q. Windows.
r. Glazing.
s. Metal studs.
t. Gypsum board.
u. Acoustical tile and panels.
v. Carpet.
w. Carpet pad.
x. Demountable partitions.
y. Equipment.
z. Cabinets.
aa. Plumbing fixtures.
bb. Piping.
cc. Supports and hangers. D
d. Valves.
ee. Sprinklers.
ff. Mechanical equipment.
gg. Refrigerants.
hh. Electrical conduit.
ii. Copper wiring.
jj. Lighting fixtures.
kk. Lamps.
ll. Ballasts.
mm. Electrical devices.
nn. Switchgear and panelboards.
oo. Transformers.

2. Construction Waste:
a. Masonry and CMU.
b. Lumber.
c. Wood sheet materials.
d. Wood trim.
e. Metals.
f. Roofing.
g. Insulation.
h. Carpet and pad.
i. Gypsum board.
j. Piping.
k. Electrical conduit.
l. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following

uncontaminated packaging materials:
1) Paper.
2) Cardboard.
3) Boxes.
4) Plastic sheet and film.
5) Polystyrene packaging.
6) Wood crates.
7) Plastic pails.

1.1 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within **7** days of date established for **commencement of the Work.**

B. Prior to any waste removal and within 30 days of Contract award, submit for approval a detailed Construction and Demolition Waste Management Plan outlined in this Section:

1. Analysis of estimated job-site waste to be generated, including types and quantities of compostable, recyclable and salvageable materials.
2. Description of means and methods to achieve 75 percent diversion requirement for compostable, recyclable, and salvageable materials, including those that may be donated to charitable organizations.
3. Identification of recycling contractors and haulers proposed for use in the project and locations accepting construction waste materials or entities providing related services.

1.2 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:
1. Material category.
2. Generation points of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of- Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and

invoices.

G. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.3 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. `Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
   a. Review requirements for documenting quantities of each type of waste and its disposition.
   b. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
   c. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
   d. Review waste management requirements for each trade.

1.4 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. **Distinguish between demolition and construction waste.** Indicate quantities by weight or volume but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of **demolition**, **site-clearing and construction** waste generated by the Work. Use **Form CWM-1 for construction waste and Form CWM- 2 for demolition waste**. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form **CWM-3 for construction waste and Form CWM-4 for demolition waste**. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

   1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
   2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
   3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
   4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
   5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
   6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Use Form **CWM- 5 for construction waste and Form CWM-6 for demolition waste**. Include the following:

1. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
3. Total cost of disposal (with no waste management).
4. Revenue from salvaged materials.
5. Revenue from recycled materials.
6. Savings in hauling and tipping fees by donating materials.
7. Savings in hauling and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

E. Training and Coordination:

1. Furnish copies of approved Waste Management Plan to all on-site supervisors, each subcontractor, Owner, and Architect.
2. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all entities at the appropriate stages of the Project.
3. Meetings: Include construction waste management on the agenda of all required regularly scheduled construction meetings.

F. Facilities: Provide designated facilities for co-mingling or separation and storage of materials for recycling, salvage, reuse, return, and waste disposal, per approved Construction Waste Management Plan for use by all contractors and installers.

1. Provide bi-lingual signage.
2. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
3. Provide adequate space, convenient to subcontractors, for pick-up and delivery.
4. Keep recycling and waste bin areas neat and clean to avoid contamination of materials.

G. Records: Maintain onsite logs for each load of materials removed from site:

1. Landfill Log: Include type of material, load (by weight or volume), recycling/hauling service, date accepted by landfill, and facility fee.
2. Waste Diversion: Include type of material, load (by weight or volume), recycling/hauling service, date accepted by recycling service, or non-profit receiver and facility fee.
3. Where comingling occurs prior to collection, track the amount of construction waste diverted from landfill based on the weight or volume of the removed co-mingled waste and provide the documentation of percentages of recycled from the sorting facility.

H. Methods of waste disposal that are not acceptable for Sustainable Design Requirements are:

1. Burning or incinerating on or off project site.
2. Burying on project site, other than fill.
3. Dumping or burying on other property, public or private, other than official landfill.
4. Illegal dumping or burying.

I. Recycling Procedures:

1. Co-mingle or separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
2. Coordinate work of recycling, composting and salvaging waste haulers with other trades.
3. Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

J. Reuse of materials On-Site: Set aside, sort, and protect separate products in preparation for reuse.

1. Materials qualifying as reused shall not be part of the waste diversion calculation. See Division 1 Section “Sustainable Design Requirements” requirements.
2. Concrete, masonry and asphalt crushed and reused onsite shall contribute to Sustainable Design Requirements. See Division 1 Section “Sustainable Design Requirements”.
3. Stone excavated from the site, crushed and reused on site shall contribute Sustainable Design Requirements. See Division 1 Section “Sustainable Design Requirements”.

K. Salvage of Materials: Set aside, sort, and protect products to be salvaged for reuse offsite.

L. Hazardous Waste Handling: Separate, store and dispose of hazardous wastes separately and in accordance with local regulations. Do not handle, separate, store, salvage, or recycle hazardous. Properly package, mark and label hazardous waste and dispose of in accordance with applicable EPA and DOEE regulations. Manifest for shipping hazardous waste must be signed by the NZP Hazardous Waste Coordinator and generator copies maintained on site.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."

B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute the waste management plan to everyone concerned within **three** days of submittal return.
2. Distribute the waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows: B.
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
   3. Store items in a secure area until installation.
   4. Protect items from damage during transport and storage.
   5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

3.3 RECYCLING, DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

   1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

      a. Inspect containers and bins for contamination and remove contaminated materials if found.

   2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
   4. Store components off the ground and protect from the weather.
   5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Asphalt Paving: Grind asphalt

   1. Crush asphaltic concrete paving and screen to comply with requirements in Section 312000 "Earth Moving" for use as general fill.

B. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.

C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals. C.

1. Crush concrete and screen to comply with requirements in Section 312000 "Earth Moving" for use as satisfactory soil for fill or subbase.

D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Pulverize masonry to maximum

a. Crush masonry and screen to comply with requirements in Section 312000 "Earth Moving" for use as satisfactory soil for fill or subbase.
b. Crush masonry and screen to comply with requirements in Section 329300 "Plants" for use as mineral mulch.

2. Clean and stack undamaged, whole masonry units on wood pallets.

E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

F. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

G. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.

H. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
   a. Comply with requirements in Section 329300 "Plants" for use of clean sawdust as organic mulch.

C. Gypsum Board: Stack large clean pieces on wood pallets or in containers and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
   a. Comply with requirements in Section 329300 "Exterior Plants" for use of clean ground gypsum board as inorganic soil amendment.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
   1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017419

SECTION 01 7700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract close-out, including, but not limited to, the following:

1. Final completion procedures.
2. Warranties.
3. Final cleaning.
4. Repair of the Work.

B. Related Requirements:

1. Final Completion.
2. Division 01 Section 012900 “Payment Procedures” for requirements for Applications for Payment.
3. Division 01 Section 013233 “Photographic Documentation” for submitting Final Completion construction photographic documentation.
4. Division 01 Section 016000 “Product Requirements” for warranties.
5. Division 01 Section 017300 “Execution” for progress cleaning of Project site.
6. Division 01 Section 017419 “Construction Waste Management and Disposal” for Sustainable Design related documentation requirements.
7. Division 01 Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
8. Division 01 Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
9. Division 01 Section 017900 "Demonstration and Training" for requirements for instructing COTR's personnel.

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 FINAL COMPLETION PROCEDURES

A. Definition: The date of Final Completion of the Project is the date, as confirmed by the COTR, when the Work is satisfactorily completed and accepted in accordance with the Contract Documents, as amended and/or modified.

B. Preliminary Procedures: Before requesting final inspection to determine the date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Submit certified copy of 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. Arrange for final changeover of locks.
4. Submit evidence of payment and transfer date of utility company accounts for those utilities previously billed to the Contractor during construction.
5. Submit evidence that all regulatory agency permits and code requirements have been completed and recorded, as necessary.
6. Submission of a signed, written statement that no damage has occurred to the Site as documented by the Final Photographic/Videotape Documentation report.
7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
8. Final Clean-up.

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 Letter of Acceptance after inspection or will notify Contractor of construction that must be completed or corrected before letter will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

D. Final Application for Payment: Complete all requirements for transmittal of the Final Application for Payment in accordance with Division 01 Section "Payment Procedures", including submission of:

1. Final labor data and Construction Progress Schedule update.
2. Certification, signed by the Contractor, that all Contract requirements, including Contract Modifications have been met.
3. Release of assignment of claims or consent of surety submitted, as necessary.
4. Return of all parking permits.
5. Final Project Record Documents.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

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

1. Organize list of spaces in sequential order,
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

a. Project name.
b. Date.
c. Name of Contractor.
d. Page number
e. Total number of pages
f. SI Project Number.

1.8 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: 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, or when delay in submittal of warranties might limit COTR's rights under warranty.

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 COTR during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual. Organize in a PDF.

1. Warranty Electronic File: Submit Warranties in a submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

PART 2 - PRODUCTS

2.1 MATERIALS

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

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 – EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Completion for entire Project or for a designated portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations 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. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.

p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
q. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls" and Section 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specify condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

    a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

SECTION 01 7823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Section 019113 "General Commissioning Requirements" for verification and compilation of data into operation and maintenance manuals.
3. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

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

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. COTR will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to COTR.

a. Name each indexed document file in composite electronic index with

applicable item name. Include a complete electronically linked operation and maintenance directory.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:
1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

2.3 EMERGENCY MANUALS

A. Content: Organize manual 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. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

A. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner'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.

2.4 OPERATION MANUALS

A. Content: In addition to the requirements in this Section, include operation data required in the individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if the Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

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

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

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

E. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name

and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

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

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

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

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

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

F. Warranties: Include copies of warranties and lists of circumstances and conditions that would affect validity of warranties.

1. Include procedures to follow and required notifications for warranty claims.
2. Provide any extended warranties offered by manufactures and/or installers (including labor) for any and all equipment for Owner to review.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semi-annual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

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

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

H. Warranties: Include copies of warranties and lists of circumstances and conditions that would affect validity of warranties.

1. Include procedures to follow and required notifications for warranty claims.
2. Provide any extended warranties offered by manufacturers and/or installers (including labor) for any and all equipment for Owner to review.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each

product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."

G. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 01 7839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Requirements:
1. Section 017300 "Execution" for final property survey.
2. Section 017700 "Closeout Procedures" for general closeout procedures.
3. Section 017823 “Operation and Maintenance Data” for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
a. Final Submittal:

1) Submit electronic PDF of marked-up record prints.

B. Record Specifications: Submit annotated PDF electronic files of Project’s Specifications, including addenda and contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

1. Where record Product Data is required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

E. Reports: Submit written report biweekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

1.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations below first floor.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
4. Mark important additional information that was either shown schematically or omitted from original Drawings.
5. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
6. Mark each sheet with the designation “AS BUILT.”

B. Record Digital Data Files: Review marked-up record prints with COTR. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same CAD program, version, and operating system as the original Contract Drawings and PDF copy.
2. Format: ArcGIS, filegeodatabase
3. Format: Annotated PDF electronic file with comment function enabled.
4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable. Mark each sheet/file with the designation “AS BUILT.”

5. Refer instances of uncertainty to COTR for resolution.

C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Ask the COTR for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

D. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Contractor.

1.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and reordered later.
2. Mark copies with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. 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 Product Data, and record Drawings where applicable.
6. Mark cover sheet with the designation “AS BUILT.”

A. Format: Submit record Specifications as annotated PDF electronic file of marked-up paper copy of Specifications.

1.3 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 manufacturers' written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.
4. Mark each cover sheet with the designation "AS BUILT."

B. Format: Submit record Product Data as annotated PDF electronic file of marked-up paper copy of Product Data.

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

1.4 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.

B. Format: Submit miscellaneous record submittals as PDF electronic file of marked-up miscellaneous record submittals.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

1.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for COTR reference during normal working hours.

END OF SECTION 017839

SECTION 01 7900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing COTR's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For facilitator, instructor, and videographer.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

E. Related Sections include the following:

1. Division 01 Section 013100 “Project Management and Coordination” for requirements for pre-instruction conferences.
2. Division 01 Section 013233 “Photographic Documentation” for preparing and submitting demonstration and training videotapes.
3. Division 01 Section 019113 “Commissioning”

F. Demonstration and Training Videotape: Submit two copies at end of each training module.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit electronically within seven days of end of each training module.

1. Identification: Provide a Submittal with the following information:
   a. Name of Project.
   b. Name and address of videographer.

c. Name of Architect.
d. Name of Construction Manager.
e. Name of Contractor.
f. Date of video recording.

2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
3. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
4. At completion of training, submit complete training manual(s) for COTR's use prepared and bound in format matching operation and maintenance manuals and in PDF electronic file format on compact disc.

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A videographer who is experienced photographing demonstration and training events like those required.

D. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 “Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

A. Coordinate instruction schedule with COTR’s operations. Adjust schedule as required to minimize disrupting COTR's operations and to ensure availability of COTR's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by COTR.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
   a. System, subsystem, and equipment descriptions.
   b. Performance and design criteria if Contractor are delegated design responsibility.
   c. Operating standards.
   d. Regulatory requirements.
   e. Equipment function.
   f. Operating characteristics.
   g. Limiting conditions.
   h. Performance curves.

2. Documentation: Review the following items in detail:
   a. Emergency manuals.
   b. Operations manuals.
   c. Maintenance manuals.
   d. Project record documents.
   e. Identification systems.
   f. Warranties and bonds.
   g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:
   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.
   d. Operating instructions for conditions outside of normal operating limits.
   e. Sequences for electric or electronic systems.
   f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:
   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.
   h. Normal shutdown instructions.
   i. Operating procedures for emergencies.
   j. Operating procedures for system, subsystem, or equipment failure.
   k. Seasonal and weekend operating instructions.
   l. Required sequences for electric or electronic systems.
   m. Special operating instructions and procedures.

5. Adjustments: Include the following:
   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.

d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:
   a. Diagnostic instructions.
   b. Test and inspection procedures.

7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.

8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and COTR for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct COTR's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with COTR with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a performance-based test if required by the COTR.

F. Cleanup: Collect used and leftover educational materials and give to COTR. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to COTR on electronic media.

1. Electronic Media: Read-only format compact disc acceptable to COTR, with commercial-grade graphic label.

2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.

3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.

4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training flash drive that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:
   a. Name of Contractor/Installer.
   b. Business address.
   c. Business phone number.
   d. Point of contact.
   e. E-mail address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.
   a. Produce segments to present a single significant piece of equipment per segment.
   b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
   c. Where a training session on a piece of equipment exceeds 15 minutes, stop filming, and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.

F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

G. Pre-produced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 017900

SECTION 01 8113 - SUSTAINABLE DESIGN REQUIREMENTS – LEED

Part 1- GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and credits needed for Project to obtain **LEED Gold** certification based on USGBC's "LEED 2009 for New Construction & Major Renovations."

1. Other LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
2. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contrac

3. Specific requirements for LEED are included in greater detail in other Sections.

1.3 DEFINITIONS

A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

B. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

C. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Respond to questions and requests from Architect and the USGBC regarding LEED credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on

Contractor's procedures until the USGBC has made its determination on the project's LEED certification application. Document responses as informational submittals.

B. The Contractor is responsible for achieving the minimum amount of Construction related credits outlined within the LEED Scorecard.

C. The Contractor is responsible for submitting all Construction related credits to USGBC through the LEED Online platform.

1.5 ACTION SUBMITTALS

A. General: Submit additional LEED submittals required by other Specification Sections.

B. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.

C. LEED Documentation Submittals:

1. Credit EA 5: Product data and wiring diagrams for sensors and data collection system used to provide continuous metering of building energy-consumption performance over a period of time of not less than one year of postconstruction occupancy.
2. Credit MR 2: Comply with Section 017419 "Construction Waste Management and Disposal."
3. Credit MR 3: Receipts for salvaged and refurbished materials used for Project, indicating sources and costs for salvaged and refurbished materials.
4. Credit MR 4: Product data and certification letter from product manufacturers indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating material cost for each product having recycled content.
5. Credit MR 5: Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
6. Credit MR 7: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
7. Credit IEQ 3.1:

    a. Construction indoor-air-quality management plan.
    b. Product data for temporary filtration media.
    c. Product data for filtration media used during occupancy.
    d. Construction Documentation: Six photographs at three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.

8. Credit IEQ 3.2:

    a. Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
    b. Product data for filtration media used during flush-out and during occupancy.
    c. Report from testing and inspecting agency indicating results of indoor-air-quality testing and documentation showing compliance with indoor-air-quality testing procedures and requirements.

9. Credit IEQ 4.1: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used.
10. Credit IEQ 4.2: Product data for paints and coatings used inside the weatherproofing system indicating VOC content of each product used.
11. Credit IEQ 4.4: Product data for products containing composite wood or Agri fiber products or wood glues indicating that they do not contain urea-formaldehyde resin.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For LEED coordinator.

B. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:

1. Furniture.
2. Plumbing.
3. Mechanical.
4. Electrical.
5. Specialty items such as elevators and equipment.
6. Wood-based construction materials.

C. LEED Action Plans: Provide preliminary submittals within 14 days of date established for the Notice to Proceed indicating how the following requirements will be met:

1. Credit MR 2: Waste management plan complying with Section 017419 "Construction Waste Management and Disposal."
2. Credit MR 3: List of proposed salvaged, refurbished, and reused materials. Identify each material that will be salvaged, refurbished, or reused, including its source, cost, and replacement cost if the item was to be purchased new.
3. Credit MR 4: List of proposed materials with recycled content. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
4. Credit MR 5: List of proposed regional materials. Identify each regional material, including its source, cost, and the fraction by weight that is considered regional.
5. Credit MR 7: List of proposed certified wood products. Indicate each product containing certified wood, including its source and cost of certified wood products.
6. Credit IEQ 3.1: Construction indoor-air-quality management plan.

D. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:

1. Credit MR 2: Waste reduction progress reports complying with Section 017419 "Construction Waste Management and Disposal."
2. Credit MR 3: Salvaged, refurbished, and reused materials.
3. Credit MR 4: Recycled content.
4. Credit MR 5: Regional materials.
5. Credit MR 7: Certified wood products.

1.7 QUALITY ASSURANCE

A. LEED Coordinator: Engage an experienced LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated.

2.2 SALVAGED, REFURBISHED, OR REUSED MATERIALS

A. Credit MR 3: Not less than 5 percent of building materials (by cost) shall be salvaged, refurbished, or reused materials.

2.3 RECYCLED CONTENT OF MATERIALS

A. Credit MR 4: Building materials shall have recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content for Project constitutes a minimum of 20 percent of cost of materials used for Project.

1. Cost of post-consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
2. Do not include furniture, plumbing, mechanical and electrical components, and specialty items such as elevators and equipment in the calculation.

2.4 REGIONAL MATERIALS

A. Credit MR 5: Not less than 10 percent of building materials (by cost) shall be regional materials.

2.5 CERTIFIED WOOD

A. Credit MR 7: Not less than 50 percent (by cost) of wood-based materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1. Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:

a. Rough carpentry.
b. Miscellaneous carpentry.
c. Heavy timber construction.
d. Wood decking.
e. Metal-plate-connected wood trusses.
f. Structural glued-laminated timber.
g. Finish carpentry.
h. Architectural woodwork.
i. Wood paneling.
j. Wood veneer wall covering.
k. Wood flooring.

l. Wood lockers.
m. Wood cabinets.
n. Furniture.

2.6 LOW-EMITTING MATERIALS

A. Credit IEQ 4.1: For field applications that are inside the weatherproofing system, adhesives and sealants shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.
2. Metal-to-Metal Adhesives: 30 g/L.
3. Adhesives for Porous Materials (Except Wood): 50 g/L.
4. Subfloor Adhesives: 50 g/L.
5. Plastic Foam Adhesives: 50 g/L.
6. Carpet Adhesives: 50 g/L.
7. Carpet Pad Adhesives: 50 g/L.
8. VCT and Asphalt Tile Adhesives: 50 g/L.
9. Cove Base Adhesives: 50 g/L.
10. Gypsum Board and Panel Adhesives: 50 g/L.
11. Rubber Floor Adhesives: 60 g/L.
12. Ceramic Tile Adhesives: 65 g/L.
13. Multipurpose Construction Adhesives: 70 g/L.
14. Fiberglass Adhesives: 80 g/L.
15. Contact Adhesive: 80 g/L.
16. Structural Glazing Adhesives: 100 g/L.
17. Wood Flooring Adhesive: 100 g/L.
18. Structural Wood Member Adhesive: 140 g/L.
19. Single-Ply Roof Membrane Adhesive: 250 g/L.
20. Special-Purpose Contact Adhesive (contact adhesive that is used to bond melamine-covered board, metal, unsupported vinyl, rubber, or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
21. Top and Trim Adhesive: 250 g/L.
22. Plastic Cement Welding Compounds: 250 g/L.
23. ABS Welding Compounds: 325 g/L.
24. CPVC Welding Compounds: 490 g/L.
25. PVC Welding Compounds: 510 g/L.
26. Adhesive Primer for Plastic: 550 g/L.
27. Sheet-Applied Rubber Lining Adhesive: 850 g/L.
28. Aerosol Adhesive, General-Purpose Mist Spray: 65 percent by weight.
29. Aerosol Adhesive, General-Purpose Web Spray: 55 percent by weight.
30. Special-Purpose Aerosol Adhesive (All Types): 70 percent by weight.
31. Other Adhesives: 250 g/L.
32. Architectural Sealants: 250 g/L.
33. Nonmembrane Roof Sealants: 300 g/L.
34. Single-Ply Roof Membrane Sealants: 450 g/L.
35. Other Sealants: 420 g/L.
36. Sealant Primers for Nonporous Substrates: 250 g/L.
37. Sealant Primers for Porous Substrates: 775 g/L.
38. Modified Bituminous Sealant Primers: 500 g/L.
39. Other Sealant Primers: 750 g/L.

B. Credit IEQ 4.2: For field applications that are inside the weatherproofing system, paints and coatings shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Flat Paints and Coatings: VOC not more than 50 g/L.
2. Nonflat Paints and Coatings: VOC not more than 150 g/L.
3. Dry-Fog Coatings: VOC not more than 400 g/L.
4. Primers, Sealers, and Undercoaters: VOC not more than 200 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
6. Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.
7. Pretreatment Wash Primers: VOC not more than 420 g/L.
8. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
9. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
10. Floor Coatings: VOC not more than 100 g/L.
11. Shellacs, Clear: VOC not more than 730 g/L.
12. Shellacs, Pigmented: VOC not more than 550 g/L.
13. Stains: VOC not more than 250 g/L.

C. Credit IEQ 4.4: Composite wood, agrifiber products, and adhesives shall not contain urea-formaldehyde resin.

PART 3 - EXECUTION

3.1 REFRIGERANT AND CLEAN-AGENT FIRE-EXTINGUISHING-AGENT REMOVAL

A. Prerequisite EA 3: Remove CFC-based refrigerants from existing HVAC&R equipment indicated to remain and replace with refrigerants that are not CFC based. Replace or adjust existing equipment to accommodate new refrigerant as described in HVAC Sections.

B. Credit EA 4: Remove clean-agent fire-extinguishing agents that contain HCFCs or halons and replace with agent that does not contain HCFCs or halons. See Section 212200 "Clean-Agent Fire-Extinguishing Systems" for additional requirements.

3.2 MEASUREMENT AND VERIFICATION

A. Credit EA 5: Implement measurement and verification plan consistent with Option B: Energy Conservation Measure Isolation the EVO's "International Performance Measurement and Verification Protocol (IPMVP), Volume III: Concepts and Options for Determining Energy Savings in New Construction,".

B. If not already in place, install metering equipment to measure energy usage. Monitor, record, and trend log measurements.

C. Evaluate energy performance and efficiency by comparing actual to predicted performance.

D. Measurement and verification period shall cover at least one year of postconstruction occupancy.

3.3 CONSTRUCTION WASTE MANAGEMENT

A. Credit MR 2: Comply with Section 017419 "Construction Waste Management and Disposal."

3.4 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

A. Credit IEQ 3.1: Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."

1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Section 015000 "Temporary Facilities and Controls," install filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
2. Replace all air filters immediately prior to occupancy.

B. Credit IEQ 3.2: Comply with one of the following requirements:

1. After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total volume of 14000 cu. ft. of outdoor air per sq. ft. of floor area while maintaining an internal temperature of at least 60 deg F and a relative humidity no higher than 60 percent.

2. If occupancy is desired prior to flush-out completion, the space may be occupied following delivery of a minimum of 3500 cu. ft. of outdoor air per sq. ft. of floor area to the space. Once a space is occupied, it shall be ventilated at a minimum rate of 0.30 cfm per sq. ft. of outside air or the design minimum outside air rate determined in Prerequisite IEQ 1, whichever is greater. During each day of the flush-out period, ventilation shall begin a minimum of three hours prior to occupancy and continue during occupancy. These conditions shall be maintained until a total of 14000 cu. ft./sq. ft. of outside air has been delivered to the space.

3. Air-Quality Testing:

a. Conduct baseline indoor-air-quality testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air," and as additionally detailed in the USGBC's "Green Building Design and Construction Reference Guide."
b. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:

1) Formaldehyde: 27 ppb.
2) Particulates (PM10): 50 micrograms/cu. m.
3) Total Volatile Organic Compounds (TVOC): 500 micrograms/cu. m.
4) 4-Phenylcyclohexene (4-PH): 6.5 micrograms/cu. m.
5) Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.

c. For each sampling point where the maximum concentration limits are exceeded, conduct additional flush-out with outside air and retest the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting noncomplying building areas, take samples from same locations as in the first test.
d. Air-sample testing shall be conducted as follows:

1) All measurements shall be conducted prior to occupancy but during normal occupied hours, and with building ventilation system starting at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.
2) Building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Nonfixed furnishings such as workstations and partitions are encouraged, but not required, to be in place for the testing.

3) Number of sampling locations varies depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft. or for each contiguous floor area, whichever is larger, and shall include areas with the least ventilation and greatest presumed source strength.
4) Air samples shall be collected between 3 and 6 feet from the floor to represent the breathing zone of occupants, and over a minimum four-hour period.

END OF SECTION 018113

SECTION 01 9113 – COMMISSIONING

PART 1 – GENERAL

1.1 Description

A. The Smithsonian will procure the services of independent Commissioning Consultant; other terms are Commissioning Provider, Commissioning Agent, and Commissioning Authority. The Commissioning Consultant is an independent and knowledgeable third party, contracted to verify that the systems work as described in the Owners Project Requirements (OPR). The Commissioning Consultant will inform the Construction Manager (CM) COTR and the Architect of the results of the commissioning and provide suggestions, as necessary, to correct deficiencies in observed performance or installation.

B. Commissioning is the process to verify to the Smithsonian that systems, equipment, mechanical, electrical, controls and special systems function together properly to meet performance requirements and design intent, and as described in the Contract Documents. The General Contractor shall be responsible for participation in the commissioning process as outlined below and in references and attachments throughout the Contract Documents. The General Contractor shall furnish labor and materials sufficient to meet all requirements of building commissioning under this contract.

C. Various sections in Division 23 and 26 Specifications as well as specifications in other formats outline the specific commissioning responsibilities of each General Contractor and corresponding subcontractors for the division and obligate the General Contractor to coordinate and manage the commissioning responsibility of those subcontractors.

1.2 REQUIREMENTS INCLUDED

A. Duties of Contractor.
B. Duties of Commissioning Consultant.
C. Commissioning Field Notebook.
D. Acceptance Procedures.
E. Performance Period.
F. Training and Instruction.

1.3 RELATED SECTIONS

A. All Division 1 Sections and Smithsonian General Requirements
B. All Division 21 Sections
C. All Division 22 Sections
D. All Division 23 Sections
E. All Division 25 Sections
F. All Division 26 Sections
G. All Division 28 Sections

1.4 TERMS

A. Acceptable Performance: A component or system being able to meet specified design parameters under actual load including satisfactory documented completion of all functional performance tests, control system trending and resolution of outstanding issues.

B. Basis of Design: The Basis of Design is *a document that records the concepts, calculations, decisions, and product selections used to meet the Owner's Project Requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of*

individual items that support the design process. (ASHRAE Guideline 0-2013). The Basis of Design provided by the design engineer addresses the decisions to meet the design intent as defined by the Smithsonian Institution. The Basis of Design describes the systems, components, conditions, and methods to meet the design intent.

C. Commissioning Plan: The Smithsonian's Commissioning Consultant prepares The Commissioning Plan. *The Commissioning plan is a document that outlines the organization, schedule, allocation of resources, and documentation requirements of the Commissioning Process (ASHRAE Guideline 0-2013)*. In addition, it defines the scope and format of the commissioning process and the responsibilities of all involved parties. The commissioning team reviews the Commissioning Plan to inform the intent and scope of the commissioning process, to ensure inclusion in the construction project scope/schedule and to facilitate and expedite the commissioning process. The Commissioning Plan is to be distributed by the Commissioning Consultant during the first third of the construction timeframe.

D. Functional Performance Testing: Is a full range of checkouts and tests carried out to determine if all components, sub-systems, systems, and interfaces between systems function in accordance with the Contract Documents and meets the design intent. In this context, "function" includes all modes and sequences of control operation, all interlocks and conditional control responses and all specified responses to abnormal emergency conditions. The Commissioning Consultant will prepare the functional performance tests.

E. Commissioning (Also Commissioning Process) is *a quality-focused process enhancing the delivery of a project. The process focusses upon verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the Owner's Project Requirements. (ASHRAE Guideline 0-2013).* Process to demonstrate the Smithsonian building equipment controls and systems function together properly to meet design intent and performance requirements shown in a composite manner in the Contract Documents.

F. Resolution Log: The purpose of this document is to provide a method for tracking and resolution of deficiencies discovered during the commissioning process. This list also includes the current disposition of issues and the date of final resolution as confirmed by the Commissioning Consultant. Deficiencies are issues where products, execution or performance does not satisfy the Specifications and/or the design intent. The Commissioning consultant creates and manages the Resolution Log.

G. Pre-functional Construction Checklists: Commissioning Consultant prepares Checklist for equipment of systems and assemblies. See paragraph 1. A. Checklist shall be for the systems or equipment involved in the commissioning process to verify installation and start-up of equipment is complete and verify that systems are ready for functional testing. These documents require signature by the Contractor prior to continuing with the commissioning process and are required as a pre-condition of beginning the Functional Performance Testing.

H. Testing and balancing (TAB) process. A complete pencil copy of TAB reports, reviewed on a system-by-system basis by the engineer and the Cx entity, is required prior to the start of any final functional performance test.

1.5 DUTIES OF CONTRACTOR

A. Provide copies of all approved shop drawings, manufacturer's literature, maintenance information or other information as may be needed for systems and assemblies to the Commissioning Consultant.

B. Collect the information requested by Commissioning Consultant for development of a complete Commissioning Plan, Commissioning Field Notebook, and Functional Performance Tests and provide to the Commissioning Consultant. The General Contractor shall review the Commissioning Plan, Commissioning Field Notebook, and Functional performance Test and confirm in writing to the CM COTR, Architect and Commissioning Consultant any known areas of conflict or areas requiring clarifications.

C. Collect all proposed equipment start-up and Pre-Functional Construction Checklists documentation and place it into the Commissioning Field Notebook. The General Contractor will provide the Commissioning Consultant with the completed commissioning field notebook.

D. Provide the Contractor's schedule to the commissioning Consultant for review and comment. Plan for and incorporate commissioning activities into the construction schedule. Provide a sufficient detailed level of scheduling, activity, and detail to properly coordinate and schedule the trades. Provide a detailed Commissioning Schedule Fragnet to the project schedule, updated monthly reflecting actual construction progress.

E. Provide Commissioning Consultant with submittals for all systems and assemblies for review and comments. Include submittals of controls system and wiring diagrams and narrative sequences of operation, in time for use in preparing the Functional Test Procedures. The Commissioning Consultant review comments of pertinent submittals is coordinated through the Construction Manager COTR.

F. Provide a fully operational system per Specifications, started, verified, debugged, calibrated, balanced, tested and under automatic control.

G. Provide qualified personnel to participate in the commissioning tests, including seasonal testing.

H. Cooperate with the Commissioning Consultant's personnel.

I. Provide access to site for the Commissioning Consultant for review, verification and testing activities.

J. Provide organized storage space for project drawings, Specifications, equipment and materials submittals, shop drawings and operation and maintenance manuals in the job site trailers or job site office space.

K. Provide updates to all project documentation to reflect all supplemental instructions, addenda or other revisions to the project construction documents. Updates and architect's supplemental instructions must be posted to the master set of documentation for review and reference by all Contractors and for the Commissioning Consultant's use.

L. Provide adequate time and resources to perform functional testing of systems and assemblies in contract. These times and activities shall be reflected in the Commissioning Fragnet schedule, updated monthly.

M. Coordinate participation of all pertinent subcontractors including mechanical, electrical, controls and Testing and Balancing TAB subcontractors in the commissioning process.

N. Participate in any efforts to finalize sequences of operations with Construction Manager COTR, Designers and Commissioning Consultant.

O. Verify that coordination, installation, quality control and final testing have been completed such that installed systems and equipment comply with construction documents.

P. Review the Commissioning Plan, Project Reports and test results and submit comments to the Commissioning Authority.

Q. In a timely manner, address issues identified during construction that may affect the commissioning process or final system performance.

R. Perform equipment start-up and testing of mechanical and electrical equipment and systems and document as required with start-up reports and completion of Pre-functional Construction Checklists. These checklists include installation documentation, start-up documentation, controls point-to-point documentation and calibration documentation, verification that controls sequence of operations meets design intent and TAB final documentation. Reports will be stored in the Contractor's field trailer, as a part of the Commissioning Field Notebook. Contractor will coordinate efforts to complete the pre-functional documentation.

S. Lead verification testing of fire/smoke dampers and direct the resolution of deficiencies. Each fire/smoke damper and its functions are tracked in a matrix spreadsheet. Owner's Authority Having Jurisdiction (OSHEM) shall witness and approve all life safety systems including fire / smoke damper operation.

T. Provide preliminary TAB report, indicating all actual field values recorded to the Commissioning Consultant through the Construction Manager COTR, prior to initiation of functional testing. These reports shall be incorporated in the commissioning field notebook. Provide these "pencilcopy" TAB data on a system-by-system basis, as systems have been finally and completely balanced.

U. Pre-test all systems prior to scheduling the final Functional Performance Test for the record. Operate equipment and systems as required in preparation of final functional performance testing. This includes but is not limited to manipulating the appropriate controls systems to execute the Functional Test Procedures.

V. The Contractor shall issue a written Notice of Readiness *for each system*; include verification of system completion, TAB completion and controls. Provide the Commissioning Consultant with a copy of the Notice of Readiness upon completion of all systems work, start-up and Pre-functional Construction Checklists requirements by trade contractors.

W. Participate in fine-tuning or troubleshooting of system performance, if these measures become necessary.

X. The Contractor shall compensate the Government for retesting and/or troubleshooting time required by the Commissioning Consultant when the Contractor's systems do not meet specified performance and are not ready for commissioning. Back-charge Contractors as necessary to collect reimbursement for Commissioning Consultant compensation.

Y. Review operating and maintenance data for verification, organization, distribution, and conformance to requirement of the Contract Documents.

Z. Submit complete operation and maintenance information and as-built drawings to the Commissioning Consultant for compliance review of the requirement of the Contract Documents. Incorporate changes and recommendations provided by the commissioning Consultant into the

AA. Provide all documentation of training for the specified systems.

BB. Provide all proprietary test equipment required to test all the systems and equipment in this project. The Contractor shall provide all necessary tools, lifts, ladders, access, PPE, and other equipment required for the Commissioning Consultant to witness Functional Performance Testing.

CC. The Commissioning Field Notebook will be stored in the Contractors field trailer and will be managed by the Contractor. The Contractor shall confirm in writing to the Commissioning Consultant that systems are complete, functional and the appropriate subcontractors have completed the specified tasks and signed off all pre function documentation.

1.6 DUTIES OF COMMISSIOING CONSULTANT

A. Develop Commissioning plan at the construction phase.

B. Develop Functional Test Procedures from Contract Documents and final equipment submittals including narrative sequences of operation, control diagrams and software code for execution with the assistance of Contractor staff as required.

C. Review the Contractor's submittals relative to the systems and assemblies. Provide comments on the submittals during the same timeframe as the architect / engineer's review. Architect / Engineer has final decision on incorporating comments by the Commissioning Consultant. CM COTR formally incorporates the response to the General Contractor.

D. Perform site observations to follow installation progress and to verify system installation quality and readiness for testing.

E. Observe the start-up activities and initial testing of selected equipment and systems as required and review Contractor's start-up documentation.

F. Observe or review documentation of validation activities including Proper test and balance activities, rotating equipment drive alignment, vibration testing, acoustical testing, electrical testing, and functional tests for normal and off-normal operating sequences.

G. Review submittal of all required pre-functional and start-up documentation provided by the General Contractor for completeness and reasonableness. This includes installation documentation, start-up documentation, point-to-point checklists, and preliminary TAB report, prior to initiation of functional testing.

H. Witness a random selection of TAB readings (10**%)** performed by the TAB contractor. Coordinate with Division 23 and 25 project specifications. This witnessing activity is during the execution of regular TAB activities.

I. TAB verification to be a separate activity, occurring prior to the final Functional Performance Testing activities.

J. Assist with scheduling, direct, and witness complete functional testing as defined in the Commissioning Plan and Functional Test Procedures. All testing to be performed and verified by the General Contractor and documented by the Commissioning Consultant.

K. Witness and verify satisfactory completion of equipment and system tests and inter-systems functional performance tests.

L. Conduct commissioning meetings and distribute minutes of those meetings to all attendees.

M. Provide site observation, functional tests, or other project reports in a timely manner.

N. Document inconsistencies or deficiencies in system operations and system compliance. System deficiencies shall be forwarded to the CM COTR and documented in the Resolution Log.

O. Coordinate via the General Contractor participation of Government's personnel with equipment, component and systems performance verification and participation in required training.

P. When commissioning has been successfully completed, recommend acceptance to the Smithsonian Institution, and provide suggestions for those systems not performing as expected.

Q. Once all functional tests are successfully completed and all outstanding issues resolved, the Commissioning Consultant will provide the Smithsonian Institution with a Final Commissioning Report of all commissioning activities that occurred during the project.

R. Provide technically qualified personnel when scheduled.

S. The Commissioning Consultant will formally communicate with the Contractor via approved project channels. It is expected, however, that informal communication and coordination will be conducted directly with the subcontractors; records of all contacts will be sent to the Architect through the normal channels.

T. The Commissioning Consultant is not authorized to release, revoke, alter or expand requirements of Contract Documents, to approve or accept any portion of the work or to perform any duties of the Contractor.

1.7 COMMISSIONING PLAN

A. The Commissioning Plan is a tool through which the commissioning process is described and incorporates the

Construction Manager COTR, Architect, Contractor, and Commissioning Authority roles relative to the commissioning process. Commissioning team members are all contractors, subcontractors, and design professionals whose participation is of benefit in the delivery of a fully functioning building to the Government. The plan shall describe the communication, authority, and responsibility of commissioning team members. The Commissioning Plan will include the following:

1. The purpose of commissioning.
2. Detail the commissioning process.
3. Commissioning team members' responsibilities.
4. Describe Pre-functional Construction Checklist Procedures.
5. Provide guidelines for acceptance of each piece of equipment or system.
6. Systems to be commissioned.
7. Provide a .pdf copy of entire completed Commissioning Field Notebook to Commissioning Consultant at conclusion of project for use in developing final Commissioning Report, prepared by the Commissioning Consultant.

1.8 SYSTEMS TO BE COMMISSIONED

A. Systems and Equipment to Be Functionally Tested: The system features are to be functionally tested, and other building features will be evaluated for installation quality during construction. The functional performance testing will include the following systems and equipment.

1. Mechanical Systems:

   a. Ductless split system units (indoor and outdoor units)
   b. Pumps
   c. Fans
   d. Unit heaters (all types)
   e. ATC dampers in OA intake and exhaust connections
   f. Radiant floor manifolds
   g. Humidifiers
   h. Boilers
   i. Automatic glycol feeder
   j. Condensate pumps (electric & pressure powered)
   k. Building automation system

2. Electrical Systems:

   a. Variable Frequency Controllers
   b. Lighting Control System

1.9 COMMISSIONING ACTIVITIES

A. The Commissioning Fragnet Schedule: This schedule defines the milestones and conditions that must be achieved before system testing and other commissioning activities can commence. The schedule also includes the expected duration of the various tasks so that the commissioning process can be incorporated into the overall construction schedule.

B. Preparation for Testing: To prepare for the system performance testing, the Commissioning Consultant will examine the design and Construction Documents, develop with appropriate Contractors Pre-functional Construction Checklists of construction responsibilities that must be completed prior to testing and develop detailed Functional Test Procedures and data forms. Using the Pre-functional Construction Checklists, the Contractor must verify that the systems they install comply with the Construction Documents and are fully functional. Commissioning is not intended to be a testing or inspection function that replaces any of the

Contractors' obligations for testing and proof of performance. Functional testing will only begin when the appropriate subcontractors' complete checklists, initialed, signed and returned to the Commissioning Consultant, the TAB process is complete for both air and water balancing, and the controls are completed, and all control loops properly tuned.

C. Functional Testing: experienced and qualified technicians of the Contractor(s) perform Functional testing, responsible for installation as facilitated by the Commissioning Consultant and may be observed by other members of the commissioning team including the Owner. Functional testing will verify proper sequencing, operation and performance of installed equipment and systems under realistic operating conditions. The functional testing will follow with written Functional Test Procedures with test results documented for permanent record.

D. Documentation: In addition to the Pre-functional Construction Checklists and Functional Test Procedures, written documentation will be maintained for all other commissioning activities. Project communication reports shall be issued by the Commissioning Authority to the Contractor and key members of the commissioning team to document apparent deficiencies identified during examination of design and construction documents, daily activities on-site, construction deficiencies and successful or unsuccessful functional test results. At the end of the commissioning process, all documentation will be assembled and summarized in the Final Commissioning Report.

E. Deficiency Resolution: When an Issues Log, Resolution Log or Field Report is issued to address an identified deficiency, the Contractor shall forward the reports to the appropriate parties to initiate corrective action in an expeditious manner. The designer is relied on for supplemental instructions or design modifications and issuance of final design details and the Contractors are relied on for implementation of that design. Change orders must be issued through proper contract channels.

1.10 FUNCTIONAL TEST PROCEDURES

A. The Functional Test Procedures include, but are not limited to, the following:

1. Verification of testing, adjusting and balancing performance.
2. Verification of all equipment's ability to perform to the design intent.
3. Verification of the performance of sub-systems consisting of combinations of equipment (e.g., refrigeration cycle, pumps, and interconnecting piping).
4. Verification of the performance of the automatic controls in all seasonal modes.
5. Verification of the performance of the HVAC system as a whole.
6. Verification of the performance of all life safety devices and systems that interface with the HVAC systems. Commissioning of life safety systems by the Commissioning Authority shall be limited to the fire alarm interface with the HVAC systems.

PART 2 - PRODUCTS (NOT USED) PART 3 -

EXECUTION

3.1 GENERAL

A. Operating equipment and systems shall be tested in the presence of Government's Commissioning Consultant and Project Officer (Construction Manager COTR) to demonstrate compliance with specified requirements.

1. Notify COTR, in writing, fourteen (14) days prior to tests, twenty-one (21) days prior if a utility shutdown is required, scheduled under requirements of this Section.
2. Testing shall be conducted under specified design operating conditions as recommended or approved by construction Manager COTR and Architect.

B. The Functional Performance Testing shall be completed by the Contractor as a requirement of Substantial Completion. The acceptance of Functional Performance Test by Construction Manager COTR is a requirement of Final Completion.

C. All elements of systems shall be tested to demonstrate that total systems satisfy all requirements of these Specifications. Testing shall be accomplished on hierarchical basis. Test each piece of equipment for proper operation, followed by each sub-system, followed by entire system, followed by interaction with other major systems.

D. Proprietary test equipment required by the manufacturer, whether specified or not, shall be provided by the manufacturer of the equipment through the installing contractor. Manufacturer shall provide the test equipment, demonstrate its use, and assist the Commissioning Consultant in the commissioning process.

E. Acceptance Documentation: A copy of the functional performance tests results shall be necessary acceptance documentation along with other specified requirements. Documentation must be signed and dated.

3.2 ACCEPTANCE PROCEDURES

A. Prior to functional performance testing of each system, the Commissioning Consultant shall observe and verify that the physical installation of components and systems being tested is substantially installed in accordance with the Contract Documents.

B. Contractor's Tests:

1. System shall be checked for proper installation, shall be adjusted, and calibrated to verify that it is ready to function as specified.
2. All system elements shall be checked to verify that they have been installed properly and that all connections have been made correctly.
3. All discrete elements and sub-systems shall be adjusted and checked for proper operation.
4. Start-up and operational tests shall be complete, with all required Pre-functional Construction Checklists signed and submitted for review by Commissioning Consultant within five (5) days of each activity, prior to starting functional performance testing.

C. Smithsonian Institution witnessed Functional Tests:

1. Objective of these tests is to demonstrate that system is operating and complying with specified performance requirements.
2. Smithsonian Institution witnessed functional performance tests shall be performed on complete system. Each function shall be demonstrated to satisfaction of the Architect / Engineer through the CM COTR and Smithsonian Institution's Commissioning Consultant on paragraph-by-paragraph basis of Commissioning Consultant's written test procedure, developed to demonstrate conformance to requirements of the Specifications.
3. Functional performance tests shall be witnessed and endorsed by the Commissioning Consultant upon satisfactory completion.
4. Actual testing program shall be conducted in accordance with prior approved procedures and shall be documented as required herein.
5. Contractor shall notify Architect and Construction Manager COTR at least two (2) weeks prior to date of functional performance tests.

D. The functional performance testing process shall be accomplished for all equipment, sub-systems, systems, and system interfaces. The order of functional performance testing shall be reflected in the Commissioning Fragnet Schedule. All must be tested for acceptance and there shall be a separate checklist for each to ensure documentation specific to each is complete.

E. Each system shall be operated through all modes of system operation (e.g., seasonal, occupied, unoccupied, warm-up, cool-down, etc., as applicable) including every individual interlock and conditional control logic, all control sequences, both full-load and part-load conditions and simulation of all abnormal conditions for which there is a specified system or controls response. The warm-up and cool-down test shall be a performance test, as applicable.

F. Temporary upsets of systems, such as distribution faults, control loss, set-point change, equilibrium upset and component failure, shall be imposed at different operation loads to determine system stability and recovery time.

G. When the functional performance of all individual systems has been proven, the interface or coordinated responses between systems shall be checked. The systems involved may be within

the overall HVAC work or they may involve other systems, such as emergency systems for life safety.

H. Corrective Measures: If acceptable performance cannot be achieved, the cause of the deficiency will be identified. If it is determined that the deficiency was caused by the system or component not being installed per the manufacturer's recommendations or Contract Documents, the necessary corrective measures shall be conducted by the General Contractor. Every check or test for which acceptable performance was not achieved shall be repeated after the necessary corrective measures have been completed. This re-testing process should be repeated until acceptable performance is achieved. The Contractor will be allowed one retest after initial testing of the equipment. If the retest fails, the Contractor shall be financially responsible, at standard rates, to reimburse the Commissioning Consultant for the additional time taken to achieve acceptable performance.

3.3 TRAINING AND INSTRUCTION

A. Training and instruction of Government personnel is a part of the commissioning process and essential for the proper operation of the facility. The contractors and vendors providing the training will complete training plans and submit to the Commissioning Consultant for review and approval in conjunction with the COTR.

3.4 SEASONAL COMMISSIONING AND OCCUPANCY VARIATIONS

A. Seasonal commissioning pertains to testing under full-load conditions during peak heating and peak cooling seasons, as well as part-load conditions in the spring and fall. Initial commissioning will be done as soon as contract work is completed, regardless of season. Subsequent commissioning may be undertaken at any time thereafter to ascertain adequate performance during the different seasons.

B. All equipment and systems will be tested and commissioned in a peak season to observe full-load performance. Heating equipment will be tested during winter design conditions. Cooling equipment will be tested during summer design conditions, with a fully occupied building. Each Contractor and supplier will be responsible to participate in the initial and the alternate peak season test of the systems required demonstrating performance.

C. Subsequent commissioning may be required under conditions of minimum and/or maximum occupancy or use. All equipment and systems affected by occupancy variations will be tested and commissioned at the minimum and peak loads to observe system performance. Each Contactor and supplier will be responsible to participate in the occupancy sensitive testing of systems to provide verification of adequate performance.

D. Commissioning team including contractor, subcontractors, commissioning personnel and COTR shall meet at site roughly ten months after Substantial Completion to review any system issues, and correct any operational concerns covered by warranty. Commissioning Consultant shall lead this site meeting and shall summarize findings in a site report.

3.5 SCHEDULE

A. The schedule includes the probable expected sequence and duration for the various tasks, so that the commissioning process can be integrated with the general construction schedule and refined over the course of the project. Actual sequencing and durations shall be by the General Contractor and Sub-Contractors, coordinated with the Commissioning Consultant.

Milestone	Duration	Successor	Predecessor
Commissioning Kick off Mtg.	1 day	All contractors on board including Controls and TAB	Before major MEP installation
Review equipment submittals	2 weeks	After receipt of submittals	Before ordering or installation
Develop Pre-functional Construction Checklists	4 weeks	After equipment submittal review and after receipt of O&M literature	Before MEP installation
Walk contractors through Pre-functional Construction Checklists	5 days	After development of Pre-Functional Checklist documentation	Before MEP installation
Write Functional Tests	3 to 5 weeks	After controls submittal review	3 weeks prior to functional testing
Submit Functional Tests for review by COTR and Contractors	1 week	After development of Functional Tests	Before Functional testing
Complete Pre-functional Construction Checklists (contractor task)	Ongoing	During installation, startup, and test, adjust and balance	Before TAB Backcheck and functional testing
Site Observations (CxA)	Ongoing	After majority of MEP installation	Before TAB Backcheck and functional testing
Test, Adjust and Balance (Contractor task)	See CPM schedule	After Start-up and Pre-functional Construction checks. All walls, windows, doors, ceilings must be installed.	Before TAB Backcheck
Test, Adjust and Balance Backcheck (10%)	1 week	After Start-up and receipt of completed Pre-functional Construction Checklists from contractors	Before functional testing
Functional Testing	2 months postponed if needed for slab heating in winter.	After TAB Backcheck and receipt of completed Pre-functional Construction Checklist have been completed by contractors	Before Government occupancy
Issues Resolution	2 weeks	After Functional Testing	Before Government occupancy
Final Commissioning Documentation Submittal	2 weeks	After resolution of issues log	2 weeks after resolution of issues log

END OF SECTION 01 91 13

SECTION 02 4116 - STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of buildings and site improvements.
2. Abandoning in-place Removing below-grade construction.
3. Disconnecting, capping or sealing, and abandoning in-place removing site utilities.
4. Salvaging items for reuse by Owner.

B. Related Requirements:

1. Section 01 0000 "Supplementary Conditions for Construction".
2. Section 01 1000 "Summary" for use of the premises and phasing requirements.
3. Section 02 4119 "Selective Structure Demolition" for partial demolition of buildings, structures, and site improvements.
4. Section 31 1000 "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse. Include fasteners or brackets needed for reattachment elsewhere.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.4 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be demolished.
2. Review structural load limitations of existing structures.
3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review and finalize protection requirements.
5. Review procedures for noise control and dust control.
6. Review procedures for protection of adjacent buildings.

7. Review items to be salvaged and returned to Owner.

1.5 INFORMATIONAL SUBMITTALS

A. Engineering Survey: Submit engineering survey of condition of building.

B. Proposed Protection Measures: Submit informational report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection , for dust control and , for noise control. Indicate proposed locations and construction of barriers.

1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain[including means of egress from those buildings].

C. Schedule of Building Demolition Activities: Indicate the following:
1. Detailed sequence of demolition work, with starting and ending dates for each activity.
2. Temporary interruption of utility services.
3. Shutoff and capping or re-routing of utility services.

D. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

E. Predemolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 01 3233 "Photographic Documentation." Submit before the Work begins.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.6 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.7 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

D. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be demolished.
2. Review structural load limitations of existing structures.

3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review and finalize protection requirements.
5. Review procedures for noise control and dust control.
6. Review procedures for protection of adjacent buildings.
7. Review items to be salvaged and returned to Owner.

1.8 FIELD CONDITIONS

A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.

B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

C. Owner assumes no responsibility for buildings and structures to be demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. Hazardous materials will be removed by Owner before start of the Work.

2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. On-site storage or sale of removed items or materials is not permitted.

1.9 COORDINATION

A. Arrange demolition schedule so as not to interfere with Owner's on-site operations or operations of adjacent occupied buildings.

PART 2 - PRODUCTS[(Not Used)]

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

2.2 SOIL MATERIALS

A. Satisfactory Soils: Comply with requirements in Section 31 2000 "Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting demolition operations.

B. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations. Comply with Section 01 3233 "Photographic Documentation."

D. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.

1. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

F. Inventory and record the condition of items to be removed and salvaged.

3.2 PREPARATION

A. Refrigerant: Remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction before starting demolition.

B. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.

1. Owner will arrange to shut off indicated utilities when requested by Contractor.

2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
3. Cut off pipe or conduit a minimum of 24 inches (610 mm) below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.

C. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of demolition.

D. Salvaged Items: Comply with the following:
1. Clean salvaged items of dirt and demolition debris.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to storage area designated by Owner.
5. Protect items from damage during transport and storage.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Utilities to be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished.

1. Owner will arrange to shut off utilities when requested by Contractor.

2. Arrange to shut off utilities with utility companies.
3. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
4. Cut off pipe or conduit a minimum of 24 inches (610 mm) below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
5. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.4 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.

B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of demolition.

C. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations.

1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
a. Provide at least 72 hours' notice to occupants of affected buildings if shutdown of service is required during changeover.

D. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 01 5000 "Temporary Facilities and Controls."
1. Protect adjacent buildings and facilities from damage due to demolition activities.
2. Protect existing site improvements, appurtenances, and landscaping to remain.
3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.

E. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.5 DEMOLITION, GENERAL

A. General: Demolish indicated buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
2. Maintain fire watch during and for at least 2 hours after flame cutting operations.
3. Maintain adequate ventilation when using cutting torches.
4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Engineering Surveys: During demolition, perform surveys to detect hazards that may result from building demolition activities.

C. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

D. Explosives: Use of explosives is not permitted.

3.6 DEMOLITION BY MECHANICAL MEANS

A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.

C. Salvage: Items to be removed and salvaged are indicated on Drawings.

D. Below-Grade Construction: Demolish foundation walls and other below-grade construction that are within footprint of new construction and extending 5 feet (1.5 m) outside footprint indicated for new construction. Abandon below-grade construction outside this area.
1. Remove below-grade construction, including basements, foundation walls, and footings, to depths indicated.

E. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.

1. Piping: Disconnect piping at unions, flanges, valves, or fittings.
2. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.

3.7 SITE RESTORATION

A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.

B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.8 REPAIRS

A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.9 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 01 7419 "Construction Waste Management and Disposal.".
1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Do not burn demolished materials.

3.10 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.
1. Clean roadways of debris caused by debris transport.

END OF SECTION

SECTION 02 4119 – SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This Sections includes the following:
   1. Demolition and removal of buildings and structures.
   2. Demolition and removal of site improvements.
   3. Removing below grade construction.

B. Disconnecting, capping or sealing, and removing site utilities. Removing existing elements if removal is necessary to accommodate the new design. These elements include, but are not limited to:
   1. Foundation walls and footings.
   2. Concrete slabs on grade.
   3. Pavements and curbs.
   4. Manholes and covers.
   5. Fences and gates.
   6. Utilities including pipes, ducts, and conduits
   7. Relocate existing construction and utilities designated to remain required for the design.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.

B. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged.

1.3 SUBMITTALS

A. Proposed Environmental-Protection, Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.

B. Schedule of Site Demolition Activities: Indicate the following:
   1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
   2. Interruption of utility services.
   3. Coordination for shutoff, capping, and continuation of utility services.
   4. Locations of temporary protection and means of egress, including for other tenants affected by building demolition operations.
      a. Coordination of continuing occupancy of adjacent buildings.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Health Hazards:

a. Whenever construction operations could result in worker contact with hazardous materials, follow recommendations of an American Board of Industrial Hygiene Certified Industrial Hygienist (CIH) employed by Contractor.
b. Existing Asbestos and Asbestos-Containing Materials: Comply with 29 CFR 1926.1101; complete removal is required.
c. Existing Lead-Based Paint: Comply with 29 CFR 1926.62; either removal or recoating is acceptable.

1.5 PROJECT CONDITIONS

A. Buildings to be demolished will be vacated and their use discontinued before start of Work.
   1. Smithsonian Institution (SI) and National Zoo Park (NZP) assumes responsibility for buildings and structures to be demolished.

B. Storage or sale of removed items or materials on site is not permitted.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Survey existing conditions and correlate with requirements indicated to determine extent of building and site demolition required.

B. Review Project Record Documents of existing construction provided by SI and NZP. SI and NZP does not guarantee the existing conditions are the same as those indicated in Project Record Documents.

C. When unanticipated mechanical, electrical, or structural elements are encountered, investigate, and measure the nature and extent of the element.

D. Verify that hazardous materials have been remediated before proceeding with building and site demolition operations.

3.2 PREPARATION

A. Existing Utilities: Locate, identify, and protect all utilities within the limits of disturbance, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
   1. Arrange to shut off indicated utilities with Contracting Officer Technical Representative (COTR).
   2. If utility services are required to be removed or relocated, before proceeding with building demolition provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
   3. Cut off pipe or conduit a minimum of 2-feet below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
   1. Strengthen or add new supports when required during progress of demolition.

3.3 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations.
   1. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during demolition.

B. Existing Utilities: Maintain utility services indicated to remain and protect them against damage during demolition operations.
   1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by COTR.
   2. Provide temporary services during interruption to existing utilities, as acceptable to COTR.
   3. Provide at least 72 hours' notice to COTR if shutdown of service is required during changeover.

C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways and as indicated:
   1. Protect existing site improvements, appurtenances, and landscaping to remain.
   2. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain near the limits of disturbance.
   3. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   4. Provide protection to ensure safe passage of people around building and site demolition area and to and from occupied portions of adjacent buildings and structures.
   5. Protect existing infrastructure and landscaping that are to remain and that are exposed to building and site demolition operations.
   6. Erect and maintain dustproof of partitions and temporary enclosures to limit dust and dirt mitigation and to separate areas from fumes and noise from occupied portions of adjacent buildings.

3.4 DEMOLITION

A. Demolition indicated existing buildings, structures, and site improvements completely. Use methods required to complete Work within limitations of governing regulations and as follows:
   1. Do not use cutting torches until work area is cleared of flammable materials. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
   2. Maintain adequate ventilation when using cutting torches.
   3. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Engineering Surveys: Perform surveys as the Work progresses to detect hazards that may result from building and site demolition activities.

C. Site Access and Temporary Controls: Conduct building and site demolition and debris-removal operations to ensure minimum interference with walks, walkways, and other adjacent occupied and used facilities.
   1. Do not close or obstruct walks, walkways, or other adjacent occupied or used facilities without permission from COTR.
   2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, or pollution.

D. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

E. Remove debris from elevated portions by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
   1. Remove structural framing members and lower to ground by method suitable to minimize ground impact or dust generation.

F. Concrete: Cut concrete full depth at junctures with construction indicated to remain, using power-driven saw, then remove concrete between saw cuts.

G. Concrete Slabs on Grade: Saw cut perimeter of area to be demolished at junctures with construction indicated to remain, then break up and remove.
   1. Structure Steel: Dismantle field connections without bending or damaging steel member. Do not use flame cutting torches unless otherwise authorized by COTR.
   2. Transport steel trusses and joists as whole units without dismantling them further.

H. Equipment: Disconnect equipment at nearest fitting connection to services, complete with service valves. Remove as whole units, complete with controls.

I. Below Grade Construction: Demolish foundation walls and other below grade construction as indicated.

J. Existing Utilities: Demolish existing utilities and below grade utility structures as indicated.

K. Explosives: Use of explosives is not permitted.

3.5 SITE RESTORATION

A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.

B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.6 REPAIRS

A. General: Promptly repair damage to adjacent construction cause by building and site demolition.

B. Where repairs to existing surfaces are required, patch to produce surfaces suitable for a new materials.

C. Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refining.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolished materials from Project site and legally dispose of them.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off-site and legally dispose of them.

3.8 CLEANING

Clean adjacent structures and improvements of dust, dirt, and debris caused by building and site demolition operations. Return adjacent areas to existing condition before building and site demolition operations began.

END OF SECTION

SECTION 26 0400 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Design Intent:
1. The Contract Documents indicate and specify the electrical design intent. The Contract Drawings are schematic and diagrammatic and are not intended to indicate construction details and routing unless specifically indicated. The specifications establish minimum performance, product and installation requirements.
2. In addition to the specified and indicated performance and quality requirements, furnish products and perform installation work consistent with the design intent, industry standards and as necessary to the provision of complete operating electrical systems.
3. Install electrical work in accordance with the National Electrical Code and all applicable local codes in a neat and workmanlike manner.
4. This Section specifies basic electrical requirements applicable to all Divisions unless explicitly excepted.
5. If there is a conflict between applicable documents, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to the most recent release when developing the proposal for installation.
6. Contractor shall thoroughly review entire set of Contract Documents, including all discipline drawings and specifications prior to bidding and include all required electrical work in bid, even if not explicitly shown on electrical Drawings and Specifications.
7. The project is pursuing LEED certification. Contractor shall provide requirements in compliance with LEED and WELL standards as identified in the Contract Documents.

1.2 REFERENCES

A. American National Standards Institute (ANSI) C2 - National Electrical Safety Code.

B. City of Washington Ordinances.

C. State of District of Columbia Codes.

D. National Electrical Contractors Association (NECA).
1. 1 - Standard for Good Workmanship in Electrical Construction.
2. 500 - Recommended Practice for Installing Indoor Commercial Lighting Systems.

E. National Fire Protection Association (NFPA).
1. 70 - National Electrical Code (NEC).
2. 70E - Standard for Electrical Safety in the Workplace.
3. 72 - National Fire Alarm and Signaling Code.
4. 101 - Life Safety Code.
5. 111 - Standard for Stored Electrical Energy Emergency and Standby Power Systems.

1.3 SUBMITTALS

A. General

1. Submit Shop Drawings, Product Data, Samples and other specified submittals on a "system" basis. Retain, and assemble drawings and data from manufacturer or component manufacturers such that each submittal is for a complete system.
2. Refer to Section 01 3300, "Shop Drawings, Product Data and Samples", for basic definitions and requirements for submittals.
3. Refer to Section 01 3330 for submittal compliance form.

B. Quality Control Submittals
1. Submit results of factory tests two weeks prior to product shipment from factory.
2. Submit results of field tests immediately upon completion of the field test.

C. Contract Closeout Submittals
1. Refer to Division 01, "Record Documents", for basic definitions and requirements for record documents.
2. Submit, at the completion of the work, record drawings per Division 01 and in an approved electronic format matching the electronic format in which the construction documents were produced. Indicate the actual electrical installation, size and construction details. Include the following information:
   a. Lighting layout, type, circuit designation and control, including each conduit and wire as installed.
   b. Power distribution system, including distribution equipment and each conduit and wire size installed.
   c. Layout and circuiting for wiring devices, surface raceways and related equipment, including location of all outlets, junction boxes, and conduit runs, including conduit size, circuit numbers, and number of wires in each run.
   d. Layout and circuitry for power circuits to mechanical equipment and other electrified building equipment, including each conduit and wire size.
   e. Supporting and mounting details.
      1) Special systems layouts such as fire alarm, security, lighting control, and telecommunications systems.
   f. Layout, cabling and circuiting of site electrical systems such as underground duct banks, manholes, hand holes and site lighting fixtures. Include system and cable identification of communication systems such as telephone, data, fiber optic, fire alarm, security system and other cabling systems.
   g. Panel schedule drawings consisting of each panelboard. Schedules shall indicate the ”as built circuiting with loads and room numbers identified. Room numbers on schedules shall include the architectural room number indicated on the Drawings and the signage room numbers from the signage schedules. Each circuit in the panel schedules shall be uniquely identified, regardless of how they are indicated on the construction documents.
   h. Layout and location of above ceiling devices, including, but not limited to, controllers, control panels, emergency load transfer devices, power supplies, relays, battery packs and all other electrical equipment and products requiring maintenance, service, adjustment or replacement in the future.

1.4 QUALITY ASSURANCE

A. Owner Construction Design Standards
1. Provide an electrical installation in accordance with the Owner's construction design standards and specifications, unless specific written waivers are provided by the Owner.

B. Regulatory Requirements
1. Comply with the applicable requirements of ANSI C2 and the latest NFPA 70.
a. Requirements of ANSI C2 and NFPA 70 shall be minimum standards of products and installation work. Furnish products and perform installation work which exceed the standards of ANSI C2 and NFPA 70 when specified or indicated.
2. Comply with applicable requirements of city, county, and state laws, ordinances and regulations including modifications and supplements to ANSI C2 and NFPA 70.
3. Comply with the applicable requirements of U.S.Department of Labor, Occupational Safety and Health Administration Standards (OSHA).
4. All materials shall conform with the standards of the Underwriter¢s Laboratories in every case where such standards have been established for the particular type of material or assembly .
5. All material and equipment shall be UL listed and bear the UL label where such listing and labeling exists.
6. In the case where two or more Codes conflict or contradict each other, comply with the more stringent Code or standard.

C. Contractor Qualifications and Character of Work
1. Contractor personnel must be knowledgeable in local, state and national codes and regulations. Contractor shall have been in the business of installing electrical systems for a minimum of ten (10) years.

2. Contractor shall have experience working in the **[District of Columbia]**

3. Contractor must possess and maintain current liability insurance certificates.
4. Contractor shall obtain and pay for all permits and inspections required by laws, local ordinances, rules, and regulations having jurisdiction for the work. Permits shall be readily available and posted in a prominent place at building site and protected from weather and physical damage.
5. The installation shall be executed in a workmanlike manner and shall present a neat physical appearance when completed.

D. Coordination
1. Utilities.

a. Coordinate work related to utility services with the appropriate utility companies. Comply with the requirements of the following companies:
1) Electrical power: Potomac Electric Power Company (PEPCO).

1.5 PROJECT/SITE CONDITIONS

A. Environmental Requirements
1. Provide products suitable for operation under the following environmental conditions:
a. Temperature: -18 to 38 degrees C (0 to 100 degrees F).
b. Humidity: 0 to 95 relative percent, non-condensing.
c. Altitude: 2010 meters (6600 feet) above sea level.
d. Outdoor: Products that are UL listed for wet locations.

1.6 WARRANTIES

A. Refer to the Conditions of the Contract for provisions concerning Contract general warranty, Statements of Compliance, correction of Work period, and form of Special Warranty.

B. All electrical systems, equipment and installations shall be provided with a one-year minimum Warranty starting from the date of substantial completion.

C. During the warranty period, and for non-conformities the contractor shall take all necessary and appropriate action; free of charge, to correct any non-conformity with the warranties contained in the manufacturer agreement. During the warranty period, contractor shall provide to Owner, free of costs and charges, all support necessary to ensure that the installation meets the requirements specified in the Contract Documents and performance guarantees provided by the contractors. During the warranty period, contractors shall furnish, or cause to be furnished, all maintenance, service, parts and replacements necessary to maintain the installation in good working condition, at no cost to Owner.

1.7 CONDUCTOR SIZING

A. Feeder and Branch Circuit Sizing
1. Provide feeder and branch circuits per the circuit sizing schedules indicated on Drawings. Where schedules are not indicated, provide conductors which are sized as required per the NEC for the indicated overcurrent protective device rating. Circuit sizing and installation shall consider the field routing and anticipated voltage drop. Upsize wire, as necessary, to compensate for voltage drop and/or other forms of derating required in accordance with the NEC.
2. Derate conductor ampacities per the NEC for field conditions including but not limited to conduits exposed to sunlight, elevated ambient temperature, and/or more than 3 current carrying conductors in a raceway.

1.8 SYSTEMS INTEGRATION

A. Coordinate with equipment suppliers and ensure integration of systems comprised of disparate equipment which work together to form a complete system.

B. Provide all miscellaneous components, wiring, hardware, etc. required for complete and operational equipment and systems whether or not these items are explicitly shown in the Contract Documents.

C. Provide systems which maintain the UL rating of the individual pieces of equipment.

D. Submit system integration wiring diagrams, control diagrams and sequence of operation, as needed.

1.9 COORDINATION

A. Contractor shall participate in the project scheduling, coordination meetings and coordination drawing/modeling activities as specified in Division 01.

B. All potential coordination issues shall be brought to the attention of the Construction Manager immediately before proceeding with the installation.

C. Contractor shall be responsible for all cross connecting and coordination with vendors and other trade contractors to provide complete operational systems.

D. For purpose of clarify and legibility, drawings are diagrammatic. Locate equipment as close as practical to the locations shown on the drawings. Should field conditions prevent the installation of equipment or materials as indicated on the drawings, make deviations only with the prior approval of the Owner's representative.

E. Coordinate arrangement, mounting, and support of electrical equipment:
1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping at required slope.
4. To allow connecting raceways, cables, wireways, cable trays, and busways to be clear of obstructions and of the working and access space of other equipment.

F. Coordinate work with other trades to ensure completion is consistent with the project schedule. Ensure the NEC-required working space and dedicated electrical space about electrical equipment is provided. Foreign systems shall not be located within these dedicated zones. Any work that encroaches on the working space or dedicated electrical space shall be relocated at the Contractor's expense.

G. Equipment and device mounting heights and alignment shall adhere to architectural drawings, rules and requirements. Devices of all trades within the same general area shall be coordinated prior to construction. Care shall be taken to align devices horizontally and vertically. Devices that are not aligned properly shall be relocated at the Contractor's expense.

H. Coordinate exact conduit routing in the field with other trades and with building elements such as structural steel members. Conduit and raceways are not explicitly shown. Conduit routing where shown on drawings shall be considered approximate. Contractor shall be responsible for final routing in the field and shall be responsible for complete coordination with all other trades.

I. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

J. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 8.

K. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. General
1. Furnish products by one of the equipment manufacturers listed under the heading "Manufacturers" within the applicable sections. When given, furnish the specified product model or brand for the selected manufacturer.

2. Provide products, for which quantities of two or more are to be furnished, from the same manufacturer and of the same product or model series.
3. Furnish product components designed to be used together and which are physically and electrically compatible.

B. Comparable Products
1. Comparable products may be proposed when the "or as approved" clause is specified under the heading "Manufacturers". Submit such products substitutions for approval per Division 01, "Product Requirements."

C. Product Substitutions
1. Product substitutions may be requested under the conditions specified in Division 1 "Substitution Procedures." Submit product substitutions for consideration per Division 01, "Substitution Procedures".

2.2 PRODUCTS

A. Product Listing and Labeling
1. Provide listed and labeled product for which listings and labels exist by Underwriters Laboratories Inc. (UL), Factory Mutual (FM), or similar independent testing organizations recognized by the authorities having jurisdiction. For products for which there are no such listings and labels, provide listed and labeled components of those products, for which component listing and labels exist.

B. PCB Content Prohibited
1. Provide products which do not contain any amounts of polychlorinated biphenyl (PCB) compounds.

C. Asbestos Content Prohibited
1. Provide products which do not contain any amounts of asbestos.

D. Access Doors
1. Provide access doors necessary to access devices, whether for control or maintenance, governed by these Basic Electrical Materials and Methods. Comply with access door requirements specified in Division 08. Access doors are not explicitly shown on the Drawings.
2. Access doors shall be coordinated with other trades and final locations shall be approved by Architect. Access doors not approved by Architect shall be removed or relocated at the Contractors expense.
3. Access doors installed in fire rated floors, walls or ceilings shall be sufficiently rated to maintain the rating of the surface where installed.

2.3 SOURCE QUALITY CONTROL

A. Factory Tests
1. Permit Architect and Owner to observe factory tests. Provide minimum five working days' notice of factory tests.
2. Schedule no more than one equipment or system factory test per week.

PART 3 - EXECUTION

3.1 [CONSTRUCTION PHASING

A. The project will utilize phased construction. Contractor shall account for any and all costs associated with a phased construction schedule in bid.]

3.2 SHUTDOWNS

A. Interruption of Existing Service: Do not interrupt electric, communications or fire alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
   1. Notify Architect, Construction Manager and Owner no fewer than seven days in advance of proposed interruption of service.
   2. Indicate method of providing temporary service.
   3. Do not proceed with interruption of service without Architect's, Construction Manager's and Owner’s written permission.
   4. Comply with NFPA 70E.

B. Coordinate all service interruptions with other disciplines and Owner's representative. Shutdowns shall be performed during off hours, which may include weekends or holidays. This premium time cost shall be included in the Contractor's base bid.

C. Maintain Owner communications and network services operations during construction. Coordinate all service interruptions with other disciplines and Owner's representative.

D. Maintain Owner fire alarm systems and services operations during construction. Coordinate all service interruptions with other disciplines and Owner's representative.

3.3 DEMOLITION

A. Protect adjacent building services and materials indicated to remain. Install and maintain barriers to keep dirt, dust, and noise from being transmitted to adjacent areas. Remove protection and barriers after demolition is complete.

B. “Carefully remove, clean and restore and reinstall items that are relocated during construction to a "like new" condition.

C. Building elements such as walls, partitions, floors and ceilings affected by electrical construction such as conduit penetrations shall be repaired, patched, painted and otherwise restored to a "like new" condition.

D. Lamp and Ballast Recycling.
   1. Recycle lamps, ballasts and drivers containing hazardous materials such as mercury during construction. These shall include tubular fluorescent, compact fluorescent, HID, LED, induction and cold cathode lamps. These lamp types, ballasts and drivers associated with these lamps shall not be disposed of as solid municipal waste.

E. Equipment Protection and Cleanup.

1. Protect equipment and materials during shipment, storage and construction against damage, dust and contamination. Items that become damaged, dirty or contaminated during construction shall be restored to a "like new" condition or replaced at the Contractor's expense.
2. Remove and legally dispose of demolished items, rubbish, debris and construction waste from the construction site daily, and at the completion of the work. The contractor shall maintain a "clean" work site. Failure to do so may result in the cleanup being performed by others and all costs thereof being deducted from the Contractor's final payment.

3.4 TEMPORARY SERVICE

A. The facility will remain operational during construction. Provide equipment, hardware, wiring, etc. to maintain systems scheduled to remain operational during construction. Coordinate detailed work phasing plans with the Construction Manager, Architect and Owner prior to commencing work.

B. Provide, maintain and remove all temporary lighting, power and communications required to complete the project.
1. Coordinate temporary service installation with the local utility companies and building landlord prior to construction.

C. In addition to NEC ground fault protection requirements, provide ground fault protection on temporary feeders 200 amps and greater.

D. Temporary feeders shall be limited to the following types:
1. Conductors installed in raceways.
2. Type MC cable.
3. Multi-conductor cable with an overall protective outer jacket (where inaccessible to the public and not subject to physical damage or abuse).
4. NEC recognized hard usage cord (where inaccessible to the public and not subject to physical damage or abuse).
5. Label temporary feeders every 25 feet maximum

3.5 INSTALLATION

A. General
1. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items, unless otherwise indicated.
2. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
3. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
4. Right of Way: Give to piping systems installed at a required slope.

B. Wiring Installation
1. Install wiring for control systems, power feeder and branch circuits, lighting branch circuits, communication and auxiliary systems, such as fire alarm and security, in separate raceways unless otherwise indicated.

2. Install wiring and devices and make connections for Owner furnished equipment and furnished under other sections of the specifications such as, but not limited to, automatic doors, projection screens, pneumatic tube stations, casework, medical headwalls, radiation oncology equipment, diagnostic imaging equipment and laboratory equipment. Refer to the specific sections for electrical requirements. Coordinate installation with the equipment supplier and the approved shop drawings.
3. Prior to rough-in of electrical and telecommunications devices, verify locations with the owner's final furniture plans and the system supplier's approved installation drawings. Adjust locations of devices to coordinate with furniture and equipment layouts.

C. Device Location
1. Allow for relocation prior to installation of wiring devices and other control devices, for example, receptacles, switches, occupancy sensors, fire alarm devices and access control devices, within a 10-foot radius of indicated location without additional cost.
2. Refer to architectural plans for device location, mounting and alignment rules and requirements. Coordinate all device and lighting fixture placement with other trades prior to rough-in.
3. Devices in proximity to each other shall be horizontally and vertically aligned. Devices which are not aligned properly shall be relocated as required to meet alignment requirements at no cost to Owner.
4. Coordinate device placement and installation with other trades and Architect/Engineer prior to construction and rough-in.

D. NECA Compliance
1. Install products in accordance with applicable NECA Standards, unless otherwise specified or indicated.

E. Wet, Damp, or Dry Location Work
1. Provide products as appropriate for wet, damp, or dry locations as defined by NFPA 70.

F. Manufacturer Installation Instructions
1. Install equipment in accordance with the manufacturer's installation instructions and recommendations.

G. Fire and Smoke Barrier Penetrations
1. Install firestopping to raceways, boxes and electrical equipment installed in or penetrating fire-rated floor and wall assemblies and smoke barrier assemblies, in a manner which maintains the fire resistance rating or barrier intent.

H. Field Painting
1. Refer to Division 09 for prime and finish field painting requirements.
2. Field paint electrical equipment, products, materials, components and systems where indicated.
3. In a manner approved by the manufacturer and satisfactory to the Owner, touch-up or refinish factory-applied paints or finishes which are chipped, defaced, scratched, or in any other way disturbed due to handling, installation, or general construction work.

I. Exposed Construction

1. Take care in areas where the installation is exposed and visible to the public. Install electrical systems and equipment in an organized fashion and field painted. Mounting surfaces shall be repaired, patched, and painted to provide a "like new" appearance.
2. Coordinate systems (e.g. conduit, cable tray, wiring, duct work, piping, hanger, supports, etc.) prior to installation.

J. Personnel Protection from Suspended Work
1. Where suspended equipment, piping or ductwork or any of their supporting or reinforcing members extend 2.1 meters (7 feet) or less above the floor or any other walking surface, cover all edges, projecting surfaces and sharp corners with pre-fabricated soft rubber pads, elastomeric insulation, caps or equivalent to prevent injury to personnel.

3.6 ACCEPTANCE TESTING

A. General.
1. Provide necessary test equipment and be responsible for setting-up test equipment, wire checks of factory wiring and any other preliminary work in preparation for the electrical acceptance tests.
2. Perform tests which do not exceed the manufacturer's recommended limit for the equipment being tested.
3. Where required for the validity of tests or safety of equipment and personnel, isolate equipment to be tested from the system.
4. Include the ambient temperature and relative humidity existing at the time when performing insulation resistance, dielectric absorption or high potential tests.
5. Coordinate testing and inspections with commissioning agent.

B. Visual Inspections.
1. Prior to any testing, perform visual inspections to verify the following:
   a. The equipment is completely and properly installed.
   b. The equipment is free from damage and defects.
   c. Shipping blocks and restraints have been removed.`
   d. Electrical terminations are properly tightened.
   e. The equipment is properly aligned.
   f. The equipment is properly lubricated.
   g. The ventilation louvers are open and unobstructed.
   h. The equipment is ready to be tested.

C. Manual Operation.
1. Prior to any testing, operate mechanical devices to verify that they function properly and freely.

D. Insulation Resistance Test.
1. Perform test with a voltage source capable of providing a constant direct voltage for the time intervals as specified below.
   a. 150 volts and under - 500 volts.
   b. 151-600 volts - 1000 volts.
   c. Hold 1000-volt and 500-volt insulation resistance tests for a minimum of one minute or until the reading reaches a constant value for 15 seconds unless specified otherwise.
   d. Apply tests from phase to ground with the other phases grounded. Test each phase in a similar manner.

e. Check phase matching and phase identification immediately prior to energizing equipment.

3.7 FIELD QUALITY CONTROL

A. Field Tests
1. Permit Architect and Owner to observe field tests. Provide minimum sevenworking days' notice of field test.
2. Schedule tests in coordination with other Contract work. Schedule no more than one equipment or system field test per day.
3. Provide test reports.

B. Inspect installed sleeves and firestopping for damage or faulty work. Replace defective installations.

C. Replace any equipment, system or materials found to be defective or found to be of lesser quality than that specified or shown on the Drawings.

3.8 CLEANING

A. Clean electrical equipment and systems to remove dirt, paint or other foreign materials and restore to match original condition and finish upon completion of construction.

3.9 TRAINING

A. General
1. Provide training for Owner's personnel in the operation and maintenance of equipment as specified in the applicable Section for the particular equipment and system.
2. Develop training schedule which is acceptable to the Owner. Submit schedule for approval.
3. Provide instruction books, manuals, and other classroom material required as part of the training sessions.
4. Provide instructors who are certified by the equipment and system manufacturers.
5. Provide training for a minimum of three of the Owner's personnel, or as specified in the applicable Section.
6. Conduct training at Project Site after the equipment/system has been installed.

B. Operations and Maintenance Training
1. Train personnel in all aspects of normal operation of the equipment, including starting, adjustments while running, and shutdown.
a. Train personnel to recognize incipient problems, including inefficient or dangerous modes of operation, and provide instruction in corrective actions to be taken.
2. Train personnel to perform all recommended maintenance on the equipment.

END OF SECTION

SECTION 26 0519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 ACTION SUBMITTALS

A. Product Schedule: Indicate type, use, location, and termination locations.

1.2 INFORMATIONAL SUBMITTALS

A. Qualification Data: For **testing agency**.

B. Field quality-control reports.

1.3 QUALITY ASSURANCE

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

B. Standards:
   1. Products listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
   2. RoHS compliant.
   3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Alpha Wire Company.
   2. American Bare Conductor.
   3. Belden Inc.
   4. Cerro Wire LLC.
   5. Encore Wire Corporation.
   6. General Cable Technologies Corporation.
   7. Okonite Company (The).
   8. Service Wire Co.
   9. Southwire Company.
   10. WESCO.

C. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 and ASTM B 496 for stranded conductors.

D. Conductor Insulation:

1. Refer to Part 3 for conductor insulation application. Comply with UL Standard appropriate for cable insulation.

2.2 MINERAL-INSULATED CABLE, TYPE MI

A. Description: Solid copper conductors encased in compressed metal oxide with an outer metallic sheath, rated 600 V or less.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. nVent Pyrotenax.

C. Standards:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. UL 2196 for fire resistance.

D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper.

E. Insulation: Compressed magnesium oxide, minimum 55 mils for 600 volt power and control cables; minimum 23 mils for 300 volt twisted pair cables.

F. Sheath: Copper, continuous and seamless, liquid- and gas-tight.

2.3 TRAY CABLE, TYPE TC FOR VFD OUTPUT CIRCUITS

A. Description: A factory assembly of insulated current-carrying conductors with or without an equipment grounding conductor in a nonmetallic jacket.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Alpha Wire Company.
2. Belden Inc.
3. Encore Wire Corporation.
4. General Cable Technologies Corporation.
5. Okonite Company (The).
6. Service Wire Co.
7. Southwire Company.
8. WESCO.

C. Standards:
1. RoHS compliant.
2. Comply with UL 1277.
3. Comply with ICEA S-95-658/NEMA WC 70 for Type TC cables used for power distribution.

D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

E. Ground Conductor: Three stranded bare copper ground wires.

F. Conductor Insulation: Type XHHW-2 or RHW-2. Comply with UL 44.

G. Shield: Copper tape shield with a minimum of 50% overlap.

2.4 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. 3M Electrical Products.
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. Service Wire Co.
10. TE Connectivity Ltd.
11. Thomas & Betts Corporation; A Member of the ABB Group.

C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
1. Material: Bronze or matching conductor material.

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.

C. VFC Output Circuits Cable: Extra-flexible stranded for all sizes.

D. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

E. Isolated Power System Secondary Conductor Type: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

F. Feeders: Type THHN/THWN-2 or XHHW-2, single conductors in raceway.

G. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway .

H. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway .

I. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2 or XHHW-2, single conductors in raceway .

J. Branch Circuits Installed below Raised Flooring: Type THHN/THWN-2, single conductors in raceway .

K. Feeders and Branch Circuits Installed on Rooftops: Type XHHW-2, single conductors in raceway.

L. Emergency Power System Branch Circuits: Type THHN-2/THWN-2, single conductors in raceway.

M. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

N. VFD Output Circuits: Type TC-ER cable with tape shield.

O. Smithsonian Design Standard: The use of Metal Clad (MC) cable for power and lighting branch circuits will be reviewed with SI for specific project requirements. The basis of design will include branch circuits run in Electrical Metallic Tubing (EMT) conduit, with a 1.8m (6ft) maximum whip length from junction box to lighting fixture position. MC cable for overall branch circuit length is not permitted.

P. Smithsonian Design Standard: Wet Locations: Type XHHW-2, single conductors in raceway.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 26 0533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 26 0529 "Hangers and Supports for Electrical Systems."

G. Install cable per manufacturer's recommendations.

3.3 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 6 inches (150 mm).

3.4 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 0553 "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.

3.5 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 07 8413 "Penetration Firestopping."

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

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

C. Prepare test and inspection reports 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.

END OF SECTION

SECTION 26 0543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits and fittings, including GRC and PVC-coated steel conduit.
2. Rigid nonmetallic duct.
3. Flexible nonmetallic duct.
4. Duct accessories.
5. Precast concrete handholes.
6. Polymer concrete handholes and boxes with polymer concrete cover.
7. Precast manholes.
8. Utility structure accessories.

1.2 DEFINITIONS

A. Direct Buried: Duct or a duct bank that is buried in the ground, without any additional casing materials such as concrete.

B. Duct: A single duct or multiple ducts. Duct may be either installed singly or as component of a duct bank.

C. Duct Bank:
1. Two or more ducts installed in parallel, with or without additional casing materials.
2. Multiple duct banks.

D. GRC: Galvanized rigid (steel) conduit.

E. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include duct-bank materials, including spacers and miscellaneous components.
2. Include duct, conduits, and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Include accessories for manholes, handholes, boxes, and other utility structures.
4. Include underground-line warning tape.

B. Shop Drawings:
1. Precast or Factory-Fabricated Underground Utility Structures:
   a. Include plans, elevations, sections, details, attachments to other work, and accessories.
   b. Include duct entry provisions, including locations and duct sizes.
   c. Include reinforcement details.
   d. Include frame and cover design and manhole chimneys.

e. Include ladder or step details.
f. Include grounding details.
g. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
h. Include joint details.

2. 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.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer and testing agency responsible for testing nonconcrete handholes and boxes.

B. Product Certificates: For concrete and steel used in precast concrete manholes andhandholes, as required by ASTM C 858.

C. Source quality-control reports.

D. Field quality-control reports.

1.5 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.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

1.7 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions, and then only after arranging to provide temporary electrical service according to requirements indicated:
1. Notify Construction Manager and Owner no fewer than five days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Construction Manager's and Owner's written permission.

B. Ground Water: Assume ground-water level is at grade level unless a lower water table is noted on Drawings.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND FITTINGS

A. GRC: Comply with ANSI C80.1 and UL 6.

B. Coated Steel Conduit: PVC-coated GRC IMC.
1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

C. Manufacturers: Subject to compliance with requirements, provide products by one of 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. Calconduit.
5. Electri-Flex Company.
6. FSR Inc.
7. Korkap.
8. Opti-Com Manufacturing Network, Inc (OMNI).
9. O-Z/Gedney; a brand of Emerson Industrial Automation.
10. Perma-Cote.
11. Picoma Industries, Inc.
12. Plasti-Bond.
13. Republic Conduit.
14. Southwire Company.
15. Thomas & Betts Corporation; A Member of the ABB Group.
16. Topaz Electric; a division of Topaz Lighting Corp.
17. Western Tube and Conduit Corporation.
18. Wheatland Tube Company.

D. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

2.2 RIGID NONMETALLIC DUCT

A. Underground Plastic Utilities Duct: Type EPC-80-PVC and Type EPC-40-PVC RNC, complying with NEMA TC 2 and UL 651, with matching fittings complying with NEMA TC 3 by same manufacturer as duct.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ARNCO Corp.
2. Beck Manufacturing.
3. CANTEX INC.
4. CertainTeed Corporation.
5. Condux International, Inc.
6. Crown Line Plastics.
7. ElecSys, Inc.
8. Electri-Flex Company.
9. Endot Industries Inc.

10. IPEX USA LLC.
11. Lamson & Sessions.
12. Manhattan/CDT.
13. National Pipe & Plastics.
14. Opti-Com Manufacturing Network, Inc (OMNI).
15. Spiraduct/AFC Cable Systems, Inc.

C. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

D. Solvents and Adhesives: As recommended by conduit manufacturer.

1. VOC Content:[510] <Insert value> g/L or less for PVC conduit and fittings.

2.3 DUCT ACCESSORIES

A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used, and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.

1. Manufacturers: Subject to compliance with requirements,provide products by one of the following:
   a. Allied Tube & Conduit; a part of Atkore International.
   b. CANTEX INC.
   c. Carlon; a brand of Thomas & Betts Corporation.
   d. IPEX USA LLC.
   e. PenCell Plastics.
   f. Underground Devices, Inc.

B. Underground-Line Warning Tape: Comply with requirements for underground-line warning tape specified in Section 26 0553 "Identification for Electrical Systems."

C. Concrete Warning Planks: Nominal 12 by 24 by 3 inches (300 by 600 by 75 mm) in size, manufactured from 6000-psi (41-MPa) concrete.
1. Color: Red dye added to concrete during batching.
2. Mark each plank with "ELECTRIC" in 2-inch- (50-mm-) high, 3/8-inch- (10-mm-) deep letters.

2.4 PRECAST CONCRETE HANDHOLES AND BOXES

A. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Christy Concrete Products.
2. Elmhurst-Chicago Stone Co.
3. Oldcastle Precast, Inc.
4. Rinker Group, Ltd.
5. Riverton Concrete Products.

6. Utility Concrete Products, LLC.
7. Utility Vault Co.
8. Wausau Tile Inc.

C. Comply with ASTM C 858 for design and manufacturing processes.

D. Frame and Cover: Weatherproof steel frame, with hinged steel access door assembly with tamper-resistant, captive, cover-securing bolts.
1. Cover Hinges: Concealed, with hold-open ratchet assembly.
2. Cover Handle: Recessed.

E. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

F. Cover Legend: Molded lettering, "ELECTRIC." as indicated for each service. Insert legend.

G. Configuration: Units shall be designed for flush burial and have open closed integral closed bottom unless otherwise indicated.

H. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus an additional 12 inches (300 mm) vertically and horizontally to accommodate alignment variations.
1. Center window location.
2. Knockout panels shall be located no less than 6 inches (150 mm) from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.
3. Knockout panel opening shall have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct.
4. Knockout panels shall be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.
5. Knockout panels shall be 1-1/2 to 2 inches (38 to 50 mm) thick.

I. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
1. Type and size shall match fittings to duct to be terminated.
2. Fittings shall align with elevations of approaching duct and be located near interior corners of handholes to facilitate racking of cable.

J. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.5 POLYMER CONCRETE HANDHOLES AND BOXES WITH POLYMER CONCRETE COVER

A. Description: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Armorcast Products Company.
2. NewBasis.
3. Oldcastle Enclosure Solutions.

4. Quazite: Hubbell Power Systems, Inc.

C. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.

D. Color: Gray Green.

E. Configuration: Units shall be designed for flush burial and have open closed integral closed bottom unless otherwise indicated.

F. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.

G. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

H. Cover Legend: Molded lettering, "ELECTRIC." as indicated for each service. Insert legend.

I. 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.

J. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering duct for secure, fixed installation in enclosure wall.

K. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have factory-installed inserts for cable racks and pulling-in irons.

2.6 PRECAST MANHOLES

A. Description: One-piece units and units with interlocking mating sections, complete with accessories, hardware, and features.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C.

1. Carder Concrete Products.
2. Christy Concrete Products.
3. Elmhurst-Chicago Stone Co.
4. Oldcastle Precast, Inc.
5. Rinker Group, Ltd.
6. Riverton Concrete Products.
7. Utility Concrete Products, LLC.
8. Utility Vault Co.
9. Wausau Tile Inc.

D. Comply with ASTM C 858.

E. Structural Design Loading: Comply with requirements in "Underground Enclosure Application" Article.

F. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus an additional 12 inches (300 mm) vertically and horizontally to accommodate alignment variations.
1. Center window location.
2. Knockout panels shall be located no less than 6 inches (150 mm) from interior surfaces of walls, floors, or roofs of manholes, but close enough to corners to facilitate racking of cables on walls.
3. Knockout panel opening shall have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct.
4. Knockout panel shall be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.
5. Knockout panels shall be 1-1/2 to 2 inches (38 to 50 mm) thick.

G. Duct Entrances in Manhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
1. Type and size shall match fittings to duct to be terminated.
2. Fittings shall align with elevations of approaching duct and be located near interior corners of manholes to facilitate racking of cable.

H. Ground Rod Sleeve: Provide a 3-inch (75-mm) PVC sleeve in manhole floors 2 inches (50 mm) from the wall adjacent to, but not underneath, the duct entering the structure.

I. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.

2.7 UTILITY STRUCTURE ACCESSORIES

A. Accessories for Utility Structures: Utility equipment and accessory items used for utility structure access and utility support, listed and labeled for intended use and application.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Bilco Company (The).
2. Campbell Foundry Company.
3. Carder Concrete Products.
4. Christy Concrete Products.
5. EJ.
6. Elmhurst-Chicago Stone Co.
7. McKinley Iron Works, Inc.
8. Neenah Foundry Company.
9. NewBasis.
10. Oldcastle Precast, Inc.
11. Osburn Associates, Inc.
12. Pennsylvania Insert Corporation.
13. Quazite: Hubbell Power Systems, Inc.
14. Rinker Group, Ltd.
15. Riverton Concrete Products.
16. Underground Devices, Inc.
17. Utility Concrete Products, LLC.
18. Utility Vault Co.

19. Wausau Tile Inc.

C. Manhole Frames, Covers, and Chimney Components: Comply with structural design loading specified for manhole.
   1. Frame and Cover: Weatherproof, gray cast iron complying with ASTM A 48/A 48M, Class 30B cast aluminum with milled cover-to-frame bearing surfaces; diameter, 26 inches (660 mm) 29 inches (725 mm).
      a. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
      b. Special Covers: Recess in face of cover designed to accept finish material in paved areas.
   2. Cover Legend: Cast in. Selected to suit system.
      a. Legend: "ELECTRIC-LV" for duct systems with power wires and cables for systems operating at 600 V and less.
   3. Manhole Chimney Components: Precast concrete rings with dimensions matched to those of roof opening.

      a. Mortar for Chimney Ring and Frame and Cover Joints: Comply with ASTM C 270, Type M, except for quantities less than 2.0 cu. ft. (60 L) where packaged mix complying with ASTM C 387, Type M, may be used.
      b. Seal joints watertight using preformed plastic or rubber complying with ASTM C 990. Install sealing material according to sealant manufacturers' written instructions.

D. Manhole Sump Frame and Grate: ASTM A 48/A 48M, Class 30B, gray cast iron.

E. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2-inch- (50-mm-) diameter eye, and 1-by-4-inch (25-by-100-mm) bolt.
   1. Working Load Embedded in 6-Inch (150-mm), 4000-psi (27.6-MPa) Concrete: 13,000-lbf (58-kN) minimum tension.

F. Pulling-in and Lifting Irons in Concrete Floors: 7/8-inch- (22-mm-) diameter, hot-dip galvanized, bent steel rod; stress relieved after forming; and fastened to reinforcing rod. Exposed triangular opening.
   1. Ultimate Yield Strength: 40,000-lbf (180-kN) shear and 60,000-lbf (270-kN) tension.

G. Bolting Inserts for Concrete Utility Structure Cable Racks and Other Attachments: Flared, threaded inserts of noncorrosive, chemical-resistant, nonconductive thermoplastic material; 1/2-inch (13-mm) ID by 2-3/4 inches (69 mm) deep, flared to 1-1/4 inches (31 mm) minimum at base.
   1. Tested Ultimate Pullout Strength: 12,000 lbf (53 kN) minimum.

H. Ground Rod Sleeve: 3-inch (75-mm) PVC sleeve in manhole floors 2 inches (50 mm) from the wall adjacent to, but not underneath, the ducts routed from the facility.

I. Expansion Anchors for Installation after Concrete Is Cast: Zinc-plated, carbon-steel-wedge type with stainless-steel expander clip with 1/2-inch (13-mm) bolt, 5300-lbf (24-kN) rated pullout strength, and minimum 6800-lbf (30-kN) rated shear strength.

J. Cable Rack Assembly: Steel, hot-rolled hot-dip galvanized, except insulators.

1. Stanchions: T-section or channel with provisions to connect to other sections or channels to form a continuous unit; 1-1/2 inches (38 mm) in width by nominal 24 inches (600 mm) long; punched with 14 hook holes on 1-1/2-inch (38-mm) centers for cable-arm attachment.
2. Arms: 1-1/2 inches (38 mm) wide, lengths ranging from 3 inches (75 mm) with 450-lb (204-kg) minimum capacity to 18 inches (450 mm) with 250-lb (114-kg) minimum capacity. Arms shall have slots along full length for cable ties and be arranged for secure mounting in horizontal position at any vertical location on stanchions.

K. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F (2 deg C). Capable of withstanding temperature of 300 deg F (150 deg C) without slump and adhering to clean surfaces of plastic ducts, metallic conduit, conduit and duct coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.

L. Fixed Manhole Ladders: Arranged for attachment to roof or wall and floor of manhole. Ladder and mounting brackets and braces shall be fabricated from nonconductive, structural-grade, fiberglass-reinforced resin hot-dip galvanized steel.

M. Cover Hooks: Heavy duty, designed for lifts 60 lbf (270 N) and greater Light duty, designed for lifts less than 60 lbf (270 N). Two Insert number required.

2.8 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures according to ASTM C 1037.

B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
1. Strength tests of complete boxes and covers shall be by an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
2. Testing machine pressure gages shall have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of duct, duct bank, manholes, 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 duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct 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 and duct bank will drain to manholes and handholes, and as approved by Architect.

C. Clear and grub vegetation to be removed, and protect vegetation to remain according to Section 31 1000 "Site Clearing." Remove and stockpile topsoil for reapplication according to Section 31 1000 "Site Clearing."

3.2 UNDERGROUND DUCT APPLICATION

A. Duct for Electrical Cables More Than 600 V: Type EPC-80-PVC RNC, concrete-encased unless otherwise indicated.

B. Duct for Electrical Feeders 600 V and Less: Type EPC-80-PVC RNC, concrete-encased unless otherwise indicated.

C. Duct for Electrical Branch Circuits: Type EPC-80-PVC RNC, direct-buried unless otherwise indicated.

D. Underground Ducts Crossing Paved Paths Walks and Driveways: Type EPC-40 PVC RNC, encased in reinforced concrete.

E. Stub-ups: Concrete-encased PVC-coated GRC.

3.3 EARTHWORK

A. Excavation and Backfill: Comply with Section 31 2000 "Earth Moving," 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. Replace removed sod immediately after backfilling is completed.

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. Comply with Section 32 9200 "Turf and Grasses" and Section 32 9300 "Plants."

D. Cut and patch existing pavement in the path of underground duct, duct bank, and underground structures according to "Cutting and Patching" Article in Section 01 7300 "Execution."

3.4 DUCT AND DUCT-BANK INSTALLATION

A. Install duct, spacers, and accessories into the duct-bank configuration shown. Duct installation requirements in this Section also apply to duct bank.

B. Install duct according to NEMA TCB 2.

C. Slope: Pitch duct a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope duct from a high point between two manholes, to drain in both directions.

D. 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 (1200 mm) , both horizontally and vertically, at other locations unless otherwise indicated.

E. Joints: Use solvent-cemented joints in duct and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent duct do not lie in same plane.

F. Installation Adjacent to High-Temperature Steam Lines: Where duct is installed parallel to underground steam lines, perform calculations showing the duct will not be subject to environmental temperatures above 40 deg C. Where environmental temperatures are calculated to rise above 40 deg C, and anywhere the duct crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.

G. Terminator Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use manufactured, cast-in-place duct terminators, with entrances into structure spaced approximately 6 inches (150 mm) o.c. for 4-inch (100-mm) duct, and vary proportionately for other duct sizes.

1. Begin change from regular spacing to terminator spacing 10 feet (3 m) from the terminator, without reducing duct line slope and without forming a trap in the line.

2. Expansion and Deflection Fittings: Install an expansion and deflection fitting in each duct in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight line duct with calculated expansion of more than 3/4 inch (19 mm).

H. Building Wall Penetrations: Make a transition from underground duct to GRC at least 10 feet (3 m) 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 RNC-to-GRC transition. Install GRC penetrations of building walls as specified in Section 26 0544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

I. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.

J. Pulling Cord: Install 200-lbf- (1000-N-) test nylon cord in empty ducts.

K. Concrete-Encased Ducts and Duct Bank:

1. Excavate trench bottom to provide firm and uniform support for duct. Prepare trench bottoms as specified in Section 31 2000 "Earth Moving" for pipes less than 6 inches (150 mm) in nominal diameter.

2. Width: Excavate trench 12 inches (300 mm) wider than duct on each side.

3. Depth: Install so top of duct envelope is at least 24 inches (600 mm) below finished grade in areas not subject to deliberate traffic, and at least 30 inches (750 mm) below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.
4. Support duct on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.

5. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 feet (6 m) of duct. Place spacers within 24 inches (600 mm) of duct ends. Stagger spacers approximately 6 inches (150 mm) between tiers. Secure spacers to earth and to duct to prevent floating during concreting. 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. Elbows: Use manufactured duct elbows for stub-ups, at building entrances, and at changes of direction in duct unless otherwise indicated. Extend encasement throughout length of elbow.

7. Reinforcement: Reinforce concrete-encased duct where crossing disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
8. 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.

9. Concrete Cover: Install a minimum of 3 inches (75 mm) of concrete cover between edge of duct to exterior envelope wall, 2 inches (50 mm) between duct of like services, and 4 inches (100 mm) between power and communications ducts.
10. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
    a. Start at one end and finish at the other, allowing for expansion and contraction of duct as its temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written instructions, 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 (15-mm) reinforcing-rod dowels extending a minimum of 18 inches (450 mm) into concrete on both sides of joint near corners of envelope.
11. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Section 03 3000 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between duct and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Allow concrete to flow around duct and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-installation application.

L. Direct-Buried Duct and Duct Bank:
1. Excavate trench bottom to provide firm and uniform support for duct. Comply with requirements in Section 31 2000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inches (150 mm) in nominal diameter.
2. Width: Excavate trench 12 inches (300 mm) wider than duct on each side.
3. Width: Excavate trench 3 inches (75 mm) wider than duct on each side.

4. Depth: Install top of duct at least 36 inches (900 mm) below finished grade unless otherwise indicated.
5. Set elevation of bottom of duct bank below frost line.
6. Support ducts on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.

7. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 feet (6 m) of duct. Place spacers within 24 inches (600 mm) of duct ends. Stagger spacers approximately 6 inches (150 mm) between tiers. Secure spacers to earth and to ducts to prevent floating during concreting. 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.

8. Elbows: Install manufactured duct elbows for stub-ups, at building entrances, and at changes of direction in duct direction unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
9. After installing first tier of duct, 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 (100 mm) over duct 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 Section 31 2000 "Earth Moving" for installation of backfill materials.

    a. Place minimum 3 inches (75 mm) of sand as a bed for duct. Place sand to a minimum of 6 inches (150 mm) above top level of duct.
    b. Place minimum 6 inches (150 mm) of engineered fill above concrete encasement of duct.

M. Underground-Line Warning Tape: Bury conducting underground line specified in Section 26 0553 "Identification for Electrical Systems" no less than 12 inches (300 mm) above all concrete-encased duct and duct banks and approximately 12 inches (300 mm) below grade. Align tape parallel to and within 3 inches (75 mm) of centerline of duct bank. Provide an additional warning tape for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional tapes 12 inches (300 mm) apart, horizontally.

3.5 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

A. Cast-in-Place Manhole Installation:
1. Finish interior surfaces with a smooth-troweled finish.

2. Knockouts for Future Duct Connections: Form and pour concrete knockout panels 1-1/2 to 2 inches (38 to 50 mm) thick, arranged as indicated.
3. Comply with requirements in Section 03 3000 "Cast-in-Place Concrete" for cast-in-place concrete, formwork, and reinforcement.

B. Precast Concrete Handhole and Manhole Installation:
1. Comply with ASTM C 891 unless otherwise indicated.
2. Install units level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch (25-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevations:
1. Manhole Roof: Install with rooftop at least 15 inches (375 mm) below finished grade.
2. Manhole Frame: In paved areas and trafficways, set frames flush with finished grade. Set other manhole frames 1 inch (25 mm) above finished grade.
3. Install handholes with bottom below frost line, below grade.
4. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
5. Where indicated, cast handhole cover frame integrally with handhole structure.

D. Drainage: Install drains in bottom of manholes where indicated. Coordinate with drainage provisions indicated.

E. Manhole Access: Circular opening in manhole roof; sized to match cover size.
1. Manholes with Fixed Ladders: Offset access opening from manhole centerlines to align with ladder.
2. Install chimney, constructed of precast concrete collars and rings, to support cast-iron frame to connect cover with manhole roof opening. Provide moisture-tight masonry joints and waterproof grouting for frame to chimney.

F. Waterproofing: Apply waterproofing to exterior surfaces of manholes and handholes after concrete has cured at least three days. Waterproofing materials and installation are specified in Section 07 1353 "Elastomeric Sheet Waterproofing." or Section 07 1354 "Thermoplastic Sheet Waterproofing." After duct has been connected and grouted, and before backfilling, waterproof joints and connections, and touch up abrasions and scars. Waterproof exterior of manhole chimneys after mortar has cured at least three days.

G. Dampproofing: Apply dampproofing to exterior surfaces of manholes and handholes after concrete has cured at least three days. Dampproofing materials and installation are specified in Section 07 1113 "Bituminous Dampproofing." After ducts are connected and grouted, and before backfilling, dampproof joints and connections, and touch up abrasions and scars. Dampproof exterior of manhole chimneys after mortar has cured at least three days.

H. Hardware: Install removable hardware, including pulling eyes, cable stanchions, and cable arms, as required for installation and support of cables and conductors and as indicated.

I. Fixed Manhole Ladders: Arrange to provide for safe entry with maximum clearance from cables and other items in manholes.

J. Field-Installed Bolting Anchors in Manholes and Concrete Handholes: Do not drill deeper than 3-7/8 inches (97 mm) for manholes and 2 inches (50 mm) for handholes, for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.

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 duct, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of duct, 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 (12.5-mm) sieve to No. 4 (4.75-mm) 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 (25 mm) above finished grade.

D. Install handholes and boxes with bottom below frost line, 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 duct 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.

G. For enclosures installed in asphalt paving and and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.
   1. Concrete: 3000 psi (20 kPa), 28-day strength, complying with Section 03 3000 "Cast-in-Place Concrete," with a troweled finish.
   2. Dimensions: 10 inches wide by 12 inches deep (250 mm wide by 300 mm deep).

3.7 GROUNDING

A. Ground underground ducts and utility structures according to Section 26 0526 "Grounding and Bonding for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, 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 12-inch- (300-mm-) long mandrel equal to duct size minus 1/4 inch (6 mm). If obstructions are indicated, remove obstructions and retest.
   3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 26 0526 "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 duct until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump.
   1. Remove foreign material.

END OF SECTION

SECTION 31 1000 – SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. This Sections includes the following:
   1. Protecting existing vegetation to remain.
   2. Removing existing vegetation.
   3. Clearing and grubbing obstructions, trees, shrubs, and other vegetation, including grinding stumps and removing roots and debris.
      a. Chipping removed tree branches and disposing off-site.
   4. Stripping and stockpiling topsoil and disposing of surplus topsoil.
   5. Stripping and stockpiling rock and disposing of surplus rock.
   6. Removing existing above- and below-grade site improvements.
   7. Disconnecting, capping or sealing, and removing or abandoning site utilities.
   8. Providing temporary erosion- and sedimentation-control measures.

1.2 REFERENCES

A. DOEE – Department of Energy and Environment.

1.3 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2-inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.

B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project Site.

1.5 SUBMITTALS

A. Photographs or videotapes, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining walks and other adjacent occupied or used facilities during site-clearing operations.
   1. Do not close or obstruct walks or other adjacent occupied or used facilities without permission from Owner and Contracting Officer Technical Representative (COTR).
   2. Provide alternative routes around closed or obstructed traffic ways if required by COTR.

B. Utility Locater Service: Notify utility locator service for area where project is located before site clearing.

C. Do not commence site clearing operations until temporary erosion and sediment control measures are in place.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain.

C. Protect existing site improvements to remain from damage during construction.
   1. Restore damaged improvements to their original condition, as acceptable to the Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to the erosion and sediment control plans, and in accordance with DOEE Standards and Specifications for Soil Erosion and Sediment Control.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

   Remove erosion and sedimentation controls and restore and stabilize areas disturbed during construction.

3.3 UTILITIES

A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by contractor.
   1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
   1. Arrange with utility companies to shut off indicated utilities.
   2. Owner will arrange to shut off indicated utilities when requested by Contractor.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated.
   1. Notify Owner no less than three days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Owner's written permission.

D. Excavate for and remove underground utilities indicated to be removed.

3.4 CLEARING AND GRUBBING

A. Remove obstructions and grass to permit installation of new construction.
   1. Cut minor roots and branches of tree not indicated to be removed in a clean and careful manner where such roots and branches obstruct installation of new construction.
   2. Remove roots and debris extending to a depth of 18 inches below exposed subgrade.
   3. Chip removed tree branches and stockpile in areas approved by Owner until the items can be properly disposed of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
   1. Place fill material in horizontal layers not exceeding a loose depth of 8-inches, and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
   1. Remove subsoil and non-soil materials from topsoil including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblow dust.
   1. Limit height of stockpiles to 72-inches.
   2. Dispose of excess topsoil as specified for waste material disposal.
   3. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.6 SITE IMPROVEMENTS

A. Remove existing below above and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove paving, gravel, and aggregate base as indicated.
   1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
   2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

3.7 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's Property.
   1. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION

SECTION 312300 - EARTHWORK

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to complete the Work specified in this Section, and as shown on the Drawings.

B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section. All work under this Section of the Specifications shall be performed in accordance with Division 01 (General Requirements).

C. Coordinate work with that of all other trades affecting or affected by the Work of this Section. Cooperate with such trades to ensure the steady progress of all work under the Contract.

D. All work shall be performed in accordance with applicable codes, permits and regulations, and the requirements of all local, state, and federal agencies having jurisdiction over the work.

1.2 RELATED DOCUMENTS

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

1.3 DESCRIPTION OF WORK

A. The Work of this Section includes, but is not limited to:
1. Excavating all types of materials (e.g., soil, boulders, bedrock, utilities, foundations, pavements, debris) to limits and bottom of excavation elevations indicated on the Drawings and herein, or required for foundations, slabs, utilities and other site improvements shown on the Drawings.
2. Over-excavate soil and weathered rock, and other unsuitable materials to suitable foundation bearing strata.
3. Preparing bearing surfaces for foundations.
4. Installing building foundation drainage systems as shown on the Drawings.
5. Providing, placing, moisture conditioning, compacting, and grading of fill and backfill materials to the specified limits and percent compaction required to construct foundations, slabs, structures, utilities, roadways, parking areas, walkways, landscaped areas, and other site improvements shown on the Drawings.
6. Handling, conveying, segregating, and stockpiling materials used during the course of the Work.
7. Re-use of the on-site soils to the extent possible.
8. Removing from the site and legally disposing of excess materials and materials that are not suitable for on-site re-use in accordance with the Specifications.
9. Removing from the site and legally and temporarily stockpiling materials that are suitable and planned for on-site re-use in accordance with the Specifications.
10. Protecting existing utilities, structures, and other facilities to remain during the work.

11. Preventing trafficking of soil materials onto public roads or sidewalks and providing street cleaning to remove such materials during the work.
12. Obtaining, paying for, and complying with all required permits, licenses, and approvals prior to commencing the work.

1.4 RELATED SECTIONS

A. Related Sections
1. 024119 Selective Demolition
2. 033000 Cast-in-Place Concrete
3. 221313 Facility Sanitary Sewers
4. 311000 Site Clearing
5. 316333 Micropiles
6. 321313 Concrete Paving
7. 331415 Site Water Distribution Piping
8. 334200 Stormwater Conveyance

1.5 DEFINITIONS

A. Refer to Section 011000 for definition of Owner, Architect, Construction Manager, Owner's Representative, and Contractor. In this Section the term Contractor may refer to the Construction Manager as Constructor or Construction Contractor.

B. Bidder: Entity bidding to complete the Work of this Section. After award of the contract, the Bidder becomes the Contractor for the purposes of this Section.

C. Site: Refer to the limits of construction shown on the Drawings.

D. Site Improvements: shall include, but not be limited to, buildings, structures, foundations, underground and above-ground utilities, pavements, landscaping, plants, slabs, sidewalks, curbs, and all other site features that are outside the limits of the site, and/or those elements within the limits of the site that are to remain.

E. Exploration: shall include, but not be limited to, test borings and test pits and results of field and lab testing.

F. Building Code or Code: Refer to the standards and regulations indicated on the Drawings.

G. Rock (Bedrock): Mass of naturally formed, crystalline-mineral material that is hardened and intact or with in-situ discontinuities, and may be altered by weathering up to the degree it is soil-like.

H. Structures: Foundations, slabs, walls, equipment pads, tanks, mechanical, plumbing, and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, or the vertical excavation level and slopes indicated on the Drawings to which the excavation shall be conducted. For footing bearing subgrades this level

will be to the elevations indicated on the Drawings, or the top of material in a state suitable for foundation bearing, whichever is lower.

J. Trench: Excavation of any length where width at top is less than twice the depth and depth is greater than 5 ft.

K. Zone(s) of Influence (ZOI): The zone(s) below lines extending away from a structural element (e.g., spread footing foundation, slab-on-grade, pile cap) shown on the Drawings. The lines for the element are:
   1. At a slope of one and one-half horizontal to one vertical (1.5H:1V) beginning at the bottom outside edge of the element and away from the element until intersecting suitable bearing materials.
   2. Horizontal beginning at the 1 ft above the top of a laterally loaded element and extending away for a distance of three times the element height.

1.6 PROJECT CONDITIONS

A. Prior to submitting a bid, the Bidder shall review and understand the information contained in the following documents. These documents are made available to the Bidder for informational purposes only. The subsurface conditions information presented in these documents, as applicable, are for informational purposes only and shall not be interpreted as a warranty of subsurface conditions whether interpreted from written text, exploration results, laboratory results, or other data or interpretations of data.
   1. "Report on Geotechnical Engineering Study, Construct Arabian Leopard Habitat, National Zoological Park, 3100 Connecticut Avenue NW, Washington, DC" prepared by Haley & Aldrich, Inc., dated March 2026.

B. Prior to submitting a bid, the Bidder shall examine the records of subsurface features including but not limited to utilities and foundations, records of explorations, and the exploration samples to determine conditions under which the Work will be performed. The exploration samples are available for review at Haley & Aldrich, Inc., Vienna, Virginia.

C. The exploration information represents subsurface conditions at the exploration locations at the time conducted. Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between explorations. It is expressly understood that the Owner and Architect will not be responsible for interpretations or conclusions drawn there from by the Bidder.

D. The Contractor may perform additional explorations and laboratory testing or field screening for their own information at no cost to the Owner following approval in writing from the Owner. The Bidder shall include the cost of any additional studies it deems necessary to properly perform the Work specified in this Section, in the Related Sections, and as shown on the Drawings.

E. If, during the course of construction operations, conditions differing substantially from those indicated in the documents referenced in this Section are encountered, promptly notify the Owner's Representative and Architect in writing, and do not disturb such conditions until directed. The Owner, Owner's Representative, and Architect will investigate such conditions,

and, if it is determined that the conditions differ substantially from those that reasonably would have been anticipated from examination of the subsurface information and site, and that such conditions will necessitate a change in the Work, the Architect will recommend any required changes and adjustments in writing. Oral or written communications with field personnel shall not constitute acknowledgment of a differing subsurface condition.

1.7 QUALITY ASSURANCE AND CONTROL

A. The Contractor shall perform on-site observation and testing during various phases of the construction operations. The presence of the Owner's Representative or Architect does not constitute supervision or direction of the Contractor's work. Neither the presence of the Owner's Representative or Architect, nor any observations and testing performed by them, nor any notice or failure to give notice shall excuse the Contractor from conformance with these Specifications or from defects discovered in his work or from the Contractor's responsibility for site safety including both persons and property.

B. The Contractor shall conduct various laboratory and field testing and interpret the results to assess conformance with the requirements of the Contract Documents for the work of this Section and related sections. Except as indicated in the Contract Documents, the Contractor shall determine the types and frequency of testing as may be appropriate in coordination with the Owner's Representative. The Contractor will prepare a report indicating non-conformances as determined by the testing.

C. Subgrades and fill layers shall be tested (if applicable), observed as required, and accepted by the Owner's Representative before construction of any further work thereon.
   1. The Owner's Representative and Architect may perform observation and field testing at any point during the work. Cooperate with the Owner's Representative and Architect to obtain field samples and conduct field testing. Furnish incidental labor in connection with the required sampling and testing.
   2. The Contractor shall be responsible for notifying the Owner's Representative and Architect of upcoming earthwork activities by providing a weekly schedule of work activities at least two business days prior to the start of each week, and with 24 hours prior notice, daily changes to the schedule.
   3. If, based on the observation and/or testing by the Contractor, a subgrade or backfill non-conformance is found (e.g., backfill below specified density), the non-conformance shall be remediated by the Contractor. All costs related to testing or remediation/replacement of nonconforming work/materials shall be paid for by the Contractor at no additional cost to the Owner and with no schedule impact to the Project.
   4. No fill material shall be removed from the site or delivered to the site prior to written acceptance by the Architect. Off-site materials, which are not accepted, if brought to the site, shall be immediately removed by the Contractor at no cost to the Owner.
   5. All materials being imported to the site shall be newly-excavated materials, free from contamination, oil and hazardous materials.
   6. The Contractor shall conduct its Work in a manner so that vibrations of buildings, structures, ground surfaces, site features, and utilities outside of the limits of Work do not exceed the more restrictive of 0.5 inches per second at all times or requirements provided by the Owner.

1.8 SUBMITTALS

A. The Contractor shall submit the following for review.
   1. A narrative and drawings (plans and sections) and calculations, describing the following: schedule, sequence, details, and procedures for excavation, temporary support of excavation, dewatering, foundation installation and construction, subdrainage installation, backfilling, soil management, and other related activities.
   2. Prior to start of earthwork, the Contractor's qualified, independent professional shall conduct a pre-construction condition survey.
      a. The survey shall include the following, unless otherwise approved by the Architect:
         1) Utilities and site improvements to remain on and within 150 ft of the extents of the Site.
         2) Any other areas as may be affected by the Contractor's construction operations.
      b. Coordinate activities, issue notices, obtain clearances and provide whatever photographic, video, and secretarial assistance is necessary to accomplish the survey.
      c. Give notice in writing, to the owner of the property concerned, tenant of the property and any representative of local authorities required to be present at such survey. Advise in notice the dates on which surveys are to be made so that they may have representatives present during the examination. Provide copies of all notices.
      d. Observations shall be recorded, and sufficient and detailed photographic and appropriately narrated video made, during the survey of the existing conditions for interiors and exteriors of buildings, utilities, and other structures that might be affected. Cracks, damage, or other defects shall be located and recorded to the extent that it will be possible to determine the effect, if any, of the construction operations on the defect.
      e. The record of each property examined shall be signed by the representatives present.
      f. Prior to start of earthwork, the Contractor's record shall be submitted to the Architect for review.
      g. Upon completion of all excavation and backfilling work, the Contractor shall make a similar examination of any properties, structures, and conditions where complaints of damage have been received or damage claims have been filed. Give notice to all interested parties so that they may be present during the final examination. Records of the final examination shall be signed and distributed the same as the original pre-construction survey.
   3. Compaction equipment manufacturer literature and model numbers.
   4. Detailed shop drawings and calculations, to be reviewed by the Architect, of applicable earthwork procedures and sequences.
   5. Supplier quality control test results and two 50 lbs. bag/bucket samples for independent quality control testing from each borrow (off-site) source or supplier for each type of proposed material.
   6. Chemical test data and source site data on proposed borrow (imported) materials. Data shall include, at a minimum:

a. Documentation, as judged sufficient by the Architect, confirming that all borrow materials are free of contamination. A letter, including backup data and chemical test results, from a Qualified Environmental Professional will constitute suitable documentation that the material is free of contamination.
b. Location, address, owner's name and telephone number, and nature of the source site, including a street map with the limits of the borrow pit property and the exact location of where the borrow material will be obtained on the site clearly illustrated.
c. Present and past usage of the source site and materials and description of abutting properties and their uses.
d. Any previously existing report(s) associated with an assessment of the source site as relates to the presence of oil or hazardous materials.
e. If the site characterization data indicate materials could possibly be polluted or contaminated, or the submitted chemical test data is unacceptable in the judgment of the Architect, chemical testing will be required as directed by the Architect. The chemical testing shall be completed by the Contractor in coordination with the Environmental Consultant at no additional cost to the Owner. If site characterization of off-site borrow sources indicates that soils are acceptable for use in the judgment of the Architect, then chemical testing will not be required.

7. Flowable Fill and Concrete Mix Designs: Mix designs with admixture information, and applicable laboratory test data documenting the specified properties.
8. A representative sample and literature of geotextiles. Submit manufacturer's product literature including physical properties in compliance with applicable specifications and warranty information.
9. Manufacturer literature and technical data for pipes and pipe fittings and specialties.

B. Certification for Examination of Site and Records: Before proceeding with the work, submit certification in an acceptable form, stating that careful examination has been made of the site, adjacent structures, existing structures, records of utility lines, test boring or test pit records and reports, soil and rock samples, and the Contract Documents.

1.9 COORDINATION

A. Prior to start of earthwork operations, the Contractor shall arrange an on-site meeting with the Owner, Architect, Owner's Representative, and other concerned entities for the purpose of establishing the Contractor's schedule of operations and reviewing observation and testing procedures and requirements. Record discussions and agreements and furnish a copy to each participant.

1.10 LINES, GRADES, AND TOLERANCES

A. The Contractor shall be responsible for establishing lines, grades, and other survey control to complete the work. The Contractor shall be responsible for the maintenance and protection of the survey control reference points and location stakes. The Contractor shall employ a licensed Registered Land Surveyor or a Registered Civil Engineer, familiar with building construction, proposed facilities, including locations and elevations and limits of excavations and fills.

B. Construct subgrades to within ½ in. of the elevations indicated on Drawings.

C. Maintain the moisture content of the fill material during placement within plus or minus two percent of the material's optimum moisture content per ASTM D1557.

D. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

1.11 PERMITS, CODES, AND REGULATIONS

A. All labor, materials, equipment, and services necessary to make the work comply with such requirements shall be provided by the Contractor without additional cost to the Owner. Earthwork shall comply with requirements of governing agencies in the District of Columbia, where applicable.

B. In case of conflict between regulations or between regulations and Specifications, the Contractor shall comply with the strictest applicable codes, regulations, or Specifications.

C. Comply with the provisions of the Manual for Accident Prevention in Construction of the Associated General Contractors of America, Inc., and the requirements of the Occupational Safety and Health Administration (OSHA), United States Department of Labor.

D. The Contractor shall procure and pay for all permits and licenses required for the complete work specified herein and shown on the Drawings.

1.12 EXISTING UTILITIES

A. Notify 811 before site clearing or excavating. Hire private utility mark-out service for areas not marked by utility companies.

B. Numerous subsurface utilities are present in the area of the work. The Contractor shall investigate, understand, and protect all utilities to remain as part of its work for this project.

C. Existing utilities remaining in service, including those remaining in service until after relocation, and relocated utilities are shown on the Drawings. Before excavating near any existing utilities, notify the utility owner, coordinate protective work and comply with the utility owners' requirements. Safeguard and protect from damage or movement any existing services, utilities and utility structures uncovered or encountered which are to remain in service.

D. Prior to beginning any excavation or fill placement, accurately locate, and mark underground utilities and appurtenances in site area. Excavate to and expose utilities at locations, and conduct field surveys as necessary to determine locations of existing utilities.

E. Should uncharted, or incorrectly charted, piping, or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and public and private utility companies in keeping respective facilities and services in operation. Repair damaged utilities to the satisfaction of utility company as directed by the Owner.

F. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, during occupied hours, except when permitted in writing by Owner and then only after

arranging to provide acceptable temporary utility services. Provide minimum of 48-hour notice to Owner and receive written notice to proceed before interrupting any utility. Do not proceed with utility interruptions without Owner's and utility owner's written permission.

G. In case of damage or injury caused in the performance of work the Contractor shall, at his own expense make good such damage or injury to the satisfaction of, and without cost to, the Owner and utility owner. Existing utilities damaged during the project work shall be repaired or replaced to their condition prior to commencement of earthwork operations as directed by the Owner.

H. Inactive or abandoned utilities encountered during construction operations shall be removed, plugged, sealed, bulkheaded or capped as directed by the Owner's Representative to prevent migration of earth, water or other fluids into such utilities. The location of such utilities shall be noted on the Record Drawings and reported in writing to the Owner's Representative.

I. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

J. When in the course of the work it is necessary to connect a utility to a main in a public way, all the requirements of both the authorities governing the utility and those governing the public way shall be met. Pavement shall be temporarily and permanently replaced as directed by these authorities at no additional cost to the Owner.

PART 2 - MATERIALS

2.1 MATERIALS

A. Earth materials for use as fills shall be as described below. All soil materials proposed for borrow shall be clean, mineral soil materials from accepted sources, free of any contamination as described in Part 1 - Submittals.

B. Processed materials consisting of a mixture of two or more soil types (such as sand and either crushed stone, crushed concrete, or other crushed construction materials) are not acceptable for use as fill unless accepted by the Architect.

C. Reuse on-site soils to the extent possible. On-site soils will be allowed as Common Fill and Structural Fill, if such materials meet the requirements of this Section and can be placed and compacted as specified herein, subject to acceptance by the Architect.

D. Common Fill: Common Fill shall consist of mineral sandy soil, free of organic materials, environmental contaminants, plastic, metal, wood, loam, trash, wood, snow, ice, frozen soil, clay and other compressible or deleterious materials. Common Fill used within 4 ft of finished grade in landscaped planting areas (as shown on the Drawings) shall be free of materials deleterious to plant growth and shall be "free-draining" (see percent finer by weight below). Common Fill shall have physical properties such that it may be readily spread and compacted without excessive weaving or instability. Common Fill shall conform to the following gradation:

Sieve (ASTM D422)	Percent Finer by Weight
8-in. *	100
No. 4	20-90
No. 40	10-80
No. 200	0-30 **, ***

* when used in trenches within 2 ft of utilities, or within 2 ft of foundation walls the largest particle dimension shall be 3 inches. The size of the largest particle shall be less than 2/3 of the lift thickness. When used within 4 ft of finished grade in landscaped planting areas (as shown on the Drawings) the largest particle dimension shall be 1-¾ in.

** when used as foundation wall backfill against drainage board, the percent finer by weight shall be less than 20.

*** when used in landscaped areas, the upper 2 ft immediately below the planting soil layer shall have a percent finer by weight of less than 8 unless otherwise approved by the Architect.

E. Crushed Stone: Crushed Stone shall consist of inert, angular stone material derived from a stone quarry that is hard, durable, washed, and free of deleterious materials. Crushed stone shall be washed at the source site to remove fine-grained soils prior to import to the site. Gradation shall conform to AASHTO No. 57 Stone as indicated on the Drawings.

F. Structural Fill: Structural Fill shall consist of suitable natural sand and gravel, free of organic material, environmental contaminants, debris, snow, ice, or other unsuitable materials. The fines in Structural Fill materials should have a liquid limit no greater than 40 percent and a plasticity index no greater than 10. Structural Fill should be well graded and shall confirm to the following limits:

Sieve (ASTM D422)	Percent Finer by Weight
6 in. *	100
No. 4	30 - 80
No. 40	10 - 50
No. 200	0 – 8 **

* when used in trenches within 2 ft of utilities or within 6 in. of foundation walls or slabs, the largest particle dimension shall be 3 inches. The size of the largest particle shall be less than 2/3 of the lift thickness.

** when placed in the upper 3 ft of filled areas during periods of wet and/or freezing weather, the percent finer by weight shall be less than 5 percent.

G. Bedding Material: Sand or sandy soil free of debris, waste, frozen materials, and organic materials with 100 percent passing a 3/8 in. sieve and not more than 10 percent passing a No. 200 sieve.

H. Sand Borrow: Sand Borrow shall consist of clean, inert, hard, durable grains of quartz or other hard, durable rock, free from loam or clay, surface coatings and deleterious materials. The maximum size for Sand Borrow shall be ¼-in. The allowable amount of material passing a No. 200 sieve shall not exceed 10 percent by weight.

I. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand, or accepted on-site material proposed for reuse.

J. Low Permeability Fill: shall consist of Common Fill with a minimum 20 percent passing a No. 200 sieve.

K. Concrete: shall have a minimum 28-day compressive strength of f'c = 2,500 psi, unless otherwise noted, with a maximum slump of 6 in.

L. Flowable Fill: A mixture of Portland cement, aggregate, and water, and may include fly ash, slag cement, air-entraining agents, and other accepted admixtures, Excavatable flowable fill shall have a 28-day compressive strength of between 30 and 150 psi. Non-excavatable flowable fill shall have a minimum 28-day compressive strength of 200 psi.

M. Geotextile Filter: Needle-punched, non-woven, synthetic, chemically resistant, non-biodegradable fabric meeting requirements of AASHTO M288 Class II Non-Woven such as Solmax (formerly TenCate) Mirafi 160N, Carthage Mills FX-50HS, ADS Geosynthetics 0601T, Propex Geosolutions Geotex 601, US Fabrics 160NW, or accepted equivalent. Fabric shall be labeled showing manufacturer name, product number and roll identification. Fabric shall be wrapped with a protective plastic from delivery until time of installation that protects against: damage by impregnation, cement, construction fluids and moisture, and ultraviolet radiation including sunlight for more than 7 total days. Fabric shall be protected against tearing, flame and chemical exposure and temperatures exceeding 160 deg F or less than -22 deg F at all times.

N. Perforated Drainage Pipe: 6-in. diameter, perforated, solid wall, Schedule 40 PVC pipe complete with bends, wyes, tees, reducers, caps, plugs, couplers, adapters, collars and joint materials. Fittings shall be DWV type with sanitary turns. Perforations shall be two rows of 5/8-in. diameter holes every 5 inches of pipe length. Rows shall be parallel to the pipe axis and 120 degrees apart at the 2 o'clock and 10 o'clock positions. Pipe shall be delivered to the site with factory-made perforations that are clean-cut and free of frayed edges.

O. Solid Drainage Pipe: Equal to Perforated Drainage Pipe except solid wall.

P. Clean-outs: Z1400 by Zurn Engineered Water Solutions, 4100 by Jay R. Smith Mfg. Co., 55000 by Josam Co., or equivalents, complete with solid riser pipes, waterstop flange, covers, bends, couplers, adapters, collars, hardware, joint materials, and concrete pad (exterior locations) or approved equal. Cleanouts shall be the same size as the pipe they serve.

Q. Choke Material: shall consist of Concrete, Flowable Fill, Crushed Stone, and/or Filter Fabric, as proposed by the Contractor and accepted by the Architect.

R. Balance of materials shall be used as indicated on the Drawings and/or as specified elsewhere in the Contract Documents.

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 in. wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 in. deep; colored as follows:
   1. Red: Electric.
   2. Yellow: Gas, oil, steam, and dangerous materials.
   3. Orange: Telephone and other communications.
   4. Blue: Water systems.
   5. Green: Sewer systems.

2.3 USE OF MATERIALS

A. Common Fill: Use to backfill outside the ZOI of foundations including beneath pavement sections and beneath select landscaping layers in landscaped areas.

B. Structural Fill: Use to replace unsuitable materials within the ZOI of structural elements and below utilities; as base course for site pavements and utility trench backfill unless otherwise specified; where free-draining backfill is required; and as shown on the Drawings.

C. Sand, Low Permeability Fill, Concrete, Flowable Fill: As shown on the Drawings, as proposed by the Contractor and accepted by the Architect, or as directed by the Architect.

D. Bedding Material: Use for utility bedding unless otherwise shown on the Drawings.

E. Crushed Stone: Use for drainage and subgrade layers as shown on the Drawings. Crushed Stone shall be entirely surrounded (i.e., top, bottom, sides) by a separation layer (e.g., Geotextile Filter) or concrete unless otherwise accepted in writing by the Architect.

F. Geotextile Filters: Geotextile shall be used: 1) at the locations shown on the Drawings, 2) other locations to prevent soil intrusion into drainage fill or drains, 3) assist in stabilizing subgrades prior to placement of fill materials or structures, and 4) to separate fine-grained materials from coarser-grained materials where the Architect judges that migration of fine material into coarse material could occur (e.g., between Crushed Stone and soil subgrades). Other instances may also require the use of geotextile filter, as judged necessary by the Architect.

G. Drainage Pipe and Cleanouts: Install at the locations and elevations shown on the Drawings. Solid pipe shall be used for lateral connections between the perforated foundation drainage piping and the discharge point.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the site and all Work prepared by others and report to the Architect in writing any conditions detrimental to the proper and timely completion of the Work of this Section. Do not

proceed with the Work until unsatisfactory conditions have been corrected in an acceptable manner.

3.2 GENERAL REQUIREMENTS

A. Earthwork activities shall conform with the Contract Documents and submittals that are acceptable to the Architect. No Work shall be performed unless it is conducted under the observation of the Architect, and in accordance with the accepted schedule and sequence.

B. Excavated materials unsuitable for reuse, and surplus excavated soil not used to fulfill requirements of the Contract, shall become the property of the Contractor, legally removed from the site and legally disposed of by the Contractor and in accordance with other Specifications, Drawings, and regulations and requirements of municipalities or agencies having jurisdiction over the disposal, disposal sites and the route between the project site and disposal sites.

C. Control vibrations and noise associated with the work so as to prevent damage to site improvements and disturbance to occupants. The Contractor shall conduct all Work associated with this Section to maintain vibrations below the Limiting Values which may require the use of light weight compaction equipment (and corresponding smaller lift thicknesses to achieve minimum degree of compaction).

D. Prevent erosion at the site at all times in accordance with the Specifications and/or shown on the Drawings.

E. Explosives or blasting agents shall not be permitted on the site without prior written approval of the Owner, Architect, Owner's Representative and local authorities.

F. If unanticipated contaminated material is suspected or encountered during an excavation, the Contractor shall contact the Owner's Representative and Architect immediately. The Owner's Representative or Architect will provide direction on how to proceed.

G. Do not excavate or remove any material from within the site or right of way, which is not within the excavation, as indicated, without written authorization from the Owner's Representative.

H. Some existing on-site soils may be suitable for reuse. The Contractor shall reuse on-site excavated soils as indicated herein, as accepted by the Architect. The Contractor shall conduct all on-site reuse activities, including excavating, conveying, processing, fragmenting, screening, handling, segregating, and stockpiling, at no additional cost to the Owner.

I. Stripping, Handling, Segregating, and Stockpiling of Materials:
   1. Strip topsoil from within the limits of Work, unless otherwise specified, and stockpile.
   2. During the course of the work, various quantities of materials will be accumulated and stockpiled (on- or off-site) for future re-use on-site or for off-site disposition. All excavated soils shall be classified by the Architect prior to reuse or removal from the site. The Contractor shall handle, segregate (to prevent intermixing of different materials), protect, stockpile, reuse and/or dispose of the excavated soils, as required.
   3. Stockpiling shall be coordinated by the Contractor and shall comply with sedimentation and erosion control requirements contained in the Specifications and/or shown on the

Drawings. Do not stockpile materials near edges of excavations or within any restricted areas shown on the Drawings.

J. Unfavorable Weather:
   1. Freezing Weather:
      a. Fill materials and/or concrete shall not be placed on snow, ice, frozen subgrades, or frozen soil. Do not place fill containing frozen materials, snow, or ice.
      b. The Contractor shall, at his own expense, keep the site clear and free of accumulations of snow and ice, or as required to carry out the Work.
      c. Fill materials and/or concrete shall not be frozen when placed or be allowed to freeze prior to, or after compaction or placement. At the end of each day's Work during freezing weather, the last lift of fill, after compaction, shall be rolled by a smooth wheeled roller to eliminate ridges of un-compacted soil. Fill materials, subgrades to receive fill or structures, and concrete shall be covered with an insulating cover or heated during freezing weather, as required to prevent frost and freezing of fill and concrete. The Contractor shall suspend backfilling operations and placement of Concrete or Flowable Fill when air temperatures are below 32ºF if directed by the Owner's Representative.
      d. Soil bearing surfaces below foundations, slabs or structures shall be protected against freezing, before and after concreting. Frost protection shall be provided in a manner acceptable to the Architect as soon as possible after foundations, slabs or structures are constructed.
      e. Do not excavate to full indicated depth when freezing temperatures may be expected, unless the footing or slab is poured immediately after the excavation has been completed. Protect the excavation from frost if placing of concrete is delayed. Where footings or slabs are exposed to freezing temperatures, they shall be protected to prevent damage to the concrete by freezing or frost penetration into the soil upon which they rest. Where foundations are exposed over the winter during construction, provide earth cover above the bottom surface of concrete equivalent to the Code required frost protection depth.
      f. Subgrades that have been permitted to freeze by the Contractor will be judged to be unsuitable for placement of fill, foundations, or structures by the Architect. The Contractor at the Contractor's expense shall conduct additional investigation to determine the extent of freezing, excavate soils that have frozen, and replace with materials acceptable to the Architect.
   2. Wet Weather:
      a. If fill material placement, spreading, rolling, or compaction operations are interrupted by wet weather, do not resume such operations until ascertaining that the moisture content and density of the previously placed soil are as required by these Specifications.
      b. The Contractor shall control the grading so that ground is pitched to prevent water from running into excavated areas, damaging other structures, or leaving the site.

K. Backfilling Prior to Approval of Work Installed:
   1. Do not allow or cause the Work performed or installed to be covered up or enclosed by Work of this Section prior to all required observations, tests, and approvals.
   2. Should any of the Work be so enclosed or covered up before it has been accepted, uncover all such Work at no additional cost to the Owner.

3. After the Work has been completely tested, observed, and accepted, make all repairs and replacements necessary to restore the Work to the condition in which it was found at the time of uncovering, all at no additional cost to the Owner.

L. Dust and Erosion Control:
1. The Contractor shall take all necessary measures and provide equipment and/or materials to minimize dust from rising and blowing across the site and also to control surface water throughout the operation so that it does not run onto paved ways without being filtered. In addition, the Contractor shall control all dust created by construction operations and movement of construction vehicles, both on-site and off-site.
2. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors, and performance of other Work on-site.
3. Repair any erosion and siltation control measures damaged during earthwork operations and install any additional measures necessary for proper control.

3.3 EXCAVATION

A. Dimensions:
1. Excavate to elevations and dimensions indicated on the Drawings or as otherwise required for the Work.
2. Do all necessary excavation, including, but not limited to excavation for structures, utility lines, mechanical work, mechanical and drainage structures, drains, and other below grade work. Excavate sufficient material to allow ample space for construction operations including placing and removal of forms, installation of waterproofing, damp-proofing, or utilities and observation of excavated areas.
3. Side forms will be required for all concrete work unless omission of forms is requested by the Contractor, in writing, to the Architect. Where omission of forms is requested by the Contractor, and accepted by the Architect, the Contractor shall bear the cost of any additional concrete volume required beyond the minimum profiles and dimensions of the utility trench as detailed.

B. Excavation shall include the removal of all materials encountered including earth, rock, organic soils, boulders, pavement, utilities, obstructions, foundations, slabs, incidental structures and other materials to the elevations and limits required to construct the work shown on the Drawings. Excavations for foundations shall be to naturally-deposited soil or bedrock acceptable to the Architect.

C. Excavation, subgrade preparation and backfilling shall be performed in-the-dry.

D. Where excavations are made to remove unsuitable materials beneath the planned building foundations, other structural elements, utilities, or other facilities, the horizontal limits of excavation shall be sufficient to place accepted materials beneath structures or facilities below. If such fill limits cannot be achieved, notify the Architect immediately.

E. Excavation shall not be made into the ZOI of structural elements unless otherwise accepted by the Architect. Where excavations are required to be made into the ZOI, the Contractor may be required to shore and brace to protect the materials within the ZOI from undermining, washing out, loosening, or becoming disturbed, and protect the structure from movement by

underpinning. Prior to excavating into the ZOI, the Contractor shall submit the proposed schedule, sequence, procedures, materials, and equipment to accomplish the work to the Architect for review. The Contractor is responsible to protect existing facilities to remain from damage.

F. The Contractor shall control the grading so that ground is pitched to prevent water from running into excavated areas, damaging other structures, or leaving the site.

G. Where soil has been softened, frozen or otherwise disturbed, it shall be removed and replaced with suitable material at no additional cost to the Owner.

H. Exercise care to preserve materials below and beyond the lines of excavation. Where excavation is carried out, through error, below indicated grade or beyond the lines of excavation, backfill to the indicated grade and compact with acceptable materials at no additional cost to the Owner.

I. Excavate within a radius of 1.5 times the drip line of any tree only if directed by the Architect and in coordination with the Owner's Representative.

J. Authorized Additional Excavation: Authorized Additional Excavation is excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Where the Architect determines that the material encountered at the elevations shown is not capable of supporting the design load, or where unsuitable material is encountered, the Owner's Representative will direct the Contractor to remove and replace the unsuitable material as required herein. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

K. Excavation: Excavate to elevations, cross sections, gradients, lines, subgrades, and dimensions indicated on the Drawings within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections. Extend excavations a sufficient depth to enable installation of base and subbase course(s), if applicable.
   1. General: Do not disturb bottom of excavation. Excavate by hand, or with flat-edge equipment if accepted by the Architect, at structures to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
   2. Rock: Excavate rock using mechanical methods (i.e., hoe-ramming and excavators).
   3. Trenches, unless indicated elesewhere: Excavate trenches to uniform widths to provide the following clearance on each side of pipe, or conduit or ductbank. Excavate trench walls vertically from trench bottom to 12 in. higher than top of pipe, conduit or ductbank.
      a. Trench excavation shall be of sufficient width, at least 12 in. each side of pipe or conduit unless other specified, and depth at all points to allow pipes to be laid, and appurtenant work to be built in a workman-like manner and, when needed, to allow for sheeting and shoring, pumping and draining, and/or for removing and replacing any unsuitable materials.
      b. Excavate trenches 8 in. deeper than bottom of pipe elevation to allow for bedding materials. Hand excavate for bell of pipe.
      c. Excavations for manholes, catch basins and miscellaneous site structures shall provide 18 in. minimum clearance on all sides.

3.4 SLOPING, SHEETING, SHORING, AND BRACING

A. The Contractor shall slope, sheet, shore and/or brace excavations in accordance OSHA 29 CFR 1926 dated October 31, 1989, and subsequent amendments and revisions, including designing, furnishing, placing, and removing (or leaving in-place if directed by the Architect). The Contractor shall be solely responsible for protection of existing or new facilities, the stability of excavations, and for maintaining site safety in accordance with OSHA and other applicable regulations. Excavation support systems shall be designed to retain and provide full support for adjacent soil, rock, structures, utilities, light fixtures, streets and other features and protect them from damage due to settlement, lateral movement, loss of ground, or any other causes related to this construction. In addition, the support system must be located to allow new construction to be completed. Excavation support systems shall be designed for all temporary and permanent loading conditions to which it will be subjected.

B. Temporary support of excavation systems shall not extend into the ZOI of structural elements unless proposed by the Contractor and accepted in writing by the Architect.

3.5 PRE-EXCAVATION

A. Coordinate pre-excavation activities including equipment and materials with the support of excavation wall Contractor(s). The support of excavation wall Contractor(s) shall be satisfied with the proposed work prior to commencing pre-excavation.

B. Pre-excavate along the alignment of the temporary support of excavation walls to remove any existing below-grade structures or obstructions so that subsequent wall construction can be undertaken without impedance.

C. Pre-excavation shall extend to naturally deposited soils or to the depth of known foundations, whichever is higher. Pre-excavation shall be a minimum of 3 ft wide (or to the top/side of existing structures).

D. Backfill the pre-excavation with a material suitable for re-excavation with nominal effort by the support of excavation wall Contractor(s) and/or to remain as the permanent backfill. The backfill material may consist of cement bentonite or excavatable flowable fill.

3.6 SUBGRADE PREPARATION AND PROTECTION

A. General:
   1. Complete the excavations to the required subgrade elevations allowing for subbase material, bedding material, plus any additional depth required to accommodate (as applicable) drainage layers, waterproofing, geotextiles, pipes, pavements, sidewalks, etc.
   2. All subgrades must be observed and accepted by the Architect prior subsequent work.
   3. The subgrade shall be made smooth, and cleaned of all loose rock and soil, and disturbed material. Remove accumulated water, silt, trash, debris, or deleterious material from temporary and final subgrades.
   4. Boulders exposed at the subgrade shall be removed to a depth of at least 12 in. below the required subgrade level.

5. Backfill all holes and depressions that will not otherwise be removed in the course of the Work with materials and methods acceptable to the Architect to the subgrade elevation indicated on the Drawings.
6. Where excavations are anticipated to extend below groundwater level, the subgrade shall be protected with a 6-in. thick (or thicker as required for dewatering performance) layer of compacted Crushed Stone placed over Filter Fabric.
7. Care shall be taken to avoid disturbance to natural inorganic soil or previously-placed fill subgrades in areas to receive fill or support future structures. Equipment shall not be operated on prepared soil subgrades.
8. Moisture condition (where necessary) and re-compact subgrade soils with at least four passes of suitable heavy vibratory compaction equipment until subgrade soils are firm under re-compaction, or stable under proof-rolling (less than ½ in. elastic deformation during proof-rolling) with heavy vibratory compaction equipment or a loaded 10-wheel dump truck, and otherwise suitable to the Architect. The Architect may, at its discretion, conduct field unit weight tests on the re-compacted subgrade soils prior to placement of backfill to confirm that the subgrade soils have been compacted in accordance with the requirements of this Section. The Architect may, at its discretion, waive the requirement for re-compacting subgrade soils.
9. In areas of weaving or soft or unstable soils, the soft materials shall be excavated and replaced with materials acceptable to the Architect, at no additional cost to the Owner.
10. Take measures necessary to prevent disturbance of prepared subgrades. Disturbed subgrades, as judged by the Architect, shall be removed and replaced with suitable materials and/or reshaped and recompacted as specified herein.
11. Subgrades may require choking to prevent loss of material into larger underlying void space. The need for choking of the subgrade shall be determined by the Architect at the time of preparation.
12. Excavate materials to 2 ft above the indicated subgrade level by general excavation methods. Excavate the final 2 ft with smooth-edge equipment. Backblading of surfaces to smooth disturbed soil will not be permitted.
13. Take measures necessary to prevent undermining of any structural elements, utilities, excavation support systems, and previously prepared subgrades.
14. Geotextile Filter shall be installed over soil subgrades and excavation sidewalls where shown on the Drawings, specified herein, or where the Architect judges migration of soil into subsequently placed material could occur. Geotextile Filter shall be installed in intimate contact with subgrades and sidewalls.
15. The excavation slope required to achieve foundation and slab step geometry shall be such that mechanical compaction of the subgrade may be performed.

B. Spread Footing Foundations:
1. Subgrades below foundations (footings) sized with a maximum net allowable bearing pressure of two and three-quarters kips per square foot (2.75 ksf) shall consist of undisturbed residuum soil or compacted Structural Fill.
2. Fill, soft/very loose residuum soil, and other materials which do not meet the characteristics for acceptable foundation subgrade material as determined by the Architect, if encountered at subgrade within the ZOI of foundations, shall be considered unsuitable, and over excavated and replaced with Structural Fill, Crushed Stone, or Concrete .

3. Subgrades shall be prepared as flat as practical and no steeper than 6H:1V unless otherwise approved by the Architect.
4. The subgrade shall be made smooth, and cleaned of all loose soil or rock and disturbed material. Disturbed subgrades shall be removed and replaced with Structural Fill, Crushed Stone, or Concrete.

C. Slabs-on-Grade:
1. Subgrades below slabs-on-grade shall consist of Structural Fill, Rock, Crushed Stone, or Concrete. Existing fill, organic deposits, debris and other unsuitable materials, if encountered at subgrade, shall be over excavated and backfilled with Structural Fill, Crushed Stone, or Concrete.
2. Slab base course shall consist of a 6-in. thick layer of compacted AASHTO NO. 57 Crushed Stone placed over Geotextile Filter. The subgrade shall be made smooth, and cleaned of all loose rock and soil, and disturbed material prior to placement of Geotextile Filter.

D. Structured Slabs and Pile Caps:
1. Subgrades below structured slabs and pile caps shall consist of Structural Fill, Common Fill, Crushed Stone, or existing soil. Organic deposits, debris, abandoned utilities, and other unsuitable materials, if encountered at subgrade, shall be over excavated and backfilled with Common Fill, Structural Fill, or Crushed Stone.
2. Base course shall consist of a 6-in. thick layer of compacted AASHTO No. 57 Crushed Stone placed over Geotextile Filter. The base course shall be contiguous throughout the building, including between pile caps and slabs across changes in subgrade level. The subgrade shall be made smooth, and cleaned of all loose rock and soil, and disturbed material prior to placement of Geotextile Filter. Subgrades shall be prepared as flat as practical and no steeper than 2H:1V where required to accommodate subgrade level transitions.

E. Utilities, unless otherwise indicated:
1. Excavate all rock, boulders, or other unyielding bearing material to at least 12 in. below bottom of proposed utility lines, or deeper if required to place bedding materials shown on the Drawings.
2. Subgrades below utilities shall consist of undisturbed, naturally deposited inorganic soils or rock, or re-compacted existing fill soils that are free of organic matter, stable under proof-compaction, and otherwise suitable to the Architect. Unsuitable soils, materials, or soft, disturbed, and unstable soils present at the subgrade level shall be over-excavated up to 18 in. below subgrade level and backfilled with Structural Fill, or other materials accepted by the Architect.
3. Excavations for manholes, catch basins and utility structures shall provide 18 in. minimum clearance on all sides.
4. Trench excavation shall be of sufficient width, at least 12 in. each side of pipe or conduit unless other specified, and depth at all points to allow pipes to be laid, and appurtenant work to be built in a workman-like manner and, when needed, to allow for sheeting and shoring, pumping and draining, and/or for removing and replacing any unsuitable materials.

3.7 INSTALLATION OF GEOTEXTILES

A. Install Geotextile Filters against the earth material indicated on the Drawings. Earth shall be unfrozen, smooth and free of debris, loose soil or rock, and irregularities including voids and projections.

B. Geotextile Filters shall be free of tension, wrinkles, folds, and in intimate contact with earth when placed. Unroll geotextiles during placement directly on the earth to receive the geotextile and in the direction of future fill placement. Unroll, cut, and place sufficient geotextile to allow for overlap widths and, where installed in trenches, the trench perimeter. Upstream/upslope geotextile shall overlap downstream/downslope geotextile. Anchor geotextiles using hand-placed Crushed Stone to prevent displacement until backfilling.

C. Overlap width shall be a minimum of 3 ft from roll to roll. Overlap width at the top of geotextile-lined trenches shall be equal to the width of the trench or 12 in., whichever is greater.

D. If sufficient backfill thickness for protection of the installed Geotextile Filter is not placed immediately after installation, place sacrificial layers Geotextile Filter or other protective material to prevent damage to installed Geotextile Filters. Sacrificial or protective material shall be removed by hand prior to final backfilling.

E. Replace geotextiles damaged prior to backfilling. Traffic directly on geotextiles shall be limited to foot traffic.

F. Backfill shall be placed immediately over the geotextile. Backfill shall be a minimum 12 in. thick prior to equipment traffic over the geotextile. Backfill in trenches shall be a minimum of 3 in. thick prior to foot traffic. Backfill shall not be dropped onto geotextiles from a height greater than 3 ft.

3.8 INSTALLATION OF FOUNDATION DRAINAGE

A. Install pipe systems to the horizontal and vertical lines and grades shown on the Drawings.

B. Drainage pipe systems and cleanouts shall be constructed to enable conventional cleaning equipment (e.g., jetting) to reach all points in the system from cleanout locations.

C. Components of the drainage systems that are damaged by the Contractor or contaminated with soil or other deleterious materials shall be replaced by the Contractor at no additional cost to the Owner and with no schedule impact to the Project.

D. Penetrations through concrete shall be accomplished by providing sleeve pipes cast into and through these elements or by drilling holes through the elements if approved by the Architect. The Contractor shall not jackhammer, chip or chisel holes to construct the sleeves. After centering the pipe in the hole, the annular space between sleeve pipes and product pipes shall be sealed with a non-degradable, elastic sealant material proposed by the Contractor and accepted by the Architect. Sleeves shall provide a 1-in. minimum annular space between the pipe and the sleeve all around. Rigid materials shall not be placed between the pipe and sleeve.

E. Place Crushed Stone in 6-in. maximum thick lifts and compact each lift with at least four passes of mechanical vibratory compaction equipment except within 12-in. around and above. Hand-tamp around and above pipes.

F. Interior of all piping shall be completely free of deleterious materials and other potential clogging contaminants before and after installation and shall be kept clean throughout construction. Pipe sections and fittings shall be cleaned and joined using adhesives, clamps, or other means in accordance with manufacturer recommendations.

G. Install cleanouts, terminations, outlets, connections, and other fixtures at the locations and configurations shown on the Drawings. Cleanouts must be accessible during and after construction.

H. Provide sleeves through concrete walls at the locations shown on the Drawings or as required. Penetrations through structural elements, and waterproofing, dampproofing, vapor barrier, and moisture barrier materials shall be sealed in accordance with manufacturer requirements and Related Sections.

I. Crushed Stone installed at the pipe haunch and shoulder during initial backfill shall be continuous with the Crushed Stone layer below slabs.

J. Provide continuous 12-in. minimum overlap between foundation wall drainage boards and Crushed Stone/Filter Fabric layers.

3.9 PLACEMENT AND COMPACTION OF FILL MATERIALS

A. Place and compact backfill in excavations promptly and as soon as possible, but not before completing the following:
   1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
   2. As-built surveying for Record Documents.
   3. Testing and inspecting underground utilities.
   4. Removing concrete formwork.
   5. Removing unsuitable materials including trash and debris.
   6. Removing temporary shoring and bracing, as applicable.
   7. Installing permanent or temporary horizontal bracing on horizontally supported walls, as applicable.
   8. Installing geotextile filters to prevent migration of fine material into voids spaces of material in contact with backfill.

B. Reuse of Excavated Soils and Materials
   1. The Contractor shall perform the work to maximize the reuse of excavated soils, subject to the requirements of this Section. Unless superseded by environmental or geotechnical reuse requirements, excavated soils should be reused in the same location and at the same depth that they were excavated.
   2. The Contractor shall coordinate, sequence, and schedule work as required to enable reuse of specified soils on-site.

3. Soils designated for on-site reuse shall be processed (i.e., screened to remove oversize cobbles or boulders and debris), moisture conditioned, and protected from the weather, as necessary, to maximize reuse. Soil that becomes unusable due to the Contractor's activities or lack thereof shall be disposed off-site in accordance with this Section at the sole cost of the Contractor. Such activities are considered those that the Contractor undertakes (or does not undertake) which result in excavated soils not being able to be reused at the time the soils are required for reuse (e.g., trafficking over prepared surfaces, failure to cover stockpiles, comingling, etc.).
4. Demolition materials and debris from foundations and utilities shall be separated from excavated soils.

C. Fill Placement
1. Place and compact fill to the limits, of the types and in the manner as specified herein and shown on the Drawings. Unless otherwise specified or directed, material used for filling and backfilling shall meet the requirements specified herein. If material removed from the excavations does not meet requirements specified herein, submission of proposed material(s) is required.
2. Slope and compact soil surfaces at the end of each day to provide for free surface drainage.
3. Placement of fill shall not begin prior to observation and acceptance of subgrade conditions by the Owner's Representative. The Contractor shall not place or compact fill material in the absence of the Owner's Representative.
4. Protect foundations, footings, waterproofing, utilities and other facilities during backfilling. Repair damage at no additional cost to the Owner.
5. Backfill shall not be placed against walls creating an unbalanced condition until they are braced or have cured sufficiently to develop strength necessary to withstand, without damage, pressure from backfilling and compacting operations. At walls not designed to resist lateral earth pressures, maintain the difference in elevation of the top of the backfill on either side of the wall within 2 ft.
6. If weaving or instability is observed during compaction, as judged by the Owner's Representative, compaction efforts shall be discontinued until the Contractor stabilizes the subgrade. If required, the Contractor shall excavate and replace the unstable fill material with acceptable compacted material, at no additional cost to the Owner.
7. Compaction shall be performed using accepted vibratory compaction equipment. Compaction by puddling or jetting is prohibited.
8. Control groundwater and surface run-off to minimize disturbance of material being placed. Dewater all subgrades prior to filling. Place all fill in-the-dry on stable, undisturbed subgrades.
9. Trench Backfill:
    a. Utility bedding material shall be deposited in the trench, uniformly on both sides of the pipe, for the entire width of the trench to the springline of the pipe. The backfill material shall be placed by hand shovels, in layers not more than 6 in. thick in loose depth, and each layer shall be thoroughly and evenly compacted by tamping on each side of the pipe to provide uniform support around the pipe, free from voids.
    b. Trench backfill material above the utility bedding material may consist of the excavated soils, provided the excavated soils meet the fill requirements for the

intended area (e.g., building slabs, parking areas, etc.), and can be readily spread and compacted.

c. Backfill shall be made to grades required to establish the proper pavement section, landscaping section, etc.

d. Any trenches or excavations improperly backfilled or where settlement occurs shall be reopened, to the depth required for proper compaction, then refilled and compacted with the surface restored to the required grade and condition, at no additional expense to the Owner.

e. During filling and backfilling operations, pipelines will be checked by the Contractor to determine whether any displacement of the pipe has occurred. If the inspection of the pipelines shows poor alignment, displaced pipe or any other defects, the condition shall be remedied in a manner satisfactory to the Architect at no additional cost to the Owner.

D. Compaction Equipment

1. Light-weight Compaction Equipment: Compaction equipment used within 25 ft (in any direction, from any point) of existing foundations shall consist of vibratory plate compactors weighing less than 200 pounds applying a dynamic centrifugal force of less than 3,500 pounds or other similar accepted, light-weight equipment that is sufficient to provide a firm, stable subgrade and achieve the required compaction. The Contractor shall increase the 25 ft distance as required to meet the maximum vibration criteria.
2. Regular-weight Compaction Equipment: Compaction equipment used in areas beyond the area noted above may consist of a walk-behind vibratory drum roller, or reversible plate compactor, or other equivalent equipment having less than 7,000 pounds centrifugal force that is sufficient to provide a firm, stable subgrade and achieve the required compaction.
3. The Contractor shall use acceptable compaction equipment to obtain the specified compaction. In some cases, additional passes or thinner loose lifts may be required. The gradation of some materials is such that field unit weight testing methods may not provide representative compaction results. In these cases, the Owner's Representative will use judgment in evaluating if the Contractor achieved the intent of the specification.
4. When acceptable compaction equipment cannot be used in tight access areas (e.g., around and below existing or new utilities), the Contractor shall place flowable fill or concrete, subject to the acceptance of the Architect, at no additional cost to the Owner.

E. Compaction Requirements

1. Compaction shall not cause vibrations that exceed the Limiting Values specified in the Related Sections.
2. The Contractor will conduct in-situ density testing following compaction of fill as a means of control. The Contractor in coordination with the Owner's Representative will determine the acceptable in-place density test method and frequency of testing.
3. The degree of compaction is expressed as the in-place dry unit weight as a percentage of the maximum dry density at optimum moisture content as determined by ASTM Test D1557. Fill and backfill shall be compacted to at least the following minimum compaction requirements:

Area	Minimum Compaction Percent
Within ZOI of structural elements and within buildings	95%
Within 3 ft below exterior slabs, sidewalks, pavements	95%

Deeper than 3 ft below exterior slabs, sidewalks, pavements	92%
Landscape areas	85% to 92%*

*as directed by the Architect

F. Moisture Control
1. The fill should generally be within 2 percent of its optimum moisture content to facilitate compaction.
2. Fill too wet for proper compaction shall be harrowed or otherwise treated to achieve compaction to the required density. Fill that cannot be dried shall be removed and replaced with drier material.
3. Fill too dry for proper compaction shall be watered uniformly over the surface of the top loose layer. Sufficient water shall be added to allow compaction to the required density.
4. Soils excavated from on-site may be too wet or too dry and may require moisture conditioning prior to reuse on-site in order to provide a firm, stable subgrade and achieve the specified compaction requirements. It shall be assumed for bidding purposes that soils within the existing building are too dry and will require wetting to achieve the requirements herein.

G. Lift Thickness
1. Place fill in uniform horizontal layers.
2. Place fill in layers not to exceed 6 in. in loose lift thickness prior to compaction when using Light-weight Compaction Equipment, and ~~12~~ 8 in. when using Regular-weight Compaction Equipment.
3. Compact material with a minimum of 4 complete coverages per lift.

H. Protection of Fill
1. Newly graded areas shall be protected from the actions of traffic and erosion. Damage to any lift caused by equipment shall be fully repaired by the Contractor prior to placement of overlying materials at no additional cost to the Owner.
2. The Contractor shall not disturb subgrade and underlying natural soils or compacted fill during filling operations. Methods of filling shall be revised as necessary to avoid disturbance of subgrade and underlying soils, including restricting the use of certain types of construction equipment and their movement over sensitive or unstable materials, dewatering, and other acceptable control measures. Disturbance shall be construed to include deterioration of fill, before or after placement and satisfactory compaction, due to the Contractor's operations, such as moving equipment, traffic, etc. Disturbed areas shall be fully repaired (e.g., excavate, replace, scarify surface, re-shape, compact, etc.) by the Contractor prior to placement of overlying materials at no additional cost to the Owner.
3. In the event of and prior to unfavorable weather, the Contractor shall suspend fill operations (placing, spreading and compaction) immediately and shall take steps to keep the site as well drained and insulated as possible. Fill operations shall not be resumed until the frost condition and moisture content of the fill meets the requirements of the Specifications.
4. Keep free of trash and debris.

I. Rough Grading
   1. Rough grading shall include cutting and filling, shaping, trimming, rolling, finishing, and maintaining of the surface of the subgrade, including temporary subgrades, in accordance with the various depths as shown on the Drawings and as specified herein. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
   2. Allow no stones over three inches (3 in.) in diameter within the upper 6 in. of subgrade material, unless more stringent criteria apply.
   3. Complete grading operations after site improvements have been installed and materials, rubbish and debris from such operations have been removed from the site. Leave subgrades clean and at required elevations. Provide sufficient grade staking to witness correct lines and grades.

J. Final Surface
   1. Upon completion of the work, ground surface shall be left and maintained in a firm, stable, unyielding, uniform condition, free of ruts and surface irregularities, in accordance with the grading requirements shown on the Drawings. All final surface grades and subgrades shall be prepared within ½ in. of the grades shown on the Drawings. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
   2. Uniformly smooth-grade all areas to be graded, as indicated and as directed, including excavated sections and all areas disturbed as a result of the Contractor's operations.
   3. Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn or other finish), add material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface and finish to match adjacent work and eliminate evidence of restoration to greatest extent possible.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Earthwork shall not be measured and shall include all excavation, demolition, handling, processing, conditioning, borrow, filling, backfilling, compacting, grading, off-site disposal, dewatering, and other work of this Section.

B. No separate measurement for payment will be made for acquisition of permits, materials, backfill, material processing, equipment, material disposal, construction dewatering, rock excavation, stockpiling, material rehandling, surveying, or other associated items or work considered incidental to the conduct of earthwork.

4.2 PAYMENT

A. Payment for Earthwork will be made at the contract lump sum price, which shall include full compensation for furnishing all material, labor, equipment, tools, and incidentals necessary for completing the Earthwork specified in this Section.

END OF SECTION 312300

SECTION 33 1415 – SITE WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Water Distribution Piping.
   2. Water Distribution Fittings.
   3. Water Distribution Sleeve Couplings.
   4. Water Distribution Concrete Thrust Block
   5. Water Distribution Valves

B. Related Requirements:
   1. Section 312000 – Earth Moving

1.2 REFERENCES

A. ASTM International (ASTM):
   1. ASTM A307 – Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.
   2. ASTM A536 – Specification for Ductile Iron Castings.
   3. ASTM A5563 – Specification for Carbon Alloy Steel Nuts.

B. American Water Works Association (AWWA):
   1. AWWA C104 – Cement-Mortar Lining for Ductile Iron-Pipe and Fittings.
   2. AWWA C110 – Ductile-Iron and Gray-Iron Fittings.
   3. AWWA C111 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
   4. AWWA C116 – Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings.
   5. AWWA C150 – Thickness Design of Ductile-Iron Pipe.
   6. AWWA C151 – Ductile-Iron Pipe, Centrifugally Cast.
   7. AWWA C153 – Ductile-Iron Compact Fittings.
   8. AWWA C210 – Liquid-Epoxy Coatings and Linings for Steel Water Pipe and Fittings.
   9. AWWA C213 – Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings.
   10. AWWA C219 – Bolted, Sleeve-Type Couplings for Plain-End Pipe.
   11. AWWA C600 – Installation of Ductile Iron Water Mains and Their Appurtenances.

C. DC Water:
   1. DC Water Standard Specifications.

1.3 SUBMITTALS

A. Product Data:
   1. Piping.
   2. Sleeves.
   3. Valves.

B. Information:
   1. Submit “Affidavits” for products stating that they comply with the requirements of this Section and the applicable AWWA standards.

2. Submit "Certifications" for each of the materials specified herein, which are used on the project, with the manufacturer's Certificate of Compliance stating that the materials meet or exceed the specified requirements.
3. Submit the "Product Data Sheets" for each product used.
4. Submit "Test" results for proof of hydraulic tests on sleeve type couplings.
5. Submit the manufacturer's "Installation Instructions and Details" for installing pipe, fittings, restrained joints, retaining glands, and sleeve type couplings.

C. Closeout:
1. Submit "Working Drawings" showing the layout and installation of the piping to be installed. Working drawings shall include but not be limited to pipe laying schedule, closure pieces, and fittings, extra mainline fittings, joint details, restraint and harnessing and special designs.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be in accordance with AWWA C600.

B. Coordinate delivery and distribution shall of pipe with installation and scheduled to provide minimum interference with traffic.

C. Distribute pipe along line of work and outside trench as near as practicable to point of placement, facing in proper direction and properly wedged secure.

D. Pipe shall not be rolled or dragged on the ground. No pipe shall be placed against trees or shrubs or in a manner that may damage private and other property.

E. Protect pipe, pipe ends, pipe coating and lining, fittings and appurtenances from damage at all-times.

F. Keep interior pipe surfaces clean at all times. Protect pipe ends by installing and maintaining, in good condition, approved plugs and caps.

G. No material shall be deposited on or against pipe.

1.5 QUALITY ASSURANCE

A. Prior to placing pipe and fittings in trench, the interior and exterior of pipe and fittings shall be inspected by Testing Agency. Pipe or fittings that are damaged shall be repaired or removed and replaced as directed by Testing Agency at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 NUTS AND BOLTS

A. Nuts shall comply with ASTM A563 unless noted otherwise in the Contract Documents.

B. Bolts shall comply with ASTM A307 unless noted otherwise in the Contract Documents.

2.2 DUCTILE-IRON PIPE

A. Pipe shall be ductile-iron meeting the requirements of AWWA C151 with mechanical joints.

B. Coat exterior of pipe with shop applied coating per AWWA C151 and cement lined with double thickness and seal coated in accordance with AWWA C104.

C. Pipe shall be furnished in lengths of 18 to 20 feet and shall include all joining materials.

D. Pipes shall be Thickness Class 56.

2.3 FITTINGS

A. Fittings shall be mechanical joints for ductile-iron pipe and fittings in accordance with AWWA C111.

B. Fittings 48 inches and smaller in diameter shall be mechanical joint bell, ductile-iron in accordance with AWWA C110.

C. Coatings for Fittings:
   1. Provide exterior asphaltic coating per AWWA C110 and interior cement-mortar lining per AWWA C104; or
   2. Provide interior and exterior fusion bonded epoxy coating, 6-8 mils in thickness, conforming to AWWA C116.

D. All fittings shall be complete with all joint accessories, rubber gaskets, bolts and nuts.

2.4 JOINT RESTRAINT

A. Unless otherwise noted, pressure ratings for pipe harnessing components shall not be less than the pipe working pressures of the installed pipe.

B. Retaining glands for restraint of mechanical joint fittings to ductile-iron pipe 24 inches in diameter and smaller shall be designed to fit standard mechanical joint bells conforming to AWWA C111. Glands shall be manufactured of ductile-iron conforming to ASTM A536 with a restraining mechanism of size and arrangement per manufacturer's recommendations, of the following type:
   1. Ductile-iron wedges in combination with extra mainline fittings, heat-treated set screws with or without twist-off nuts, torqued per manufacturer's recommendation or hardened steel set screws with knurled and cupped points, with or without twist-off nuts.
   2. Megalug Series 1100 by EBAA Iron Sales, Inc., Uni-Flange Series 1400 by Ford Meter Box Co., or approved equal.
   3. Retainer gland shall meet working pressure ratings for installed pipe.

2.5 SLEEVE TYPE COUPLINGS

A. Couplings shall be designed, manufactured and installed in accordance with AWWA C219 except as modified below:
   1. The Manufacturer shall provide an affidavit certifying compliance with the above standard.
   2. Couplings shall be designed for 150 psi operating pressure unless shown otherwise on the Contract Drawings. Provide manufacturer certification for proof of design tests per AWWA C219.
   3. The Contractor shall verify the outside diameters of the pipes to be connected, and shall select the correct diameter sleeve-type coupling to ensure a proper fit without utilizing pipe stops.

B. The entire sleeve assembly shall be lined and coated with one of the factory-applied coating systems as follows:
   1. Fusion bonded epoxy per AWWA C213 with eight (8)-12 mils minimum exterior coating thickness and eight (8)-12 mils minimum interior coating thickness.

2. Liquid epoxy per AWWA C210 with 16 mils minimum and 25 mils maximum coating thickness.
3. Other coating system as approved by the Engineer.

C. Bolts, nuts and harness tie rods shall be stainless steel as specified in AWWA C219.

D. The Contractor may use mechanical joint sleeve at no additional cost to DC Water.

2.6 FIELD APPLIED COATING AND LINING SYSTEMS

A. Field applied coating system for repairs of pipe coatings and linings shall be a two (2) component, quick setting, 100 percent polyurethane product – Corropipe by Valspar Industrial, or equal.

B. Lining system shall be NSF 61 compliant.

C. Touch-up coating that is oxidized by using shop coat paint and following the manufacturer's recommendations.

2.7 GATE VALVES

A. Adhere to the standards and specification in DC Water Specification 33 14 00 Gate Valves.

2.8 POST INDICATOR VAVLE

A. Refer to the Contract Drawings.

2.9 FIRE DEPARTMENT CONNECTION

A. Refer to the Contract Drawings.

PART 3 - EXECUTION

3.1 GENERAL

A. Pipe, fittings, and specials shall be new materials.

B. No more than 50 linear feet of pipe shall be laid in advance of backfilling.

C. Straight pipe shall be furnished in standard uniform lengths. Approved short pipe lengths shall be used where necessary to meet line and grade or as closure pieces.

3.2 MAINTAINING WATER SERVICE

A. Existing water service or by-pass piping shall remain in service until new water mains are complete, temporarily capped, tested, disinfected, and charged except when disconnecting or connecting new Work.

B. Where existing pipe is cut and connected to a new pipe, Work shall be scheduled as directed by Contracting Officer Technical Representative (COTR) to minimize service interruption.

C. The Contract shall submit a shutdown request to COTR at least five (5) days prior to cuttings or abandoning water piping.
   1. Prior to submitting the shutdown request all work necessary to prepare for the shutdown shall be complete, including but not limited to excavation, determining existing pipe measurements, having pipe laying sketches and work plan complete and approved, and all materials are procured and on site.
   2. Upon receiving the shutdown request COTR will verify the Contractor is ready to perform the connection and, if all preparatory work is complete, COTR will schedule the date of the outage and notify the Contractor of the approved outage date. Contractor shall make the connection on the date and time approved by COTR.

3.3 INSTALLATION

A. Interior pipe surfaces shall be kept clean throughout construction by use of carefully fitted stoppers.

B. Trench excavation and suitable bedding shall be complete to proper grade before pipe is placed. Any adjustment due to improper trench grade or settlement shall be accomplished at Contractor's expense.

C. Pipe shall be laid to the horizontal and vertical alignment as shown on the Project Drawings. Entire length of pipe and fittings shall be bedded solidly on trench bottom to required line and grade. Under no condition shall pipe be subjected to a blow or shock to bring it to required line and grade.

D. As part of work, bell holes shall be excavated to adequate size where necessary to accommodate proper joints.

E. When straight pipe requires cutting, the Contractor shall take field measurements for making, closing, and connecting pieces of correct dimensions. Cutting shall leave a smooth end. The cut shall be made by abrasive saw or by a special DIP pipe cutter. All pipe ends shall be square with the longitudinal axis of the pipe and shall be reamed and smoothed to assure a good connection.

3.4 MAKING CONNECTIONS

A. Unless otherwise indicated, the Contractor shall cut existing water mains and remove pipe, fittings, and appurtenances to connect new water mains, reconnect existing water mains, and perform all work necessary or incidental thereto.

B. Transferring water connections, completing connections, and abandoning pipe shall be performed continuously until complete. The Contractor shall provide necessary labor, equipment, and materials, including but not limited to overtime pay, lights, and generators, to complete the work on a 24 hour basis at no additional cost to Owner.

3.5 JOINTS AND FITTINGS

A. Joints shall be assembled per AWWA C600 and manufacturer’s recommendations.

B. Springing of joints is prohibited.

C. Unless otherwise specified, the diameter of ductile-iron plain ends shall be the same as for mechanical-joint cast or ductile-iron pipe.

D. The inside of the pipe socket and the outside of the plain end shall be thoroughly cleaned to remove oil, grit, excess coating and other foreign matter.

E. A retainer gland shall not be used on any pipe joint connecting ductile-iron pipe to existing cast-iron pipe.

F. Pipe installation of proprietary restrained joint pipe systems shall be in accordance with the manufacturer's printed recommendations.

G. Pipe Deflections:
   1. Under no circumstances shall pipe deflections, either horizontal or vertical, exceed the manufacturer's printed recommendations. Where deflections will exceed the manufacturer's recommendations, fittings shall be used.
   2. Keep the pipe straight while pushing the pipe home. The joint deflections shall only be completed after the pipe is homed.
   3. Changes in alignment or grade greater than the manufacturer's allowable deflection shall be made using fittings.

H. Installing Mechanical Joint Fittings:
   1. Install mechanical joint fittings in accordance with the fitting manufacturer's instructions and AWWA C600.
   2. Torque range for retainer gland set screws shall be in accordance with fitting manufacturer's recommendations or AWWA C600 if manufacturer does not make recommendations.
   3. T-bolts, harness tie rods, coupling bolts, flanged joint bolts, etc. shall be installed to provide at least one complete thread projecting beyond the nut when properly tightened.
   4. If effective seal is not obtained at maximum specified torque, the joint shall be disassembled, cleaned and reassembled at no additional cost to the Owner.
   5. Bolts that are overstressing shall be removed and replaced at no additional cost to the Owner.

I. After each ductile-iron pipe, fitting, and valve is jointed, each joint area including restraint elements shall be cleaned, inspected and approved before next section is installed.

J. Carbon steel bolts, clamps, and connecting parts including thread areas, etc., shall receive one prime coat and one finish coat of field-applied coating system applied in accordance with AWWA C210. Field coatings shall be complete prior to line tests.

3.6 SLEEVE TYPE COUPLINGS

A. General:
   1. Use sleeve-type couplings only when indicated on the Contract Drawings.

B. Pipe end condition:
   1. Pipe for use with sleeve type couplings shall have plain ends, cast or machined at right angles to pipe axis.
   2. Ductile-iron and cast-iron pipe shall be smooth and round for a distance of eight inches from end of the pipe up through 24 inch diameter, and for 12 inches from the end of the pipe for pipe larger than 24 inch diameter.
   3. Maximum actual O.D. of pipe end shall be such as to permit the passing of a ring gauge having an internal bore not greater than 0.01 inch larger than the nominal O.D. plus the maximum variation indicated in AWWA C110.

4. Steel pipe larger than 10-3/4 inches O.D. shall be free from indentations, projections or roll marks for a distance of eight inches from the end of the pipe and, within this distance, the actual O.D. shall be not more than 1/32 inch smaller than nominal O.D. Maximum actual O.D. shall be not more than 1/32 inch smaller than nominal O.D. Maximum actual O.D. of pipe end shall be such as to permit the passing of a ring gauge having an internal bore not greater than 3/32 inch larger than pipe nominal O.D.
5. For each type pipe, minimum actual O.D. shall be determined by use of a steel tape, calibrated to 100^{th} of an inch, applied circumferentially to pipe.

C. Assembly:
1. Couplings shall be assembled in accordance with the manufacturer's printed installation instructions and provide a leak free connection when the pipe is tested at required test pressure.
2. Laying deflection per coupling shall not exceed manufacturer's recommendations.
3. Harness all couplings using stainless steel tie rods.
4. The Contractor ma use mechanical joint sleeve at no additional cost to Owner.

3.7 BLOW-OFFS

A. Piping for air and drain blow-offs shall be included as part of the water utility piping installation.

B. Blow-off valves and casings shall be supplied as specified in DC Water Specification 33 06 23 Concrete Valve Casings and DC Water Specification 33 14 00 Gate Valves.

3.8 THURST RESTRAINT

A. Pipe shall be restrained at all joints, fitting, valves, appurtenances, and specials using the joint restraining systems specified in this Section.

B. Concrete thrust restraints shall be used when shown on the Contract Drawings, as required by DC Water Specification 33 11 20 Concrete Thrust Restraints or when approved by Engineer and shall be in accordance with DC Water Specification 33 11 20.

C. Mechanical joint and retainer glands shall be used to restrain fittings. Restraint of mechanical joint ductile-iron pipe shall be accomplished by using approved ductile-iron retainer glands in lieu of follower glands, installed in accordance with manufacturer's printed instructions.

D. After each restrained joint is complete, the joint restraint elements shall be cleaned and inspected.

3.9 DISINFECTING WATER PIPING

A. Piping for water systems shall be disinfected in accordance with DC Water Specification 33 13 01 Disinfecting Water Mains.

3.10 PRESSURE AND LEAKAGE TESTING

A. Pressure pipe shall be tested in accordance with DC Water Specification 33 19 05 Pressure and Leakage Testing – Pressure Pipe.

3.11 EXTRA MAINLINE FITTINGS

A. Contractor shall identify to Engineer extra mainline fittings necessary for closure sections or unanticipated interferences. If Engineer agrees that extra mainline fittings are necessary, the Contractor shall:
   1. Verify the size of existing pipe in service and provide fittings in accordance with this section to complete a closure or navigate around an unanticipated interference.
   2. Contractor shall provide working drawings showing the proposed modifications to the design and the limits of pipe and fittings that will be needed for closure or navigating around the unanticipated interference.
   3. Upon review and approval of the proposed modifications by Engineer, the Contractor shall install the modifications as shown on the working drawings.

END OF SECTION

SECTION 33 4200 – STORMWATER CONVEYANCE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Storm Conveyance Piping.
2. Storm Conveyance Fittings.
3. Storm Conveyance Manholes.
4. Storm Conveyance Overflow Structures.
5. Storm Conveyance Trench Drains.
6. Storm Conveyance Drain Basins.

B. Related Requirements:
1. Section 312000 – Earth Moving

1.2 REFERENCES

A. ASTM International (ASTM):
1. ASTM A48 – Standard Specification for Gray Iron Castings
2. ASTM A536 – Standard Specification for Ductile Iron Castings
3. ASTM A615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
4. ASTM B26 – Standard Specification for Aluminum-Alloy Sand Castings
5. ASTM C1103 – Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
6. ASTM C139 – Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes
7. ASTM C231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
8. ASTM C270 – Standard Specification for Mortar for Unit Masonry
9. ASTM C32 – Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)
10. ASTM C443 – Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
11. ASTM C478 – Standard Specification for Precast Reinforced Concrete Manhole Sections
12. ASTM C507 – Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
13. ASTM C55 – Standard Specification for Concrete Building Brick
14. ASTM C923 – Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
15. ASTM C990 – Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants
16. ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
17. ASTM D1752 – Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion
18. ASTM D1784 – Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
19. ASTM D1785 – Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
20. ASTM D2167 – Density and Unit Weight of Soil in Place by the Rubber Ballon Method

21. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
22. ASTM D3212 – Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
23. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
24. ASTM F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

B. DC Water:
1. DC Water Standard Specifications.

1.3 SUBMITTALS

A. Product Data:
1. Storm drainage piping and fittings.
2. Manholes.
3. Overflow Structures.
4. Drain Basins.
5. Stormwater Trench Drains

B. Shop Drawings:
1. Manholes, Overflow Structures, and Drain Basins:
   a. Indicate RIM and Bottom Elevations
   b. Indicate the size of all incoming pipes and the outgoing pipe.
   c. Indicate the invert elevations for all incoming pipes and the outgoing pipe.
   d. Indicate the location of any throat openings, if required in the Drawings.
2. Stormwater Trench Drain:
   a. Indicate critical dimensions, installation and anchoring requirements, and other details.
   b. Signed and sealed by the qualified professional engineer responsible for their preparation.

C. Information:
1. Source Quality-Control Reports: For Stormwater Trench Drains.
2. Field Quality-Control Reports: For storm drainage pipe, manholes, overflow structures, drain basins, and Stormwater Trench Drains.
3. Qualifications Statement: For manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer’s original packaging and inspect for damage.

B. Store materials according to manufacturer instructions.

C. Protection:
1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

1.6 WARRANTY

A. Furnish five year manufacturer's warranty for stormwater trench drains.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Perform Work according to:
   1. DC Water Standards and Specifications

2.2 STORM DRAINAGE PIPING

A. Reinforced Concrete Piping:
   1. Pipe:
      a. Comply with ASTM C76, Class IV, Wall Type B.
      b. Reinforcement: Bars complying with ASTM A615, Grade 60
      c. Inside Nominal Diameter: According to the Drawings
      d. End Connections: Bell and spigot
   2. Fittings: Concrete.
   3. Joints:
      a. Comply with ASTM C443.
      b. Gaskets: Rubber, compression.

B. PVC Piping:
   1. Pipe:
      a. Comply with ASTM D1785, Schedule 80.
      b. Inside Nominal Diameter: According to the Drawings
      c. Style: Bell and spigot with rubber-ring seal gasket joint.
   2. Fittings: PVC.
   3. Joints:
      a. Comply with ASTM F477.
      b. Gaskets: Elastomeric.

2.3 MANHOLES

A. In accordance with the latest editions of DC Water Standards and Specifications, unless otherwise noted on the plans. Conform to ASTM C478. Joints between precast concrete risers and tops shall be full-bedded in cement mortar and shall be smoothed to a uniform surface on both interior and exterior of the structure or made with flexible watertight, rubber-type gaskets meeting the requirements of paragraph JOINTS.

2.4 OVERFLOW STRUCTURES

A. All overflow structures' materials and methods of installation shall be in conformance with the latest edition of DC Water Standards and Specifications unless otherwise noted on the plans.

2.5 MANHOLE AND OVERFLOW STRUCTURE FRAMES AND COVERS

A. In accordance with the latest editions of DC Water Standards and Specifications, unless otherwise noted on the plans. Submit certification on the ability of frame and cover or gratings to carry the imposed live load. Frame and cover for gratings shall be cast gray iron, ASTM A48, Class 35B; cast ductile iron, ASTM A536, Grade 65-45-12; or cast aluminum, ASTM B26, Alloy 356.O-T6.

Weight, shape, size, and waterway openings for grates and curb inlets shall be as indicated on the plans. The word "Storm Sewer" shall be stamped or cast into covers so that it is plainly visible.

2.6 MISCELLANEOUS MATERIALS

A. Concrete:
   1. Unless otherwise specified, concrete and reinforced concrete shall conform to the requirements for 3,500 psi concrete under Section 03 30 00 CAST IN PLACE CONCRETE. The concrete mixture shall have air content by volume of concrete, based on measurements made immediately after discharge from the mixer, of 5 to 7 percent when maximum size of coarse aggregate exceeds 1-1/2 inches. Air content shall be determined in accordance with ASTM C231/C231M. The concrete covering over steel reinforcing shall not be less than 1 inch thick for covers and not less than 1-1/2 inches thick for walls and flooring. Concrete covering deposited directly against the ground shall have a thickness of at least 3 inches between steel and ground. Expansion-joint filler material shall conform to ASTM D1751, or ASTM D1752, or shall be resin-impregnated fiberboard conforming to the physical requirements of ASTM D1752.

B. Mortar:
   1. Mortar for pipe joints, connections to other drainage structures, and brick or block construction shall conform to ASTM C270, Type M, except that the maximum placement time shall be 1 hour. The quantity of water in the mixture shall be sufficient to produce a stiff workable mortar but in no case shall exceed 6 gallons of water per sack of cement. Water shall be clean and free of harmful acids, alkalis, and organic impurities. The mortar shall be used within 30 minutes after the ingredients are mixed with water. The inside of the joint shall be wiped clean and finished smooth. The mortar head on the outside shall be protected from air and sun with a proper covering until satisfactorily cured.

C. Precast Concrete Segmental Blocks:
   1. Precast concrete segmental block shall conform to ASTM C139, not more than 8 inches thick, not less than 8 inches long, and of such shape that joints can be sealed effectively and bonded with cement mortar.

D. Brick:
   1. Brick shall conform to ASTM C62, Grade SW; ASTM C55, Grade S-I or S-II; or ASTM C32, Grade MS. Mortar for jointing and plastering shall consist of one part portland cement and two parts fine sand. Lime may be added to the mortar in a quantity not more than 25 percent of the volume of cement. The joints shall be filled completely and shall be smooth and free from surplus mortar on the inside of the structure. Brick structures shall be plastered with 1/2 inch of mortar over the entire outside surface of the walls. For square or rectangular structures, brick shall be laid in stretcher courses with a header course every sixth course. For round structures, brick shall be laid radially with every sixth course a stretcher course.

2.7 JOINTS

A. Flexible Watertight Joints:
   1. Flexible watertight joints shall be made with plastic or rubber-type gaskets for concrete pipe. The design of joints and the physical requirements for preformed flexible joint sealants shall conform to ASTM C990, and rubber-type gaskets shall conform to ASTM C443. Factory-fabricated resilient joint materials shall conform to ASTM C425. Gaskets shall have not more than one factory-fabricated splice, except that two factory-fabricated splices of the rubber-type gasket are permitted if the nominal diameter of the pipe being gasketed exceeds 54 inches.
   2. Rubber gaskets shall comply with the oil resistant gasket requirements of ASTM C443. Certified copies of test results shall be delivered to the Contracting Officer Technical Representative (COTR) before gaskets or jointing materials are installed. Alternate types of watertight joint may be furnished, if specifically approved.

B. External Sealing Bands:
   1. Requirements for external sealing bands shall conform to ASTM C877.

C. Flexible Watertight, Gasketed Joints:
   1. Gaskets: When infiltration or exfiltration is a concern for pipe lines, the couplings may be required to have gaskets. The closed-cell expanded rubber gaskets shall be a continuous band approximately 7 inches wide and approximately 3/8 inch thick, meeting the requirements of ASTM D1056, Type 2 A1, and shall have a quality retention rating of not less than 70 percent when tested for weather resistance by ozone chamber exposure, Method B of ASTM D1171. Rubber O-ring gaskets shall be 13/16 inch in diameter for pipe diameters of 36 inches or smaller and 7/8 inch in diameter for larger pipe having 1/2 inch deep end corrugation. Rubber O-ring gaskets shall be 1-3/8 inches in diameter for pipe having 1 inch deep end corrugations. O-rings shall meet the requirements of ASTM C990 or ASTM C443. Preformed flexible joint sealants shall conform to ASTM C990, Type B.
   2. Connecting Bands: Connecting bands shall be of the type, size and sheet thickness of band, and the size of angles, bolts, rods and lugs as indicated or where not indicated as specified in the applicable standards or specifications for the pipe. Exterior rivet heads in the longitudinal seam under the connecting band shall be countersunk or the rivets shall be omitted and the seam welded. Watertight joints shall be tested and shall meet the test requirements of paragraph HYDROSTATIC TEST ON WATERTIGHT JOINTS.

2.8 STRUCTURE STEPS

A. Storm structures with a depth of 4 feet and greater must be provided with manhole steps. Unless stated otherwise on plans, steps must be a minimum of 10 inches wide with a maximum step spacing of 16 inches on center. Step must be embedded a minimum of 3 inches into concrete structure wall and extend a minimum of 4 ½ inches from the face of structure wall. Step shall withstand a minimum force of 300 pounds. The preferred structure step is constructed of #4, grade 60 reinforcing bar encased with polypropylene.

2.9 RESILIENT CONNECTORS

A. Flexible, watertight connectors used for connecting pipe to manholes and inlets shall conform to ASTM C923.

2.10 TRENCH DRAINS

A. Performance and Design Criteria:
   1. Loading:H-20, according AASHTO HB-17.

B. Channel Drains:
   1. Material, built-in slope, bottom radius, channel section length, end connections, and bottom outlet according to manufacturer requirements.
   2. Width: According to the Drawings.

C. Channel Grates:
   1. Material, openings, style, and color according to Landscape Drawings and/or Exhibit Drawings.
   2. Shall be high heel proof.

D. Accessories:
   1. Grate lock.
   2. End cap and screws.
   3. End outlet.
   4. Bottom outlet adapter.

2.11 DRAIN BASINS

A. Basin
   1. Shall be manufactured from PVC pipe stock, utilizing a thermoforming process to reform the pipe stock to the specified configuration.
   2. The drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with specified pipe system.
   3. Joint tightness shall conform to ASTM D3212 for joints for drain and sewer plastic using flexible elastomeric seals. The flexible elastomeric seals shall conform to ASTM F477.
   4. The pipe bell spigot shall be jointed to the main body of the drain basin or catch basin. The raw material used to manufacture the pipe stock that is used to manufacture the main body and pipe stubs of the surface drainage inlets shall conform to ASTM D1784 cell class 12454.

B. Grates and Frames
   1. Furnished for all surface drainage inlets, shall be ductile iron, and shall be made specifically for each basin so as to provide a round bottom flange that closely matches the diameter of the surface drainage inlet.
   2. Grates for drain basins shall be capable of supporting various wheel loads as specified.
   3. Ductile iron used in the manufacture of the castings shall conform to ASTM A536 grade 70-50-05. Grates and covers shall be provided and painted black.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING

A. Excavation of trenches, and for appurtenances and backfilling for piping, manholes, and overflow structures shall be in accordance with the applicable portions of these Specifications, DC Water Standards and Specifications, and the requirements specified below.

B. Trenching:
   1. The width of trenches at any point below the top of the pipe shall be not greater than the outside diameter of the pipe plus 24 inches to permit satisfactory jointing and thorough tamping of the bedding material under and around the pipe. Sheeting and bracing, where required, shall be placed within the trench width as specified, without any overexcavation. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures will be necessary. Cost of this redesign and increased cost of pipe or installation shall be borne by the Contractor without additional cost to the Government.

C. Removal of Rock:
   1. Rock in either ledge or boulder formation shall be replaced with suitable materials to provide a compacted earth cushion having a thickness between unremoved rock and the pipe of at least 8 inches or 1/2 inch for each foot of fill over the top of the pipe, whichever is greater, but not more than three-fourths the nominal diameter of the pipe. Where bell-and-spigot pipe is used, the cushion shall be maintained under the bell as well as under the straight portion of the pipe. Rock excavation shall be as specified and defined in Section 31 20 00 Earth Moving.

D. Removal of Unstable Material:

1. Where wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the COTR, is unexpectedly encountered in the bottom of a trench, such material shall be removed to the depth required and replaced to the proper grade with select granular material, compacted as provided in paragraph BACKFILLING. When removal of unstable material is due to the fault or neglect of the Contractor while performing shoring and sheeting, water removal, or other specified requirements, such removal and replacement shall be performed at no additional cost to the Government.

E. Bedding:
1. Follow the requirements noted in the Drawings and according DC Water Standards and Specifications.

F. Placing Pipe:
1. Each pipe shall be thoroughly examined before being laid; defective or damaged pipe shall not be used. Plastic pipe, excluding SRPE pipe shall be protected from exposure to direct sunlight prior to laying, if necessary to maintain adequate pipe stiffness and meet installation deflection requirements. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Lifting lugs in vertically elongated pipe shall be placed in the same vertical plane as the major axis of the pipe. Pipe shall not be laid in water, and pipe shall not be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. Deflection of installed flexible pipe shall not exceed 5%. Lay bell and spigot pipe shall proceed upgrade with the bell end upstream.

3.2 JOINTS

A. Flexible Watertight Joints
1. Gaskets and jointing materials shall be as recommended by the particular manufacturer in regard to use of lubricants, cements, adhesives, and other special installation requirements. Surfaces to receive lubricants, cements, or adhesives shall be clean and dry. Gaskets and jointing materials shall be affixed to the pipe not more than 24 hours prior to the installation of the pipe, and shall be protected from the sun, blowing dust, and other deleterious agents at all times. Gaskets and jointing materials shall be inspected before installing the pipe; any loose or improperly affixed gaskets and jointing materials shall be removed and replaced. The pipe shall be aligned with the previously installed pipe, and the joint pushed home. If, while the joint is being made the gasket becomes visibly dislocated the pipe shall be removed and the joint remade.

3.3 DRAINAGE STRUCTURES

A. Manholes and Overflow Structures:
1. Construction shall be of reinforced concrete, precast reinforced concrete; complete with frames and covers or gratings; and with fixed galvanized manhole steps as necessary. Pipe connections to concrete manholes and inlets shall be made with flexible, watertight connectors.

B. Structure Step Installation:
1. Step shall be vertically aligned and uniformly spaced the entire depth of any structure. In precast structures the steps may be cast in place, mortared into holes provided by fabricator or driven.

3.4 BACKFILLING

A. Backfilling Pipe in Trenches

1. After the pipe has been properly bedded, selected material from excavation or borrow, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 6 inches in compacted depth. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. The fill shall be thoroughly compacted under the haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation equal to the midpoint (spring line) of concrete pipe or has reached an elevation of at least 12 inches above the top of the pipe for flexible pipe. The remainder of the trench shall be backfilled and compacted by spreading and rolling or compacted by mechanical rammers or tampers in layers not exceeding 8 inches. Tests for density shall be made as necessary to ensure conformance to the compaction requirements specified below. Where it is necessary, in the opinion of the COTR, that sheeting or portions of bracing used be left in place, the contract will be adjusted accordingly. Untreated sheeting shall not be left in place beneath structures or pavements.

B. Backfilling Pipe in Fill Sections
   1. For pipe placed in fill sections, backfill material and the placement and compaction procedures shall be as specified below. The fill material shall be uniformly spread in layers longitudinally on both sides of the pipe, not exceeding 6 inches in compacted depth, and shall be compacted by rolling parallel with pipe or by mechanical tamping or ramming. Prior to commencing normal filling operations, the crown width of the fill at a height of 12 inches above the top of the pipe shall extend a distance of not less than twice the outside pipe diameter on each side of the pipe or 12 feet, whichever is less. After the backfill has reached at least 12 inches above the top of the pipe, the remainder of the fill shall be placed and thoroughly compacted in layers not exceeding 8 inches. Use select granular material for this entire region of backfill for flexible pipe installations.

3.5 MOVEMENT OF CONSTRUCTION MACHNERY

A. When compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or injury to the pipe shall be avoided. Movement of construction machinery over a pipe or storm drain at any stage of construction shall be at the Contractor's risk. Any damaged pipe shall be repaired or replaced.

3.6 COMPACTION

A. General Requirements:
   1. Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, clays, silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, cohesionless soils will show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture-density curves.

B. Minimum Density:
   1. Backfill over and around the pipe and backfill around and adjacent to drainage structures shall be compacted at the approved moisture content to the following applicable minimum density, which will be determined as specified below.
      a. Under paved roads, streets, parking areas, and similar-use pavements including adjacent shoulder areas, the density shall be not less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material, up to the elevation where requirements for pavement subgrade materials and compaction shall control.

b. Under unpaved or turfed traffic areas, density shall not be less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material.
c. Under nontraffic areas, density shall be not less than that of the surrounding material.

3.7 TRENCH DRAINS

A. Examination:
1. Examine substrates, areas, and conditions for compliance with the requirements for installation tolerances and other conditions affecting performance.
2. Verify that excavation is ready to receive stormwater trench drains.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Preparation:
1. Do not install stormwater trench drains if Site conditions induce loads exceeding structural capacity of trench drains.

C. Installation of Stormwater Trench Drains:
1. Excavation:
a. According to manufacturer requirements and to depth as indicated on Drawings.
b. Provide clearance around sidewalls of structure for construction operations.
c. If groundwater is encountered, prevent accumulation of water in excavations; place stormwater trench drains in dry trench.
2. Place stormwater trench drain sections plumb and level, to elevations as indicated on Drawings, and according to manufacturer's instructions.
3. Backfilling: As specified by manufacturer and in Section 31 20 00 Earth Moving.
4. Cut and fit for pipe.

3.8 DRAIN BASINS

A. The specified PVC surface drainage inlet shall be installed using conventional flexible pipe backfill materials and procedures. The backfill material shall be crushed stone or other granular material meeting the requirements of class 1 or 2 material as defined in ASTM D2321. The surface drainage inlets shall be bedded and back-filled uniformly in accordance with ASTM D2321. The drain basin body shall be cut at the time of the final grade so as to maintain a one piece, leak proof structure. No brick, stone or concrete block will be used to set the grate to the final grade height. For H-25 load rate installations, an 8-inch to 10-inch thick concrete ring shall be poured under the grate and frame as recommended by details provided from the manufacturer.

3.9 FIELD QUALITY CONTROL

A. Testing is the responsibility of the Contractor. Perform all testing and retesting at no additional cost to the Government.

B. Hydrostatic Test on Watertight Joints: Watertight joints shall be tested and shall meet test requirements of paragraph HYDROSTATIC TEST ON WATERTIGHT JOINTS. Rubber gaskets shall comply with the oil resistant gasket requirements of ASTM C443. Certified copies of test results shall be delivered to the COTR before gaskets or jointing materials are installed.

1. PVC Pipe: A hydrostatic test shall be made on the watertight joint types as proposed. Only one sample joint of each type needs testing; however, if the sample joint fails because of faulty design or workmanship, an additional sample joint may be tested. During the test period, gaskets or other jointing material shall be protected from extreme temperatures which might adversely affect the performance of such materials. Test requirements for joints in PVC, PE, and PP plastic pipe shall conform to ASTM D3212.
2. Leakage Test: Lines shall be tested for leakage by water testing or exfiltration tests, as appropriate, prior to completing backfill. Testing of individual joints for leakage by water shall conform to ASTM C1103. Prior to exfiltration tests, the trench shall be backfilled up to at least the lower half of the pipe. If required, sufficient additional backfill shall be placed to prevent pipe movement during testing, leaving the joints uncovered to permit inspection. Visible leaks encountered shall be corrected regardless of leakage test results. When the water table is 2 feet or more above the top of the pipe at the upper end of the pipeline section to be tested, infiltration shall be measured using a suitable weir or other device acceptable to the COTR. An exfiltration test shall be made by filling the line to be tested with water so that a head of at least 2 feet is provided above both the water table and the top of the pipe at the upper end of the pipeline to be tested. The filled line shall be allowed to stand until the pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be reestablished. The amount of water required to maintain this water level during a 2-hour test period shall be measured. Leakage as measured by the exfiltration test shall not exceed 0.2 gallons per inch in diameter per 100 feet of pipeline per hour.
3. Determination of Density: Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. Tests shall be performed in sufficient number to ensure that specified density is being obtained. Laboratory tests for moisture-density relations shall be made in accordance with ASTM D1557 except that mechanical tampers may be used provided the results are correlated with those obtained with the specified hand tamper. Field density tests shall be determined in accordance with ASTM D2167 or ASTM D6938. When ASTM D6938 is used, the calibration curves shall be checked and adjusted, if necessary, using the sand cone method as described in paragraph Calibration of the referenced publications. ASTM D6938 results in a wet unit weight of soil and ASTM D6938 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D6938. Test results shall be furnished the COTR. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed.
4. Deflection Testing: Conduct deflection test no sooner than 30 days after completion of final backfill and compaction testing. Clean or flush all lines prior to testing. Perform a deflection test on entire length of installed flexible pipeline upon completion of work adjacent to and over the pipeline, including backfilling, placement of fill, grading, paving, placement of concrete, and any other superimposed loads. Deflection of pipe in the installed pipeline under external loads shall not exceed limits in paragraph PLACING PIPE above as percent of the average inside diameter of pipe. Use a laser profiler or to determine if allowable deflection has been exceeded.
5. Laser Profiler: Inspect pipe interior with laser profiling equipment. Utilize low barrel distortion video equipment for pipe sizes 48 inches or less. Use a camera with suitable lighting to allow a clear picture of the entire periphery of the pipe interior. Center the camera in the pipe both vertically and horizontally. The camera must be able to pan and tilt to a 90 degree angle with the axis of the pipe rotating 360 degrees. Use equipment to move the camera through the pipe that will not obstruct the camera's view or interfere with proper documentation of the pipe's condition. The video image shall be clear, focused, and relatively free from roll static or other image distortion qualities that would prevent the reviewer from evaluating the condition of the pipe. For initial post installation inspections for pipe sizes larger than 48 inches, a visual inspection shall be completed of the pipe interior.

3.10 INSPECTION

A. Post-Installation Protection: Visually inspect each segment of concrete pipe for alignment, settlement, joint separations, soil migration through the joint, cracks, buckling, bulging and deflection. An engineer must evaluate all defects to determine if any remediation or repair is required.
   1. Flexible Pipe: Check each flexible pipe (PVC) for rips, teras, joint separations, soil migration through the joint, cracks, localized bucking, bulges, settlement and alignment.
   2. Post-Installation Inspection Report: The deflection results and final post installation inspection report must include: a copy of all video taken, pipe location identification, equipment used for inspection, inspector name, deviation from design, grade, deviation from line, deflection and deformation of flexible pipe, inspector notes, condition of joints, condition of pipe wall (e.g. distress, cracking, wall damage dents, bulges, creases, tears, holes, etc.).

B. Trench Drains:
   1. Inspect stormwater trench drains immediately prior to placement in excavation to verify that trench drains are internally clean and free from damage.
   2. Remove and replace damaged sections.
   3. Verify alignment of gate and components.
   4. Verify that gate operates smoothly and does not bind or scrape.
   5. Prepare test and inspection reports.

C. Repair of Defects:
   1. Leakage Test: When leakage exceeds the maximum amount specified, correct source of excess leakage by replacing damaged pipe and gaskets and retest.
   2. Deflection Testing: When deflection readings are in excess of the allowable deflection of average inside diameter of pipe are obtained, remove pipe which has excessive deflection and replace with new pipe. Retest 30 days after completing backfill, leakage testing and compaction testing.
   3. Inspection: Replace pipe or repair defects indicated in the Post-Installation Inspection Report.
      a. Flexible Pipe: Replace pipes having cracks or splits.
   4. Protection: Protect storm drainage piping and adjacent areas from superimposed and external loads during construction.
   5. Warranty Period: Pipe segments found to have defects during the warranty period must be replaced with new pipe and retested.

END OF SECTION