GULF ISLAND NATIONAL SEASHORE

REPLACE EAST LIFT STATION
GUIS PMIS NO. 303760

PROJECT SPECIFICATIONS
FINAL CONSTRUCTION DOCUMENTS

NATIONAL PARK SERVICE
SOUTHEAST REGION
JUNE 2, 2023

SECTION 000110 - TABLE OF CONTENTS

PROCUREMENT AND CONTRACTING REQUIREMENTS

SPECIFICATIONS

END OF SECTION

SECTION 011100 - SUMMARY OF WORK

PART 1 GENERAL

1.1 SUMMARY

A. Section includes the following:

1. Work Covered by Contract Documents
2. Government-Furnished Materials
3. Contractor Use of Site
4. Public Use of Site
5. Occupancy Requirements for Buildings
6. Conduct of Operations
7. Work Restrictions
8. Special Construction Requirements

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Location: 1400 Fort Pickens Road, Pensacola Beach, Florida 32561

B. The Work consists of:

1. Demolition of existing lift station, 50-KW diesel generator, and pump control panel, and 200-amp, 240 volt, 3-pole auotmatic transfer switch.
2. Installation of a new lift station with fiberglass wet well and 15 horsepower pump, 80-KW propane generator with 250-gallon propane tanks, pump control panel, and 200-amp, 240 volt, 3-pole service rated automatic transfer switch.

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

1.3 CONTRACTOR USE OF SITE

A. General: Contractor shall have limited use of site for construction operations. Limit use of premises to work in areas indicated on drawings. Do not disturb portions of Project site beyond areas in which the Work is indicated.

B. Storage of Materials: Confine storage of materials to areas approved by the Contracting Officer.

C. Parking: Confine parking to areas approved by the Contracting Officer.

D. Stockpiling: Confine stockpiling to areas approved by the Contracting Officer.

E. Preservation of Natural Features:

1. Prevent damage to natural surroundings. Restore damaged areas, repairing or replacing damaged trees and plants, at no additional expense to the Government.
2. Provide temporary barriers to protect existing trees and plants and root zones.
3. Do not remove, injure, or destroy trees or other plants without prior approval. Consult with Contracting Officer (CO) and remove agreed-on roots and branches that interfere with construction.
4. Do not fasten ropes, cables, or guys to existing trees.
5. Carefully supervise excavating, grading, filling, and other construction operations near trees to prevent damage.

F. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Government employees, and emergency vehicles at all times. Do not use for parking or

storage of materials.

1. Schedule deliveries to minimize use of driveways and entrances.
2. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

G. Construction Camp: Establishment of a camp within park will not be permitted.

1.4 PUBLIC USE OF SITE

A. The area will be closed to the public during construction.

B. Contractor shall conduct his operations to ensure the least inconvenience to public.

1.5 OCCUPANCY REQUIRMENTS FOR BUILDINGS

A. Existing Buildings

1. Full Government Occupancy: Government will occupy buildings under construction during the entire contract period. Cooperate with Government during construction operations to minimize conflicts and facilitate Government usage. Perform Work so as not to interfere with Government's day-to-day operations. Maintain existing exits, unless otherwise indicated.
    a. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Contracting Officer.
    b. Maintain existing building in weather tight condition throughout construction period. Repair damage caused by construction operations. Protect building and occupants during construction period.

1.6 CONDUCT OF OPERATIONS

A. Contractor shall conduct his operations in conformance with rules and regulations promulgated by the Secretary of the Interior for the National Park Service, and applicable park rules and regulations prescribed by Park Superintendent.

B. Work on Saturdays, Sundays, Federal holidays or at night may not be performed unless stated in the Work Restrictions below or without prior consent from the Contracting Officer. Submit requests 2 business/calendar days in advance of the work to the Contracting Officer for approval.

C. No signs or advertisements (except those specified herein) shall be displayed on the construction site or within the park unless approved by the Contracting Officer.

1.7 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed during normal business working hours of 6:00 a.m. and 5:00 p.m., Monday through Friday, except when otherwise indicated.

B. Existing Utilities

1. Existing Utilities: Notify Contracting Officer and utility companies of proposed locations and times for excavation.
2. Contractor shall be responsible for locating and preventing damage to known utilities. If damage occurs, repair utility at no additional expense to the Government.

3. If damage occurs to an unknown utility, repair utility. An equitable adjustment will be made in accordance with the Changes clause of the contract.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Government or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Contracting Officer not less than two business days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Contracting Officer's written permission.
3. Hours and length of Utility Shutdowns:

D. Nonsmoking Building/Tobacco Use/Vaping: Smoking is not permitted within building or within 25 feet of entrances, operable windows, or outdoor air intakes.

1.8 SPECIAL CONSTRUCTION REQUIREMENTS

A. Project Website: A project website administered by NPS will be used for purposes of managing communication and documents during construction stage.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 012601 - CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. Section consists of administrative and procedural requirements for contract modifications.

1.2 DEFINITIONS AND ALLOWANCES

A. Home Office Overhead: Costs incurred in support of all of a contractor's projects and not attributable to a specific job. The cost for home office overhead is only allowed as a percentage of all direct work excluding profit. The following items represent allowable home office overhead costs identified in Part 31 of the Federal Acquisition Regulation (FAR):

1. Rent
2. Utilities
3. Furnishings
4. Office equipment
5. Executive and management staff not exclusively assigned to the project
6. Support, accounting, and administrative staff
7. Preparation of cost proposals, estimating, and schedule analyses connected with Modifications
8. Estimating and preconstruction services
9. Mortgage costs
10. Real estate and corporate taxes
11. Automobile maintenance and travel costs for home office personnel
12. Home office insurances i.e. structure, automotive, umbrella, flood, etc.
13. Depreciation of equipment and other assets
14. Home office supplies (paper, staples, etc.)
15. Legal services
16. Accounting and data processing
17. Professional fees/registration

B. General Conditions (Field Office Overhead): Management and administrative costs incurred on site for the designated project. Costs associated with preparation of modifications will not be allowed. Costs for these items are to be included only in the general conditions of the modification estimate. Only in the case of a contract time extension are additional general conditions included in modifications. The following items, if applicable, are considered allowable costs for calculating General Conditions:

1. Project Manager (PM), Assistant Project Manager
2. Superintendent, Assistant Superintendent
3. Quality Control, Safety Officer, Environmental Manager, etc.
4. Engineers
5. Travel, lodging, and per diem (as established by Federal Travel Regulations)
6. Scheduling
7. Field Office Trailers and associated temporary utilities
8. Field office supplies
    a. Mailing and couriers

b. Reproduction costs
c. Storage
d. Phones
e. Computers
f. Copiers

9. Personal vehicles i.e. Superintendent Pickup trucks

C. General Requirements: Costs directly associated with the project and are necessary to perform the actual work of the modification. These costs shall be shown as direct costs in the estimate. The following items, if applicable, are considered allowable costs for calculating General Requirements:

1. Hoisting
2. Material handling
3. Temporary fencing
4. Port-a-lets
5. Trash removal, dumpsters
6. Barricades
7. Small tools
8. Safety supplies
9. Scaffolding
10. Daily cleaning
11. Traffic control
12. Temporary signage
13. Temporary heating and power

D. Personnel Costs: Costs included in the modification must only be for General Conditions staff and workers actually present and working on project site. Modification costs for salaried workers are only allowed within the structure of a 40-hour week and no overtime or holiday pay will be allowed.

1. Worker Hourly Rates are costs directly associated with the individual worker and consist of the following:
   a. Base Rate: The hourly rate paid directly to the worker
   b. Labor Burden: Employer payments of all applicable burdens; includes insurance and taxes the business must pay on behalf of the worker to government entities and educational forums, such as:
      1) Social Security
      2) Medicare
      3) Workers Compensation – Policy and company calculation to be made available.
      4) Federal Unemployment Tax Act (FUTA) - Cap Rate and percentage to be proportionally allocated over one year.
      5) State Unemployment Tax Act (SUTA) - Cap Rate and percentage to be proportionally allocated over one year.
      6) Union agreement costs - Other costs required under an enforceable collective bargaining agreement.
   c. Fringe Benefits: Various non-wage compensations provided to employees such as:
      1) Health Care Insurance Premiums
      2) Cell Phone

3) Clothing
4) 401K and Pensions
5) Vehicle allowances
6) Gas allowance
7) Life insurance premiums
8) Disability insurance
9) Other Fringe Benefits required under an enforceable collective bargaining agreement

E. Bonuses or Deferred Compensation: No Bonus or Deferred Compensation will be allowed within any components of pricing including Home Office Overhead, General Conditions, General Requirements, Hourly Worker Rates, or the direct costs of work.

F. General Liability Insurance: An insurance policy that protects Contractor from claims resulting from bodily injury or property damage to a third party. Include as a separate line item within all modification proposals and provide a current insurance quote upon request.

G. Performance and Payment Bonds: A performance bond is a surety bond issued by an insurance company or bank to guarantee satisfactory completion of a project. The Payment Bond guarantees the Contractor will pay the labor and material costs incurred. Banks and Insurance companies charge a premium for individual project based on a sliding scale related to the size of the project. Include as a separate line item in modification proposals and provide current company bonding rates upon request.

H. Builder's Risk Insurance: Covers the contractor's loss due to fire, high winds, or other natural forces. Not reimbursed by the National Park Service (NPS) and shall not be included in modification proposals.

1.3 MODIFICATION PROPOSAL PRICING REQUIREMENTS

A. General:

1. Proposal be received in the format and within the time frame specified in the Request for Proposal (RFP) letter. Costs or delays resulting from failure of contractor to submit within the time frame specified will not be compensable.
2. Proposal shall be detailed with itemized lists of equipment, materials, labor, production rates, overhead, profit, and bond markup for each item. Labor costs must be itemized by craft and hourly rate, including Fringe Benefits and Labor Burden. If the costs of Fringe Benefits and Labor Burden are not itemized, it is assumed they are included in the hourly rate shown, or contractor is not requesting reimbursement. Contractor may utilize the government provided Contractor Estimate Form, or their own form, provided that it contains the same information and level of detail as the Government's form.
3. Requests for extensions of contract time as a result of change must be justified with a Time Impact Analysis (TIA). Refer to Section 01 32 16 "Construction Schedule", for time impact analysis requirements. TIA and associated costs shall be received with the proposal by the date shown within the Request for Proposal letter. Contractor's failure to submit within the specified time frame will be construed as the Contractor waiving right for additional time and no time extension will be allowed.
4. All supporting documentation used to justify the proposed modification will be made available to the Contracting Officer (CO) upon request.

5. Contractor shall review and approve all subcontractor/supplier pricing in detail for proper format, scope, production rates, and pricing prior to submission to NPS. All delay costs associated with not reviewing and approving subcontractor/supplier pricing will be borne by the Contractor.
6. All pricing and production rates within the estimate must be based on fair and reasonable pricing and cannot include built-in contingency.

B. Labor:

1. Contractor shall estimate cost of labor by itemizing each craft involved, indicating worker hourly rate (base rate + labor burden + fringe benefits) for each and itemizing hours required for each craft directly engaged in modification work. Any work proposed requiring overtime work or premium pay shall be itemized separately. Rates shall be in accordance with the Davis-Bacon Act as incorporated herein. Labor Burden may include payroll taxes, Social Security, unemployment insurances, workers compensation insurance, Federal Insurance Contributions Act (FICA), FUTA, and other direct costs resulting from Federal, State or local laws.
2. Itemize labor costs for equipment operators separate from equipment costs.
3. Labor cost for foremen shall only be costs for related work required for the modification.

C. Materials:

1. Estimated cost for materials shall include quotes from multiple sources. Material prices shall include applicable fees and credits, including but not limited to, sales tax, freight and delivery charges, and tax rebates.
2. No markup shall be applied to any material provided by NPS.

D. Equipment:

1. Equipment used for the project must be appropriately sized for work being performed.
2. Do not include costs for "miscellaneous tools and equipment", in your proposal for a replacement value of $500 or less. Costs shown in excess of $500 shall be broken out separately.
3. Regardless of ownership, rates to be used in determining equipment rental costs shall be the lowest cost from one of the following sources:
    a. United States (U.S.) Army Corps of Engineers, Ownership and Operating Expense Schedule (use latest edition and applicable region)
    b. Construction Blue Book
    c. Local equipment rental rates, documented by actual invoice charges, or itemized vendor quotes.
4. Estimated equipment rates shall include operating costs of all fuel, oil, lubrication, supplies, small tools, necessary attachments, ground engaging components, tires and tracks, routine repairs and maintenance (cost of major repair and overhaul is not allowed per Federal Acquisition Regulation (FAR) 31.105(d)(2)), depreciation, storage, insurance, and all incidentals. Mobilization, if applicable, may be included for equipment solely used on the modification work but must be listed separately.
5. Estimate full rate for equipment only for duration that equipment will be utilized to accomplish work of the modification.
6. Standby unit rates used in accordance with paragraph 1.3, D, 2, above. If the U.S. Army Corp of Engineers is utilized then their standby rates prevail. If Bluebook or local

equipment pricing is accepted, then 1/2 of equipment costs minus any operating costs, major repair and overhaul will be accepted.

7. If equipment is in standby mode due solely to a documented NPS delay, established standby rate shall apply from the first day of the delay.
8. Equipment not used and on job site for up to five consecutive days may be classified at standby rates, provided the equipment is or has been used solely to perform work on the modification and will be necessary to complete additional modification work. Equipment still on the jobsite but not in use after five consecutive days will not be considered in the modification pricing.
9. Requests for compensation for equipment stand by time must be justified, documented and itemized separately.
10. The estimated timeframe (daily, weekly, monthly) for use of the equipment must reflect the lowest cost to the Government.

E. Establishment and Application of Overhead and Profit Percentages:

1. Home Office Overhead and Profit (OH&P) shall be applied to direct costs only. Profit shall not be applied to overhead amounts; and overhead shall not be applied to profit. Home office overhead shall contain only allowable, allocable, and reasonable costs per the contract documents and FAR Part 31. Profit percentages are based on risk factors found in FAR Part 31which have been applied to the specific type of work included in this project. Negotiated rates shall not exceed the following percentages for OH&P for contractor self-performed work:
   a. Overhead……10%
   b. Profit……10%
2. Total aggregate limit of markup (OH&P) for Contractor and Subcontractors on modification work shall not exceed 25%. The NPS will not be responsible for allocation of percentages between contractor and subcontractors at any tier.
3. If Contractors form a partnership, partnership may only receive home office overhead and profit in same amount as an individual Contractor (refer to paragraph 1.3,E,1 above). It is the responsibility of the partners to decide on division of revenue.
4. Combined Increases and Decreases: On proposals involving both increases and decreases in the Contract Price, overhead and profit mark-ups are required on net increases and deducted on net decreases.
5. At no time can profit be calculated on Overhead or itself, it must be calculated on direct costs of work only.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 013000 - PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.1 SUMMARY

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

1. Definitions
2. Construction Coordination
3. Submittals
4. Coordination Drawings
5. Requests for Information (RFIs)
6. NPS/DSC Project Website
7. Project Meetings
8. Environmental Coordination
9. Permits

B. Related Requirements:

1. Section 01 32 16 "Construction Schedule" for preparing and submitting Contractor's construction schedule.
2. Section 01 73 40 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.

1.2 DEFINITIONS

A. Agency with Jurisdiction

B. Construction Permits – Contractor Provided

C. Government Furnished Permits

1.3 CONSTRUCTION COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of Specifications 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 installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other Contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of components, including mechanical and electrical.
5. Properly plan construction operations to include permit requirements. Allow enough time to execute permit provisions to maintain work schedule, site visits, inspections, and reporting deadlines.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to:

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. Permit requirements
7. Pre-installation conferences
8. Project closeout activities

1.4 SUBMITTALS

A. Division 1 documents: The following items shall be submitted a minimum of one week prior to Preconstruction Conference. Contracting Officer will notify Contractor of tentative date for Pre-Construction Conference.

1. Letter designating Project Superintendent
2. Construction Schedule
3. A Comprehensive Schedule of Values
4. Accident Prevention Plan
5. A List of Subcontractors for this project
6. Written statements from Subcontractors certifying compliance with applicable labor standard clauses.
7. Certificates of Insurance or SF1413 for Contactor and all Subcontractors
8. Waste Management Plan
9. Quality Control Plan
10. Temporary Storm Water Pollution Prevention Plan (SWPP or UPPP)
11. List of Required Construction Permits. Include the following information for each permit:
    a. Name of Permit
    b. Agency(ies) with Jurisdiction issuing the permit
    c. Information required from Government to complete permit application

B. Provide items listed to Contracting Officer before Pre-Construction Conference. If all documents have not been received one week prior to scheduled Pre-Construction Conference date, conference may be cancelled, Notice to Proceed may not be issued, and Contracting Officer will consider other contractual remedies. Work shall not commence until written Notice to Proceed has been issued.

1.5 REQUESTS FOR INFORMATION (RFIS)

A. General: Immediately on discovery of the need for additional information or interpretation of Contract Documents, Contractor shall prepare and submit an RFI utilizing form created on NPS/DSC management software website.

1. Contracting Officer will not respond to RFIs submitted by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner to avoid delays in the work.

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

1. RFI number, numbered sequentially
2. Date
3. RFI subject
4. Specification Section number and title and related paragraphs, as appropriate.
5. Drawing number and detail references, as appropriate.
6. Field dimensions and conditions, as appropriate.
7. Contractor's suggested resolution: If Contractor's suggested resolution impacts Contract Time or Contract Sum, Contractor shall state impact in RFI.
8. Contractor's signature
9. Requested date for response
10. 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. RFI Form: Complete RFI Form on NPS/DSC Project Website as follows:

1. Enter general information at the top of the form.
2. Under the "Action" section at the bottom of the form, select "Question" then select "CMR" in drop-down of "Send to" box.
3. Enter details of question and attach related documents.
4. Select "Submit Form" at bottom of page.

D. Contracting Officer’s Action: Contracting Officer will review each RFI, determine action required, and respond. Contracting Officer will determine critical nature of each RFI and issue response accordingly.

1. The following are not considered to be RFIs and will receive no 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 Contract Documents.
    e. Requests for adjustments in Contract Time or Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.
2. Contracting Officer's action may include a request for additional information; time for response will date from time of receipt of additional information.
3. Contracting Officer's action on RFIs may result in need for a change to Contract Time or Contract Sum. All contract changes will be processed following terms and conditions of contract.

1.6 PROJECT WEB SITE

A. Use NPS/DSC management software website for communication throughout contract period on:

1. Project directory
2. Project correspondence
3. Meeting agendas and minutes
4. Contract modifications forms and logs
5. RFI form and processing
6. Task and issue management
7. Photo documentation
8. Baseline schedule, schedule updates and calendar management
9. Submittal form and processing
10. Payment coordination documentation
11. Drawing and specification document hosting, viewing, and updating
12. Online document collaboration
13. Reminder and tracking functions
14. Archiving functions
15. Notification of submittal and RFI statuses and current responsible party
16. Permits and addendums

B. All users will be required to have the following software packages:

1. Internet Explorer version 7 or later.
2. Adobe Acrobat Professional (Pro) version 9 or later.

1.7 PROJECT MEETINGS

A. Preconstruction Conference: Before start of construction, Contracting Officer will arrange an on-site meeting with Contractor. Meeting agenda will include the following as a minimum:

1. Roles & Responsibilities / Lines of Authority
2. Park rules and regulations
3. Jobsite Safety
4. Resolution of comments on required Division 1 documents
5. Coordination of Subcontractors
6. Labor law application
7. Modifications
8. Payments to Contractor
9. Payroll reports
10. Contract time
11. Liquidated damages
12. Contractor Performance Evaluation
13. Display of Hotline posters
14. Notice to proceed
15. Correspondence procedures
16. NPS/DSC Project website
17. Acceptance/rejection of work
18. Progress meetings

19. Submittal procedures
20. NPS Final Accessibility Inspection
21. Environmental requirements
22. Permit requirements
23. As-constructed drawings/operation and maintenance (O&M) manuals.
24. Saturday, Sunday, holiday and night work.
25. Reference materials
26. Value engineering
27. Schedule of Values

B. Progress Meetings: Contracting Officer will schedule weekly meetings with Contractor.

1. Attendees: In addition to Government Representatives, each Contractor, Subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented. Participants at meeting 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. Meeting agenda will include:
    a. Approval of minutes of previous meetings
    b. Submittal status
    c. Review of off-site fabrication and delivery schedules.
    d. Requests for information (RFI) and other issues.
    e. Modifications
    f. Work in progress and projected.
        1) Status of required inspections (Special Inspections, Accessibility, etc.)
    g. Inspections of work in progress and projected (Special inspections, Accessibility, etc.)
    h. Construction Schedule update (provide updated Critical Path Method (CPM)).
    i. Status of Project Record Drawings and O&M manuals.
    j. Other business relating to work.
    k. Permit requirements

C. Preinstallation Conferences: Conduct at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend meeting. Advise Contracting Officer of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for particular activity under consideration, including requirements for:
    a. Contract Documents
    b. Options
    c. Related RFIs
    d. Related Change Orders
    e. Purchases
    f. Deliveries
    g. Submittals

h. Possible conflicts
i. Compatibility requirements
j. Time schedules
k. Weather limitations
l. Manufacturer's written instructions
m. Warranty requirements
n. Compatibility of materials
o. Acceptability of substrates
p. Temporary facilities and controls
q. Space and access limitations
r. Regulations of agency(ies) with jurisdiction
s. Installation procedures
t. Coordination with other work
u. Required performance results
v. Protection of adjacent work
w. Protection of construction and personnel

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene conference at earliest feasible date.

1.8 ENVIRONMENTAL COORDINATION

A. Contractor’s Environmental Manager: Designate on-site party responsible for overseeing Contractor’s conformance to environmental goals for project and implementing procedures for environmental protection.

1. Qualifications: Minimum 3 years Construction experience on projects of similar size and scope; with environmental procedures similar to this project; familiarity with Environmental Management Systems (EMSs) such as International Organization for Standardization (ISO) 14001 ; familiar with environmental regulations applicable to construction operations.
2. Responsibilities: Responsibilities shall include:
   a. Compliance with applicable Federal, State, and local environmental regulations, including maintaining required documentation.
   b. Implementation of Waste Management Plan (WMP).
   c. Implementation of Storm Water Pollution Prevention Plan (SWPPP).
   d. Present overview of environmental issues and summarize site specific procedures relating to management plans at Preconstruction conference.
   e. Training for Contractor personnel in accordance with position requirements.
   f. Monitoring and documentation of environmental procedures.

B. Perform project quality control in accordance with requirements specified in Related Sections, including:

1. Quality Requirements

2. Regulatory Requirements
3. Temporary Storm Water Pollution Prevention Environmental Management
4. Construction Waste Management

C. Contractor's Environmental Training Program: Contractor shall provide environmental training for workers performing work on project site. Training shall include:

1. Overview of environmental issues related to building industry.
2. Overview of environmental issues related to Project.
3. Review of site-specific procedures and management plans:
   a. Construction Waste Management
   b. Temporary Storm Water Pollution Prevention
4. Pollution Prevention (P2) practices: Submit evidence of P2 training.
5. Compliance with environmental regulations: As specified in Regulatory Requirements. Submit Contractor 40 CFR (Code of Federal Regulations) employee training records upon request of Contracting Officer.

D. Provide documentation for environmental procedures as specified herein and in accordance with approved Waste Management Plan and Storm Water Pollution Prevention Plan.

1.9 PERMITS

A. General:

1. Permits and Responsibilities: Contractor shall, without additional expense to the Government, be responsible for obtaining necessary licenses and permits, and for complying with Federal, State and municipal laws, codes, and regulations applicable to the performance of the work. Contractor shall also be responsible for damages to persons or property that occur as a result of Contractor's fault or negligence; and for materials delivered and work performed until completion and acceptance of the work.
2. For the purpose of this contract, Contractor will not be considered an agent of the Government. Contractor shall comply with appropriate Federal, State and local laws.

B. Government Furnished Permits: During development of the project's design, permits listed below were negotiated and agreed to by the Government. Terms and provisions of these permits shall be adhered to for the duration specified in each permit.

1. A permit was acquired for with identification number . The Agency(ies) with Jurisdiction for this permit is.

C. Potential Permits: Permits listed below were identified during the design process as likely to be required based on typical means and methods of construction. The list is provided to assist Contractor in determining which permits will be required for contract's chosen means and methods. The list shall not be considered complete; it is the Contractors' responsibility to determine means and methods and obtain required permits. Contractor shall obtain all permits required to legally conduct work.

1. Sewer Hookup - Emerald Coast Utilities Authority (ECUA).

D. Coordination with Agency(ies) with Jurisdiction Issuing Permits

1. Coordination: Contact the Agency(ies) with Jurisdiction as needed and sufficiently in advance to avoid delaying work: Coordinate meetings, reporting requirements, inspections, and other requirements.

E. Administrative Procedures:

1. Coordinate scheduling and timing of required administrative provisions of project permits with Agency(ies) with Jurisdiction, Construction Manager, and Park to avoid conflicts.
2. Supply needed information to Agency(ies) with Jurisdiction issuing permits, pay fees required and provide material needed to comply with permit's conditions and provisions.
3. Upload permits to NPS/DSC management software website when permits are obtained.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 013216 - CONSTRUCTION SCHEDULE

PART 1 GENERAL

1.1 SUMMARY

A. Section consists of Construction Schedule requirements including:

1. Schedule of Values
2. Construction Schedule Requirements.
3. Construction Schedule Updates.
4. Time Impact Analysis.

B. Purpose: The Construction Schedule ensures adequate planning, coordination, scheduling, and reporting during execution of the work by the Contractor. It shall assist the Contractor and Contracting Officer (CO) in monitoring the progress of the work, evaluating proposed changes, and processing Contractor's monthly progress payments. It shall include the dates in the contract, phases, milestones, occupancies, holidays, weather consideration, a critical path, and the requirements of this section.

1.2 DEFINITIONS

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

1. Critical activities are activities on the critical path. They 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: Allocation of the Schedule of Values for completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by the Contracting Officer.

C. Critical Path Method (CPM): 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: Longest connected chain of interdependent activities through the network schedule that establishes minimum overall Project duration and contains no float.

E. Float: Measure of leeway in starting and completing an activity.

1. Float: Not for the exclusive use or benefit of the Government or Contractor but is jointly owned.
2. Free Float: Amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total Float: Measure of leeway in starting or completing an activity without adversely affecting planned Project completion date.

F. Resource Loading: Allocation of manpower and equipment necessary for completion of an activity as scheduled.

G. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

1.3 SUBMITTALS

A. Electronic Copies: Schedules and reports submitted shall be posted on the NPS/DSC management software website in native electronic file formats. The intent of the Government is to limit the number of printed reports to those determined by the project team as essential.

B. Schedule of Values: After contract award and before Pre-Construction conference, submit schedule of dollar values based on Contract Price Schedule.

C. Construction Baseline Schedule: After contract award and before Pre-Construction conference, submit two paper copies of baseline schedule, large enough to show entire schedule for entire construction period. Utilize Schedule of Values in preparation of Construction Baseline Schedule.

D. Critical Path Method (CPM) Reports: Concurrent with CPM schedule, submit three paper copies of the following computer-generated reports. For each activity, include 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 activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of predecessor and successor tasks for 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 activities sorted in ascending order of total float.

E. Construction Schedule Updates: On or before 7th day preceding progress payment request date, submit estimates of percent completion of each schedule activity and necessary supporting data. Provide two paper copies.

F. Construction Schedule Revisions and Time Impact Analysis: For each Construction Schedule revision, submit two paper copies of a Time Impact Analysis. Incorporate a Fragmentary Network (Fragnet) into currently accepted Construction Schedule that demonstrating how Contractor proposes to incorporate a modification, change, delay, or Contractor request.

1.4 QUALITY ASSURANCE

A. Contractor shall meet with Contracting Officer on day of the preconstruction conference to go over:

1. Review software limitations, content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing.
4. Review time required for review of submittals and re-submittals.
5. Review requirements for tests and inspections by independent testing and inspecting agencies.
6. Review time required for completion and startup procedures.
7. Review time required for obtaining and activating permits.
8. Review and finalize list of construction activities to be included in schedule.
9. Review baseline schedule comments, resolve issues and progress on incorporating them
10. Review procedures for updating schedule.

11. Discuss reporting requirements and establish protocol for naming and transmitting electronic schedules.

B. Contractor's Schedule Representative: Before the preconstruction conference, designate an authorized representative to be responsible for preparing and maintaining the Construction Schedule. Submit resume outlining qualifications of Scheduler to Contracting Officer for acceptance. Scheduler shall have prepared and maintained at least 5 previous schedules of similar size and complexity similar to this Contract, demonstrating proficiency of using scheduling software. Authorized representative will be responsible for preparing the Baseline Schedule, required updates, revisions, Time Impact Analyses, and reports.

1.5 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate Contractors.

B. Coordinate Construction Baseline Schedule with Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. In developing Construction Baseline Schedule, ensure Subcontractor’s work at all tiers, and prime Contractor’s work, is included and coordinated.
2. Secure time commitments for performing critical elements of work from parties involved.
3. Coordinate each construction activity in network with other activities and schedule in proper sequence.

PART 2 PRODUCTS

2.1 SCHEDULE OF VALUES

A. Breakdown each lump-sum item into component work activities used in the schedule for which progress payments may be requested. Work activities broken out within schedule of values shall be integrated into and made a logical part of the construction baseline schedule. Total costs for the component work activities shall equal contract price for that lump-sum item. Contracting Officer may request data to verify accuracy of dollar values. Include mobilization, general condition costs, overhead and profit in the total dollar value of unit price items and in the component work activities for each lump-sum item. Do not include mobilization, general condition costs, overhead or profit as a separate item.

B. Do not break down unit price items. Use only the contract price for unit price items.

C. Total cost of all items shall equal the contract price. The Schedule of Values will form the basis for progress payments and the Construction Schedule.

2.2 CONSTRUCTION SCHEDULE REQUIREMENTS

A. Construction Baseline Schedule: Prepare Construction Baseline Schedule using a computerized, cost and resource-based, time-scaled Critical Path Method network analysis diagram for the Work.

1. Develop and finalize Construction Baseline Schedule so it can be accepted for use no later than 30 days after date established for the Notice of Award.
    a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing work within applicable completion dates, regardless of Governments acceptance of schedule.

2. Establish procedures for monitoring and updating Construction Baseline Schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

B. Construction Baseline Schedule Preparation: Prepare a list of all activities required to complete the Work. Using preliminary Critical Path Method network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate estimated duration, sequence requirements, and relationship of each activity in relation to other activities.
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 Critical Path Method schedule within the limitations of the Contract Time.
4. Show sequence and interdependence of activities required for completion of work. Ensure work sequences are logical and Construction Baseline Schedule shows a coordinated plan of the work.
5. Resource loading of each activity shall include personnel by labor category and equipment type and capacity proposed to complete the activity in duration shown.
6. Consider seasonal weather conditions in planning and scheduling work influenced by high and low ambient temperatures, wind, or precipitation to ensure completion of work within contract time.
7. Time Frame: Proposed duration assigned to each activity shall be Contractor's best estimate of time required to complete activity considering the scope and resources planned for activity.
    a. An early finish date may be shown but the late finish date shall be same date as last day of contract period. An early completion schedule shall contain:
        1) Insert an activity titled "Project Float" as a successor to last activity in early project completion schedule network.
        2) Add a milestone titled "Contract End Date" as a successor to the activity "Project Float".
        3) Add duration to the activity "Project Float" as required so the milestone "Contract End Date" equals the last day of Contract Period.
    b. Contract completion date shall not be changed by submission of a schedule that shows an early completion date.
    c. Contractor shall limit use of lead or lag duration’s between schedule activities.
    d. Project Calendars: Develop and incorporate the following calendars:
        1) Administrative Calendar: Include calendar based on a 7-day week to be used on activities based on calendar days. Apply this calendar to administrative tasks or other tasks not affected by non-working days (Federal Holidays, weather, etc.).
        2) Project Calendar: Include calendar based on planned work week for the project. Include Federal Holidays, weekends, and non-workdays indicated in contract documents. Apply this calendar to activities not anticipated to be affected by weather. Be clear when identifying number of work days in work week.

3) Weather Calendar: Utilize Project Calendar and show anticipated normal downtime related to weather as non-working time. Weather days shall be based on data for local area from a reliable source like the National Oceanic and Atmospheric Administration (NOAA), National Park Service records, or source acceptable to Contracting Officer. Apply this calendar to activities anticipated to be affected by weather.

e. Activity Duration: Define so no activity is longer than 14 days, except for non-construction activities including mobilization, shop drawings and submittals, fabrication and delivery of materials and equipment.

f. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 calendar days, as separate activities in the schedule. Procurement cycle activities can include submittals, approvals, purchasing, fabrication, and delivery.

g. Submittal Review Time: Include review and re-submittal times indicated. Coordinate submittal review times in Construction Baseline Schedule.

h. Substantial Completion: Allow time for Government administrative procedures necessary for certification of Substantial Completion. (For more information, refer to Specification 01 77 00 "Closeout Procedures.")

8. Constraints: Include constraints and work restrictions indicated in Contract Documents and as follows in schedule and show how the sequence of Work is affected.
   a. Phasing: Arrange list of activities on schedule by phase.
   b. Work under More Than One Contract: Include a separate activity for each contract.
   c. Work Restrictions: Show effect of the following on the schedule:
      1) Coordination with existing construction
      2) Limitations of continued occupancies
      3) Uninterruptible services
      4) Partial occupancy before Substantial Completion
      5) Use of premises restrictions
      6) Provisions for future construction
      7) Seasonal variations
      8) Environmental control
      9) Permit provisions
   d. Work Stages: Indicate important stages of construction for each major portion of the Work.
      1) Subcontract awards
      2) Submittals
      3) Purchases
      4) Deliveries
      5) Installation
      6) Tests and inspections
9. Milestones: Include milestones indicated in Contract Documents in schedule, including, but not limited to, Notice to Proceed, Substantial Completion

C. Joint Review, Revision, and Acceptance:

1. Within seven calendar days of receiving Contractor's proposed Construction Baseline Schedule, Contracting Officer shall review initial Construction Baseline Schedule.

2. Within seven calendar days after review, Contractor shall revise and resubmit Construction Baseline Schedule in accordance with comments presented from review.
3. In the event the Contractor fails to define any element of work, activity, or logic, and the Contracting Officer review does not detect this omission or error, such omission or error, when discovered by Contractor or Contracting Officer, shall be corrected by Contractor within seven calendar days and shall not affect contract period.
4. Upon acceptance of the Construction Baseline Schedule, Contracting Officer saves schedule as a baseline and updates on a monthly basis. Construction schedule update will be used to evaluate Contractor's monthly applications for payment based upon information developed at monthly Construction Schedule update meeting.

D. Cost Correlation: In the heading of the schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of Work performed as of dates used to prepare payment requests.

1. Contractor shall assign cost to construction activities on Construction Baseline Schedule. Costs shall not be assigned to submittal activities unless specified otherwise but may, with Contracting Officer’s approval, be assigned to fabrication and delivery activities. Costs shall be included for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training (if applicable).
2. Each activity cost shall reflect an accurate value based on the Contract Price Schedule.
3. Total cost assigned to activities shall equal total Contract Price.

E. Recovery Schedule: When periodic schedule update indicates Work is 14 or more calendar days behind current accepted schedule, a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule shall also be submitted. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery shall be accomplished.

F. Computer Software: Prepare schedules using a program developed specifically to manage construction schedules.

1. Use Microsoft Project or Primavera, for ____ (Windows 7 and newer.)

PART 3 EXECUTION

3.1 CONSTRUCTION SCHEDULE UPDATES

A. Progress Meeting Updates: Provide a 2 week look-ahead schedule, derived from the currently accepted schedule, before each weekly progress meeting. Utilize look-ahead schedule to facilitate and take notes on discussions held during progress meeting.

B. Monthly Schedule Updates:

1. General: Update Construction Schedule on monthly basis to reflect construction progress and activities throughout entire contract period and until project substantial completion. The status date of each schedule update shall be the 7th day preceding the progress payment request date.
2. Procedure: Contractor shall meet with Contracting Officer each month at Construction Schedule update meeting to review progress made through the status date of the Construction Schedule update, including dates activities were started or completed and

percentage of work completed on each activity started or completed.

3. Reports: Concurrent schedule revisions, prepare tabulated reports showing:
   a. Identification of activities that have changed
   b. Changes in early and late start dates
   c. Changes in early and late finish dates
   d. Changes in activity durations in workdays
   e. Changes in the critical path
   f. Changes in total float or slack time
   g. Changes in the Contract Time
4. Narrative: Report shall include a brief description of actual progress made during update period; actual and potential delaying activities; impediments to progress; issues related to inclement weather; progress toward established milestones and project float. Report shall include a brief description of work anticipated to be performed in the next month. Minor revisions to the schedule should be identified for evaluation and acceptance or rejection.
5. As Work progresses, indicate Actual Completion percentage for each activity.
6. If schedule update shows a late finish date after contract completion date, include:
   a. Known delays
   b. Actions to get back on schedule
   c. Pending modifications
   d. Impediments or constraints affecting progress
7. Progress Payments: Monthly updating of the currently accepted Construction Schedule shall be an integral part of the process upon which progress payments will be made. If Contractor fails to provide schedule updates or revisions, a portion of the monthly payment may be retained until corrections have been made.

C. Distribution: Distribute copies of accepted schedule to Contracting Officer, Contracting Officers Representative, Construction Management Representative, Subcontractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to same parties and post in same locations. Delete parties from distribution when they have completed their assigned portion of the Work.

D. Construction Schedule Revisions:

1. Required Revisions: If, as a result of the monthly schedule update, it appears the currently accepted Construction Schedule no longer represents actual prosecution and progress of the work, Contracting Officer will request, and Contractor shall submit, a revision to the Construction Schedule. Contractor may also request reasonable revisions to currently accepted Construction Schedule in event the Contractor's planning for the work is revised. If Contractor desires to make changes, Contractor shall notify Contracting Officer in writing, stating reason for proposed revision. Accepted revisions shall be incorporated into currently accepted Construction Schedule for next monthly schedule update.
2. Procedure: If revision to currently accepted Construction Schedule is contemplated, Contractor or Contracting Officer shall advise the other in writing at least seven calendar days prior to next monthly schedule update meeting, describing revision and reasons for the revision. Government-requested revisions will be presented in writing to the

Contractor, who shall respond in writing within seven calendar days.

3. Reports: Concurrent with making revisions to schedule, prepare tabulated reports showing:
   a. Identification of activities changed
   b. Changes in early and late start dates
   c. Changes in early and late finish dates
   d. Changes in activity durations in workdays
   e. Changes in critical path
   f. Changes in total float or slack time

3.2 TIME IMPACT ANALYSIS FOR CONTRACT MODIFICATIONS CHANGES DELAYS AND CONTRACTOR REQUESTS:

1. Requirements: When contract modifications or changes are initiated, delays experienced, or Contractor desires to revise currently accepted Construction Schedule, Contractor shall submit to Contracting Officer a written time impact analysis illustrating the influence of modification, change, delay, or Contractor request on contract time.
2. Time Extensions: Activity delays, resulting in a late completion date projection, shall not automatically mean an extension of contract time is warranted or due to Contractor. It is possible a modification, change, or delay will not affect existing critical path activities or cause non-critical activities to become critical. A modification, change, or delay may result in absorbing a part of available total float that may exist within an activity chain of the Schedule, not causing any effect on contract time. Time extensions will be granted in accordance with terms of contract.
3. Extension of contract time will be granted only to the extent the equitable time adjustments to activity or activities affected by modification, change, or delay exceeds total (positive or zero) float available on a particular activity.
4. Procedure: Each time impact analysis shall be submitted within time period stated in a request for proposal, or time period designated under the clauses entitled Changes or Default. In cases where Contractor does not submit a written request for extension of time and a time impact analysis within the designated time, it is mutually agreed that the particular modification, change, delay, or Contractor request does not require an extension of the contract time. Upon acceptance, time impact analysis shall be incorporated into currently accepted Construction Schedule at next monthly schedule update.
5. Contract Modifications: Prepare time-impact analysis using fragnets to demonstrate effect of proposed change on overall Construction Schedule for each proposed contract modification concurrent with submission.

END OF SECTION

SECTION 013233 - PHOTO DOCUMENTATION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for:

1. Existing condition images
2. Periodic construction images

B. See Section 01 77 00 "Closeout Procedures" for a complete listing of closeout documents.

C. See Section 01 79 00 "Demonstration and Training" for submitting videotapes of demonstration of equipment and training of National Park Service (NPS) personnel.

1.2 SUBMITTALS

A. Construction Images: Submit images electronically within seven days of taking the image. Include:

1. Date, time and number (sequentially number all images) in filename.
2. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
3. Submit digital images exactly as originally recorded in digital camera, without alteration, or modifications using image-editing software.

B. Closeout: Submit complete set of digital image electronic files as a Project Record Document. Submit on Digital Video Disc (DVD).

1. Provide index as separate file on Disc. List each image as a file name with number, date, and time. Include description and or vantage point image was taken.
2. Submit images that have the same aspect ratio as the sensor, un-cropped.

PART 2 PRODUCTS

2.1 FORMAT REQUIREMENTS

A. Media: DVD-R Archival Gold

B. Media Labels: Archival DVD labeling markers, archival labels, or direct print.

C. Images: Provide sRGB (standard Red Green Blue) color images in JPEG (Joint Photographic Experts Group) format. Minimum sensor size of 8 megapixels, and at image resolution of not less than 1600 by 1200, and 300 dpi (dots per inch).

PART 3 EXECUTION

3.1 CONSTRUCTION IMAGES

A. General: Take digital images using the maximum range of depth of field, in-focus, to clearly show the Work. No blurry or out-of-focus areas accepted.

1. Maintain index with each set of Construction images and identify the number, date, time, and description for each.
2. Maintain one set of images accessible in field office at Project site available for reference.

B. Existing Condition Images: Before commencement of excavation, take color digital images of Project site and surrounding properties, including existing items to remain during construction, from different vantage points.

1. Flag construction limits before recording construction images.
2. Take eight separate images to show existing conditions adjacent to property before starting Work.
3. Take eight separate images of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.

C. Periodic Construction Images: Take 12 color, digital images monthly, coinciding with cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last images were taken.

D. Additional Images: Contracting Officer may issue requests for additional images.

1. Three days advance, where feasible.
2. In emergency situations, take additional images within 24 hours of request.
3. Additional images include, but are not limited to:
    a. Immediate follow-up when on-site events result in construction damage or losses.
    b. Fabrication locations away from Project site.
    c. Substantial Completion of a major phase or component of Work.
    d. Extra record images at time of final acceptance.

END OF SECTION

SECTION 013323 - SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

A. Action Submittals: Written, graphic information, and physical samples that require Government's responsive action.

B. Informational Submittals: Written information that does not require Government's responsive action. Submittals may be rejected for not complying with requirements.

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 GENERAL SUBMITTAL PROCEDURES

A. General: Prepare and submit submittals required by individual Specification Sections and in some cases as requested in drawings. Types of submittals are indicated in individual specific sections.

1. Contracting Officer (CO) reserves right to require submittals in addition to those called for in individual sections.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Review for legibility, accuracy, completeness, and compliance with Contract Documents.

1. Coordinate 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 Work so processing will not be delayed because of need for concurrent review coordination.
    a. Contracting Officer reserves right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittal List: Submittal list is attached to the end of this Specification Section. The intent is to provide an overall summary of submittal requirements. The requirements of individual Specification Sections and terms and conditions of the Contract still apply regardless of what is shown on submittal list.

D. Processing Time: Allow time for submittal review, including time for re-submittals, as follows. Time for review shall commence when e-mail notification is received by Contracting Officer (or designee) indicating submittal has been posted on NPS management software website and is ready for review. When Contracting Officer has completed review, e-mail notification will be

sent to Contractor indicating submittal has been processed. No extension of Contract Time will be authorized because of failure to transmit submittals in advance of Work to permit processing, including re-submittals.

1. Action Submittals
   a. Initial Review: Allow 30 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required.
   b. Re-submittal Review: Allow 30 days for review of each re-submittal.
2. Informational submittals
   a. Review: Allow 10 days for review of each submittal.

E. Approved Equals:

1. For each item proposed as an "approved equal," submit supporting data, including:
   a. Drawings and samples as appropriate.
   b. Comparison of the characteristics of the proposed item with that specified.
   c. Changes required in other elements of the work because of the substitution.
   d. Name, address, and telephone number of vendor.
   e. Manufacturer's literature regarding installation, operation, and maintenance, including schematics for electrical and hydraulic systems, lubrication requirements, and parts lists. Describe availability of maintenance service, and state source of replacement materials.
2. A request for approval constitutes a representation that Contractor:
   a. Has investigated the proposed item and determined that it is equal or superior in all respects to that specified.
   b. Will provide the same warranties for the proposed item as for the item specified.
   c. Has determined that the proposed item is compatible with interfacing items.
   d. Will coordinate installation of an approved item and make changes required in other elements of the work because of the substitution.
   e. Waives claims for additional expenses that may be incurred as a result of the substitution.

F. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Transmittal Form (CM-16): All submittals shall be transmitted using National Park Service Transmittal Form (CM-16). The form can be downloaded from the DSC Workflows website's Submittal Review page and completed on the NPS/DSC management software website. No action will be taken on a submittal item unless accompanied by this Transmittal Form.
   a. Complete the general information at the top of form.
   b. Provide all required information based on submittal type
   c. Attach all related documents.
   d. Sign the Contractor section at bottom of the Transmittal Form (CM-16).
2. Physical samples: Complete Transmittal Form (CM-16) on the NPS/DSC management software website as described above. Deliver physical sample to the Contracting Officer (or designee) on site for processing. All comments and actions will be documented on the Transmittal Form (CM-16) on the NPS/DSC management software website.

G. Identification: Submittal number or other unique identifier, including revision identifier.

1. Submittal number shall use a sequential number (e.g. .001). Re-submittals shall include alphabetic suffix after another decimal point (e.g. .001.A).

H. Re-submittals: Make re-submittals using same process used with initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in the title block on the Transmittal Form (CM-16) and clearly indicate extent of revision.
3. Re-submit submittals until they are marked "Approved" or "Approved with notations".

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, and others as necessary for performance of construction activities.

J. Use for Construction: Use only final submittals with mark indicating "Approved" or "Approved with notations". Ensure notations have been incorporated and, at a minimum, keep one copy of final approved submittal on site for use during construction.

1.4 CONTRACTOR'S USE OF CAD/BIM FILES

A. General: At Contractor's written request, copies of CAD (Computer Aided Design)/BIM (Building Information Modeling) files will be provided to Contractor for Contractor's use in connection with Project, subject to:

1. Files provided as-is; no format or other changes to files or changes to objects in the drawing will be done by the Government.

PART 2 PRODUCTS

2.1 ACTION SUBMITTALS

A. 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 submittal to show which products and options are applicable.
3. As applicable, include:
   a. Manufacturer's product specifications.
   b. Manufacturer's installation instructions: When Contract Documents require compliance with manufacturer's printed instructions, provide one complete set of instructions to Contracting Officer and keep another complete set of instructions at the project site until substantial completion.
   c. Manufacturer's catalog cuts: Submit only pertinent pages; mark each page of standard printed data to identify specific products proposed for use.
   d. Wiring diagrams showing factory-installed wiring.
   e. Printed performance curves.
   f. Operational range diagrams.
   g. Compliance with specified referenced standards.
   h. Testing by recognized testing agency.
4. Submit product data in PDF (portable document format) file format before or concurrent with samples.

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

submittal of CAD/BIM Drawings is otherwise permitted.

1. Preparation: Fully illustrate requirements in Contract Documents. As applicable, include:
   a. Dimensions
   b. Identification of products
   c. Fabrication and installation drawings
   d. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring
   e. Schedules
   f. Notation of coordination requirements
   g. Notation of dimensions established by field measurement
   h. Relationship to adjoining construction clearly indicated
   i. Seal and signature of professional engineer if specified
   j. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring
2. Submit shop drawings as PDF electronic file

C. 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. Complete and post the Transmittal Form (CM-16) on the NPS/DSC management software website for processing and documentation of action on submitted samples.
3. Identification: Attach label on unexposed side of Samples that includes:
   a. Generic description of Sample
   b. Product name and name of manufacturer
   c. Sample source
   d. Submittal Number and title of appropriate Specification Section
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing full range of colors, textures, and patterns available.
   a. Number of Samples: Submit two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Contracting Officer will return 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: 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 four sets of Samples. Contracting Officer will retain three Sample sets; remainder will be returned. Retain sample set as a Project Record Sample.

D. Construction Materials: Contractor is encouraged to submit products made out of recycled or environmentally responsible material. Every effort will be made by National Park Service to approve these materials.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by individual Specification Sections.

1. Post informational submittals as PDF electronic files directly to the NPS management software website.
2. Certificates and Certifications: Provide a notarized statement with signature of entity responsible for preparing certification. Certificates and certifications shall be signed by officer or other individual authorized to sign documents on behalf of that entity.
3. Informational submittals that do not comply with requirements specified in Contract Documents will be rejected and one copy will be returned.

B. Coordination Drawings: Comply with requirements specified in Section 01 31 00 "Project Management and Coordination."

C. Contractors Construction Schedule: Comply with requirements specified in Section 01 32 16 "Construction Schedule."

D. Accident Prevention Plan: Comply with requirements specified in Section 01 35 23 "Safety Requirements."

E. Schedule of Values: Comply with requirements specified in Section 01 32 16 "Construction Schedule."

F. Waste Recycling Plan: Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."

G. Quality Control Plan: Comply with requirements specified in Section 01 40 00 "Quality Requirements."

H. Storm Water Pollution Prevention Plan: Comply with requirements specified in Section 01 57 23 "Temporary Storm Water Pollution Prevention" and storm water permit requirements identified in Section 01 31 00 "Project Management and Coordination."

I. Qualification Data: Prepare written information demonstrating capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

J. Installer Certificates: Prepare written statements on manufacturer’s letterhead certifying Installer complies with Contract Documents and, where required, is authorized by manufacturer for this specific Project.

K. Manufacturer Certificates: Prepare written statements on manufacturer’s letterhead certifying manufacturer complies with Contract Documents. Include evidence of manufacturing experience where required.

L. Product Certificates: Prepare written statements on manufacturer’s letterhead certifying product complies with Contract Documents.

M. Material Certificates: Prepare written statements on manufacturer’s letterhead certifying material complies with Contract Documents.

N. 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 in Contract Documents.

O. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

P. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

Q. 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 in Contract Documents.

R. 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.

S. 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 in Contract Documents.

T. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Section 01 78 23 "Operation and Maintenance Data."

U. Design Data: Prepare written and graphic information, including: 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.

V. Manufacturer's Instructions: Prepare written or published information documenting manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer.

W. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. As applicable, include:

1. Statement on condition of substrates and their acceptability for installation of product.
2. Summary of installation procedures being followed, compliance with requirements and, if not, what corrective action was taken.
3. Results of operational and other tests and a statement of whether observed performance complies with the requirements.

X. Permit Compliance Products: Prepare required information for compliance with permit provisions. Products include written notification of project startup, suspension, and completion

of work; photo documentation of site conditions; reports; and drawings.

PART 3 EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of Contract and for compliance with Contract Documents. Note corrections and field dimensions.

3.2 CONTRACTING OFFICER'S ACTION

A. General: Submittals will be disapproved without technical review if identification information is missing, not filled in, or if placed on back of submittal; an incorrect format of submittals is provided; transmittal form is incorrectly filled out; submittals are not coordinated; or submittals do not show evidence of Contractor's approval.

1. Any work done or orders for materials or services placed before approval shall be at Contractor's own risk.

B. Action Submittals: Contracting Officer will review each submittal, generate comments on corrections or modifications required, and indicate appropriate action on the Transmittal Form (CM-16). Submittal will be marked as defined below:

1. APPROVED: Acceptable with no corrections.
2. APPROVED WITH NOTATIONS: Minor corrections or clarifications required. Comments are clear and no further review is required. Contractor shall address review comments when proceeding with the work.
3. DISAPPROVED - RESUBMIT: Rejected as not in accordance with the contract or as requiring major corrections or clarifications. Contracting Officer will identify reasons for disapproval. Contractor shall revise and resubmit with changes clearly identified.

C. Informational Submittals: Contracting Officer will review each submittal and will either accept or reject it.

D. Partial submittals are not acceptable, will be considered non-responsive, and will be returned without review.

END OF SECTION

SECTION 013523 - SAFETY REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes establishing an effective accident prevention program and providing a safe working environment for personnel and visitors.

1.2 SUBMITTALS

A. Accident Prevention Plan (APP): Submit APP after contract award and before Pre-Construction conference. Contracting Officer (CO) will review proposed APP. If APP requires any revisions or corrections, Contractor shall resubmit Plan within 10 days. No progress payments will be made until the APP is accepted.

B. Severe Weather plan (SWP): After contract award and before the Pre-Construction conference, submit for review, a Severe Weather Plan. The Contracting Officer will review the proposed Plan. If the Plan requires any revisions or corrections, the Contractor shall resubmit the Plan within 10 days. No progress payments will be made until the Plan is accepted.

1. This area is prone to hurricanes and severe weather. The contractor is responsible for taking appropriate precautions and meeting all OSHA and Park safety standards with regards to inclement weather. The Park will provide a severe weather protocol and evacuation procedure to the contractor prior to beginning work. Hurricane season is considered June 1st through November 30th with the peak months being August, September, and October. The contractor is responsible for providing a hurricane plan that removing from or securing the project site to prevent items such as fencing, construction equipment, etc. f rom becoming airborne suring a severe weather event.

1.3 QUALITY ASSURANCE

A. Comply with contract clauses "Accident Prevention" and "Permits and Responsibilities." In case of conflicts between Federal, State, and local safety and health requirements, the most stringent shall apply. Onsite equipment shall meet 29 CFR 1926 (Code of Federal Regulations) (Occupational Safety and Health Administration (OSHA)) requirements. Failure to comply with requirements of this section and related sections may result in suspension of work.

B. Site Safety Supervisor:

1. Designate authorized onsite representative for preparation and maintenance of the APP.
2. Shall be responsible for:
    a. Implementation and enforcement of the APP
    b. Daily safety inspections
    c. Conducting and documenting weekly and monthly safety meetings
    d. Review of safety requirements at progress meetings
    e. Compilation and maintenance of Safety Data Sheets (SDS) and safety reference materials
    f. Tracking and resolution of safety violations
    g. Site personnel and visitor compliance with site safety and health requirements and APP
    h. Investigation and reporting of accidents and injuries

C. Qualifications of Employees:

1. Physically and able to perform their assigned duties in a safe manner.
2. Do not allow employees whose ability or alertness is impaired because of prescription or illegal drug use, fatigue, illness, intoxication, or other conditions that may expose themselves or others to injury to perform work.
3. Provide operating instructions for equipment. Operators of vehicles, hoisting equipment, and hazardous plant equipment shall be able to understand signs, signals, operating instructions, and be fully capable of operating such equipment. Retain copies of operator licenses and certifications onsite.

1.4 ACCIDENT REPORTING

A. Reportable Accidents: Defined as: death, occupational disease, and/or traumatic injury to employees or the public; fires; and/or property damage by accident in excess of $100.

1. Notify Contracting Officer immediately in the event of a reportable accident.
2. Fill out and forward an Accident/Property Damage Report Form (CM-22) to Contracting Officer within 7 days of a reportable accident. Obtain form from Contracting Officer.

1.5 RESOURCES

A. COVID-19 (Coronavirus Disease 2019) information provided below is not intended to provide a complete analysis of requirements for Contractor and is provided as a courtesy.

1. Coronoavirus.gov
2. Occupational Safety and Health Administration (United States Department of Labor) - COVID-19
3. Center for Disease Control (CDC)
   a. Get the Facts About Coronavirus
   b. What Construction Workers Need to Know about COVID-19
4. Federal Emergency Management Agency (FEMA) - Coronavirus (COVID-19) Response
5. National Park Service (NPS) - NPS Public Health Update

PART 2 PRODUCTS

2.1 ACCIDENT PREVENTION PLAN (APP)

A. APP shall be written to comply with OSHA and project requirements (generic plan is not acceptable) including but not limited to:

1. Name and qualifications of supervisor responsible to carry out program.
2. Weekly and monthly safety meetings shall be documented with topics and attendees.
3. First aid and rescue procedures.
4. Job Hazard Analysis (JHA) for each major phase. List of hazards associated and methods proposed to provide for property protection and safety of the public, National Park Service personnel, and Contractor's employees. Include initial and continuing training.
5. Planning for possible emergency situations, as detailed in Article 1.2. Such planning shall take nature of construction, site conditions, and degree of exposure of persons and property into consideration.
6. Infectious Disease Preparedness:
   a. Contractors are responsible for their employees' safety and the safety of job site visitors during the performance of this contract. We encourage Contractors to follow

guidance from the Department of Labor (DOL), Occupational Safety and Health Administration (OSHA), the Centers for Disease Control and Prevention (CDC), and all other applicable local, city, and state mandates. We encourage Contractors to develop policies for infection prevention and an Infectious Disease Preparedness and Response Plan.

b. To the extent appropriate, Contractors should include the protective health and safety measures they intend to implement in any accident prevention or safety submittals required under this contract. These plans should contain preventive measures the Contractor intends to follow while performing work on government property as well as responsive and corrective actions to be taken if an employee exhibits symptoms or tests positive for contagion.

c. Upon contract award, Contractors should communicate with Contracting Officer regarding Contractor decisions and actions to protect the health and safety of workers for the duration of contract performance under which pandemic conditions exist.

2.2 SEVERE WEATHER PLAN (SWP)

A. The Plan shall be written to work within timelines for evacuation and securement of equipment and materials stored on-site buildings provided by Gulf Islands National Seashore. The barrier island is prone to flooding from the Gulf side which could adversely impact access by land to materials and equipment stored on-site for days or perhaps even weeks or months at a time dependent upon severity and disruption of NPS operations.

2.3 FIRST AID FACILITIES

A. Provide adequate facilities for number of employees and appropriate to construction hazards.

2.4 PERSONNEL PROTECTIVE EQUIPMENT (PPE)

A. Selection shall conform to OSHA Subpart E.

PART 3 EXECUTION

3.1 DAILY SAFETY INSPECTIONS

A. Conduct daily safety inspections and maintain daily safety reports which include:

1. Area/operation inspected
2. Date of inspection
3. Identified hazards
4. Corrective actions taken

3.2 EMERGENCY INSTRUCTIONS

A. Post telephone numbers and reporting instructions for ambulance, physician, hospital, fire department, and police in conspicuous locations at work site.

3.3 FIRE AND LIFE SAFETY

A. Comply with requirements of National Fire Protection Association (NFPA) 241 (Standard for Safeguarding Construction, Alteration, and Demolition Operations).

3.4 HAZARDOUS MATERIALS

A. Hazardous materials: Explosive, flammable, poisonous, corrosive, oxidizing, irritating, or otherwise harmful substances that could cause death or injury.

B. Store hazardous materials in accordance with manufacturer's and OSHA Subpart D requirements. Maintain Safety Data Sheets (SDS) for each chemical readily available on site.

1. Immediately report spills of hazardous materials to the Park.
2. Maintain a spill emergency response kit.
3. Train employees how to respond to a spill and use emergency response kit.

3.5 PROTECTIVE EQUIPMENT

A. Inspect personal protective equipment daily and maintain in a serviceable condition. Clean, sanitize, and repair personal items as appropriate before issuing to another individual.

3.6 SAFETY MEETINGS

A. As a minimum, conduct one weekly 15-minute "toolbox" safety meeting conducted by a foreman or supervisor and attended by construction personnel at worksite. Topics shall coincide with work scheduled for following week. Document and submit meeting minutes to Contracting Officer within one day after meeting.

B. Conduct monthly safety meetings for personnel, contractors, and subcontractors performing work on the site. Notify Contracting Officer of meeting dates and times. Meetings shall be used to: review effectiveness of Contractor's safety effort; resolve current health and safety problems; provide a forum for planning safe construction activities, and for updating Accident Prevention Plan. Contracting Officers Representative will attend meetings and enter results of meetings into the daily log.

3.7 HARD HATS AND PROTECTIVE EQUIPMENT AREAS

A. A hard hat use area shall be designated by Contractor. Hard hat area shall be posted by Contractor in a manner satisfactory to Contracting Officer.

B. It is Contractor's responsibility to require persons working on or visiting site to wear hard hats and PPE in good repair at all times. As a minimum, maintain six hard hats and other APP required equipment.

3.8 TRAINING

A. First Aid: Provide training to personnel to ensure prompt and efficient first aid.

B. Hazardous Material: Train and instruct each employee exposed to hazardous material in safe and approved methods of handling and storage.

END OF SECTION

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

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

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements. Quality of work shall be responsibility of the Contractor.

1. Specified tests, inspections, and related actions do not limit Contractor's other quality assurance and control procedures that facilitate compliance with Contract Document requirements.

C. See Divisions 2 through 49 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

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

B. Quality Control Services: Tests, inspections, procedures, and related actions during and after execution of the work to evaluate actual products incorporated into the work and completed construction comply with requirements.

C. Preconstruction Testing: Tests and inspections performed specifically for project before products and materials are incorporated into work to verify performance or compliance with specified criteria.

D. Product Testing: Tests and inspections performed by a Nationally Recognized Testing Laboratory (NRTL), a National Voluntary Laboratory Accreditation Program (NVLAP), or a testing agency qualified to conduct product testing, to establish product performance and compliance with industry standards.

E. Source Quality Control Testing: Tests and inspections performed at the source, i.e., plant, mill, factory, or shop.

F. Field Quality Control Testing: Tests and inspections performed on-site for installation of work and for completed work.

G. Testing Agency or Laboratory: Entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

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

1. Using a term such as "carpentry" does not imply 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 corresponding generic name.

1.3 CONFLICTING REQUIREMENTS

A. Reference Standards: If compliance with two or more standards is specified and standards establish different or conflicting requirements for minimum quality levels, comply with most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Contracting Officer before proceeding.

B. Minimum Quality Levels: Quality level shown or specified shall be minimum provided or performed. Actual installation may comply exactly with minimum quality specified, or it may exceed minimum within reasonable limits. To comply with requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Contracting Officer before proceeding.

1.4 SUBMITTALS

A. Quality Control Plan:

1. After contract award and before Pre-Construction conference, submit a written Contractor Quality Control (CQC) plan.
2. If plan requires revisions or corrections, Contractor shall resubmit plan within 10 days.
3. Government reserves the right to require changes in plan during contract period as necessary to obtain the quality specified.
4. No change in the approved plan may be made without written concurrence by Contracting Officer.

B. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in form of a recent report on inspection of testing agency by a recognized authority.

C. Contractor Quality Control (CQC) Daily Reports: Submit showing inspections and tests on first workday following date covered by report. Quality Control Supervisor shall utilize DSC Forms.

1. Review Construction Management Representative (CMR) Daily report if applicable and reconcile any differences prior to posting.

D. Test Reports

1. Test reports shall be completed by person performing test.
2. Submit Daily Test Information Sheets with Quality Control Daily Reports.
3. Submit failing test results and proposed remedial actions within four hours of noted deficiency.
4. Submit three copies of complete test results no later than one calendar day after test was performed.

E. Off-Site Inspection Reports: Submit prior to shipment.

F. If Contractor Quality Control plan and Quality Control Daily Reports are not submitted as specified, Contracting Officer may retain payments until such time plan(s) is/are accepted and implemented, or may retain payments for work completed on days with no Quality Control Daily Reports.

G. Permits, Licenses, and Certificates: For National Park Service (NPS) 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 work.

1.5 QUALITY ASSURANCE

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

B. Contractors Quality Control Staff:

1. Contractor's Quality Control Supervisor may also perform other duties.
2. Contractor's Quality Control Supervisor shall be assigned no other duties.
3. Contractor's designated Quality Control Supervisor shall be on the project site whenever contract work is in progress.
4. Contractor's job supervisory staff may be used to assist Quality Control Supervisor supplemented, as necessary, by additional certified testing technicians.

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

D. Manufacturer Qualifications: Firm experienced in manufacturing products or systems similar to those indicated for Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

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

F. Professional Engineer Qualifications: Professional engineer legally qualified to practice in jurisdiction where Project is located and is experienced in providing engineering services of kind indicated (including Structural Tests and Special Inspections (STSI)). Engineering services are defined as those performed for installations of system, assembly, or products similar to those indicated for Project in material, design, and extent.

G. Testing Agency Qualifications: A Nationally Recognized Testing Laboratory (NRTL), a National Voluntary Laboratory Accreditation Program (NVLAP), or an independent agency with experience and capability to conduct testing and inspecting indicated, according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by Contract, is acceptable to Contracting Officer.

1. Nationally Recognized Testing Laboratory (NRTL): Nationally recognized testing laboratory according to 29 CFR 1910.7 (Code of Federal Regulations).
2. National Voluntary Laboratory Accreditation Program (NVLAP): Testing agency accredited according to National Institute of Standards and Technology’s (NIST) National Voluntary Laboratory Accreditation Program.
3. Measuring devices, laboratory equipment, and instruments shall be calibrated at established intervals against certified standards in accordance with NIST requirements. Measuring and testing devices shall be made available for use by Government for verification tests.

1.6 QUALITY CONTROL

A. Contractor is responsible for testing and inspections, including Structural Tests and Special Inspections (STSI), as identified in attached STSI. Inspect and test work as needed to ensure quality of materials, workmanship, construction, finish, and functional performance are in

compliance with applicable specifications, drawings, and those required by the Building Code.

1. Engage qualified testing agency to perform quality-control services.
2. Submit appropriate report for each quality-control service.
3. Testing and inspecting requested by Contractor and not required by Contract Documents are Contractor's responsibility.
4. Contracting Officer may designate test locations.

B. Manufacturer's Field Services: Where indicated, engage factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

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

D. Testing Agency Responsibilities: Cooperate with NPS and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Contracting Officer and Contractor promptly of irregularities or deficiencies observed in work during performance of services.
2. Determine location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections, State in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit 3 copies of certified written report of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase Contract Document requirements or approve or accept any portion of Work.

E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide:

1. Access to Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for material mixes that require control by testing agency.
7. Security and protection for samples and testing and inspecting equipment at Project site.

F. Coordination: Coordinate sequence of activities to accommodate required quality assurance and control services with minimum delay and to avoid removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 PRODUCTS

2.1 QUALITY CONTROL PLAN

A. Quality Control Plan shall include:

1. List of personnel responsible for quality control and assigned duties. Include each person's qualifications. Include alternate(s) and qualifications.
2. Copy of letter of direction to Contractor's Quality Control Supervisor(s) outlining assigned duties and authorities designated by principal or owner.
3. Names, qualifications / accreditations, and descriptions of laboratories to perform sampling and testing, and samples of proposed report forms from laboratories.
4. Methods of performing, documenting, and enforcing quality control of work including Contractor report forms and acknowledgment of NPS forms.
5. Methods of monitoring and controlling environmental pollution and contamination as required by regulations and laws.
6. Specific discussion regarding mockups, off-site visits, receiving inspections, manufacturers representation, startup requirements, and other aspects of performance specific to Project.
7. Provisions for substantial completion(s) and final inspection(s) per Contract.

PART 3 EXECUTION

3.1 OFF-SITE CONTROL

A. Items fabricated or assembled off-site shall be inspected for quality control at place of fabrication.

3.2 ON-SITE CONTROL

A. Notification:

1. Notify Contracting Officer at least 48 hours in advance of preparatory phase meeting.
2. Notify Contracting Officer at least 24 hours in advance of initial and follow-up phases.

B. Preparatory Phase: Perform before beginning each feature of work.

1. Review control submittal requirements with personnel directly responsible for quality assurance and quantity control of the work. As a minimum, Contractor's Quality Control Supervisor and foreman responsible for feature of work shall be in attendance.
2. Review applicable specifications sections and drawings related to feature of work.
3. Ensure copies of referenced standards related to sampling, testing, and execution for feature of work are available on site.
4. Ensure provisions have been made for field control testing.
5. Examine work area to ensure preliminary work has been completed.
6. Verify field dimensions and advise Contracting Officer of discrepancies with contract documents.
7. Ensure necessary equipment and materials are at project site and they comply with approved shop drawings and submittals.
8. Document preparatory phase activities and discussions on Contractor's Quality Control Daily Report.

C. Initial Phase:

1. As soon as work begins, inspect and test representative portion of particular feature of work for quality of workmanship.
2. Review control testing procedures to ensure compliance with contract requirements.

3. Document initial phase activities and discussions on Contractor's Quality Control Daily Report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.

D. Follow-Up Phase: Inspect and test as work progresses to ensure compliance with contract requirements until completion of work.

E. Additional Preparatory and Initial Phases: Additional preparatory and initial phases may be required on same feature of work for following reasons:

1. Quality of on-going work is unacceptable.
2. Changes in quality control staff, on-site production supervision, or work crew.
3. Work on particular feature of work is resumed after substantial period of inactivity.

3.3 DOCUMENTATION

A. Maintain Quality Control Daily Reports, Daily Test Report Information Sheets, and Accessibility Inspection Reports of quality control activities and tests. (Download from DSC Workflows website > Forms/Templates/Samples/Guidelines page > Construction Forms section.)

B. Quality Control Daily Reports shall not be substituted for other written reports required under clauses of contract, such as Disputes, Differing Site Conditions, or Changes.

3.4 ENFORCEMENT

A. Contractor shall stop work on any item or feature pending satisfactory correction of deficiency noted by quality control staff or Contracting Officer.

3.5 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. Restore patched areas and extend restoration into adjoining areas with durable seams as invisible as possible.

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.

END OF SECTION

SECTION 014200 - REFERENCE STANDARDS

PART 1 GENERAL

1.1 ENVIRONMENTAL DEFINITIONS

A. Definitions pertaining to sustainable development: As defined in ASTM E2114 and as specified herein.

B. Biobased Materials: As defined in the Farm Security and Rural Investment Act, for purposes of Federal procurement of biobased products, "biobased" means a "commercial or industrial product (other than food or feed) that is composed, in whole or in significant part, of biological products or renewable domestic agricultural materials (including plant, animal, and marine materials) or forestry materials." Biobased materials also include fuels, chemicals, building materials, or electric power or heat produced from biomass as defined by The Biomass Research and Development Act of 2000.

1. Biobased content: Amount of biobased carbon in the material or product as a percentage of weight (mass) of total organic carbon in the material or product.

C. Chain-of-Custody: Process whereby a product or material is maintained under physical possession or control during its entire life cycle.

D. Deconstruction: Disassembly of buildings for purpose of recovering materials.

E. DFE (Design for the Environment): A technique that includes elements of resource conservation and pollution prevention as applied in various product sectors. A technique that incorporates approaches which are part of product (or assembly) concept, need and design. Considerations involve material selection, material and energy efficiency, reuse, maintainability and design for disassembly and recyclability. Refer to International Organization for Standardization (ISO) Guide 64 for additional clarification.

F. Environmentally preferable products: Products and services that have a lesser or reduced effect on the environment in comparison to conventional products and services. Refer to EPA's Final Guidance on Environmentally Preferable Purchasing Program.

G. Non-Renewable Resource: A resource that exists in a fixed amount that cannot be replenished on a human time scale. Non-renewable resources have potential for renewal only by geological, physical, and chemical processes taking place over of millions of years. Examples include iron ore, coal, and oil.

H. Perpetual Resource: A resource that is virtually inexhaustible on a human time scale. Examples include solar energy, tidal energy, and wind energy.

I. Recycled Content Materials: Products that contain pre-consumer or post-consumer materials as all or part of their feedstock. Recycled content claim shall be consistent Federal Trade Commission (FTC) Guide for Use of Environmental Marketing Claims.

J. Renewable Resource: A resource that is grown, naturally replenished, or cleansed, at a rate which exceeds depletion of the usable supply of that resource. A renewable resource can be exhausted if improperly managed. However, a renewable resource can last indefinitely with proper stewardship. Examples include trees in forests, grasses in grasslands, and fertile soil.

1.2 QUALITY ASSURANCE

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into Contract Documents to the extent referenced. Such standards are made a part of Contract Documents by reference.

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

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

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless Contract Documents include more stringent requirements, applicable construction industry standards have same force and effect as if bound or copied directly into Contract Documents to the extent referenced. Such standards are made a part of Contract Documents by reference.

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

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities found in Section 01 42 00 Sources for Reference Publications, Unified Facilities Guide Specifications (UFGS) (accessible via Masters website > Downloads section > click on UFGS Master (WBDG Website). Names, telephone numbers, and websites are subject to change and are believed to be accurate and up-to-date as of date of Contract Documents.

XX	EXAMPLE Association (The)
	www.EXAMPLE.org

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

DIN	Deutsches Institut fur Normung e.V. www.din.de	49 30 2601-3003

IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICC	International Code Council www.iccsafe.org	(888) 422-7233
ICC-ES	ICC Evaluation Service, Inc. icc-es.org	(800) 423-6587 (562) 699-0543

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

ABA & ABAAS United States Access Board	Architectural Barriers Act (ABA) Architectural Barriers Act Accessibility Standards (ABAAS) www.access-board.gov
CoE	Army Corps of Engineers
	www.usace.army.mil
CPSC	Consumer Product Safety Commission
	www.cpsc.gov
DOC	Department of Commerce
	www.commerce.gov
DOD	Department of Defense
	www.defense.gov
DOJ	Department of Justice
	www.justice.gov
DOE	Department of Energy
	www.energy.gov
EPA	Environmental Protection Agency
	www.epa.gov
FAA	Federal Aviation Administration
	www.faa.gov

FCC	Federal Communications Commission
	www.fcc.gov
FDA	Food and Drug Administration
	www.fda.gov
GSA	General Services Administration
	www.gsa.gov
HUD	Department of Housing and Urban Development
	www.hud.gov
LBL	Lawrence Berkeley National Laboratory
	www.lbl.gov
NCHRP	National Cooperative Highway Research Program
	(See TRB (Transportation Resource Board))
NIST	National Institute of Standards and Technology
	www.nist.gov
OSHA	Occupational Safety & Health Administration
	www.osha.gov
PHS	U.S. Department of Health and Human Services
	www.hhs.gov
RUS	Rural Utilities Service
	(See USDA (Department of Agriculture))
SD	State Department
	www.state.gov
TRB	Transportation Research Board
	www.nationalacademies.org/trb/transportation-research-board
USDA	Department of Agriculture
	www.usda.gov

USP	U.S. Pharmacopeia
	www.usp.org
USPS	Postal Service
	www.usps.com

D. 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 following list. Names, telephone numbers, and websites are subject to change and are believed to be accurate and up-to-date as of date of Contract Documents.

ABAAS	Architectural Barriers Act Accessibility Standards www.access-board.gov
CFR	Code of Federal Regulations Available from Government Printing Office www.govinfo.gov/app/collection/cfr
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point www.dsp.dla.mil/Specs-Standards/
DSCC	Defense Supply Center Columbus (See FS (Federal Specification))
FED-STD	Federal Standard (See FS (Federal Specification))
FS	Federal Specification Available from Department of Defense Single Stock Point www.dsp.dla.mil/Specs-Standards/ Available from General Services Administration www.gsa.gov Available from National Institute of Building Sciences www.nibs.org
FTMS	Federal Test Method Standard (See FS (Federal Specification))
MIL	(See MILSPEC (Military Specification and Standards))
MIL-STD	(See MILSPEC (Military Specification and Standards))

MILSPEC	Military Specification and Standards Available from Department of Defense Single Stock Point www.dsp.dla.mil/Specs-Standards/
UFAS	Uniform Federal Accessibility Standards Available from Access Board www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-aba-standards/ufas (UFAS is only for housing projects per Fair Housing Act. See also the Fair Housing Act Design Manual, www.huduser.gov/portal/publications/destech/fairhousing)

1.5 ENVIRONMENTAL REFERENCE STANDARDS

A. American Forest and Paper Association:

1. Sustainable Forestry Initiative

B. American Society of Heating Refrigerating and Air Conditioning Engineers (ASHRAE):

1. ASHRAE 52.2, Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size
2. ASHRAE 55, Thermal Environmental Conditions for Human Occupancy
3. ASHRAE 62.1, Ventilation for Acceptable Indoor Air Quality
4. ASHRAE 62.2, Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings
5. ASHRAE/IESNA 90.1, Energy Standard for Buildings, Except Low-Rise Residential Buildings
6. ASHRAE 90.2, Energy Efficient Design of Low-Rise Residential Buildings

C. American Association of State Highway and Transportation Officials (AASHTO):

1. M288 Geotextile Specification for Highway Applications
2. MP009-06 Standard Specification for Compost for Erosion/Sediment Control (Filter Berms and Filter Socks)
3. MP010-03 Standard Specification for Compost for Erosion/Sediment Control (Compost Blankets)

D. American Society for Testing and Materials International (ASTM):

1. A478 Standard Specification for Chromium-Nickel Stainless Steel Weaving and Knitting Wire
2. A580/A580M Standard Specification for Stainless Steel Wire
3. A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
4. B813 Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
5. C1240 Standard Specification for Silica Fume Used in Cementitious Mixtures

6. C128 Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate
7. C131 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
8. C1319 Standard Specification for Concrete Grid Paving Units
9. C1338 Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings
10. C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
11. C1371 Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers
12. C1386 Standard Specification for Precast Autoclaved AERATED Concrete (PAAC) Wall Construction Units
13. C1483 Standard Specification for Exterior Solar Radiation Control Coatings on Buildings
14. C1549 Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer
15. C1601 Standard Test Method for Field Determination of Water Penetration of Masonry Wall Surfaces
16. C289 Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
17. C311 Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland-Cement Concrete
18. C33 Standard Specification for Concrete Aggregates
19. C593 Standard Specification for Fly Ash and Other Pozzolans for Use With Lime
20. C595 Standard Specification for Blended Hydraulic Cements
21. C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
22. C67 Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
23. C739 Standard Specification for Cellulosic Fiber (Wood-Base) Loose-Fill Thermal Insulation
24. C936 Standard Specification for Interlocking Concrete Paver Units
25. C989 Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
26. D1435 Standard Practice for Outdoor Weathering of Plastics
27. D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 foot pound force per cubic foot (ft-lbf/ft3) (2,700 kilonewton meter per cubic meter (kN-m/m3))
28. D1972 Standard Practice for Generic Marking of Plastic Products
29. D198 Standard Test Methods of Static Tests of Lumber in Structural Sizes
30. D2103 Standard Specification for Polyethylene Film and Sheeting
31. D217 Standard Test Methods for Cone Penetration of Lubricating Grease
32. D2369 Standard Test Method for Volatile Content of Coatings
33. D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
34. D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method

35. D3792 Standard Test Method for Water Content of Coatings by Direct Injection Into a Gas Chromatograph
36. D3864 Standard Guide for Continual On-Line Monitoring Systems for Water Analysis
37. D3960 Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
38. D4017 Standard Test Method for Water in Paints and Paint Materials by Karl Fischer Method
39. D4263 Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
40. D4444 Standard Test Methods for Use and Calibration of Hand-Held Moisture Meters
41. D4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity
42. D4552 Standard Practice for Classifying Hot-Mix Recycling Agents
43. D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
44. D4716 Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
45. D4833 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Product
46. D4840 Standard Guide for Sampling Chain-of-Custody Procedures
47. D4887 Standard Test Method for Preparation of Viscosity Blends for Hot Recycled Bituminous Materials
48. D5106 Standard Specification for Steel Slag Aggregates for Bituminous Paving Mixtures
49. D5116 Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products
50. D5199 Standard Test Method for Measuring the Nominal Thickness of Geosynthetics
51. D5261 Standard Test Method for Measuring Mass per Unit Area of Geotextiles
52. D5268 Standard Specification for Topsoil Used for Landscaping Purposes
53. D5359 Standard Specification for Glass Cullet Recovered from Waste for Use in Manufacture of Glass Fiber
54. D5505 Standard Practice for Classifying Emulsified Recycling Agents
55. D5509 Standard Practice for Exposing Plastics to a Simulated Compost Environment
56. D5512 Standard Practice for Exposing Plastics to a Simulated Compost Environment Using an Externally Heated Reactor
57. D5539 Standard Specification for Seed Starter Mix
58. D5957 Standard Guide for Flood Testing Horizontal Waterproofing Installations
59. D5603 Standard Classification for Rubber Compounding Materials—Recycled Vulcanizate Particulate Rubber
60. D5663 Standard Guide for Validating Recycled Content in Packaging Paper and Paperboard
61. D5759 Standard Guide for Characterization of Coal Fly Ash and Clean Coal Combustion Fly Ash for Potential Uses
62. D5792 Standard Practice for Generation of Environmental Data Related to Waste Management Activities: Development of Data Quality Objectives
63. D5834 Standard Guide for Source Reduction Reuse, Recycling, and Disposal of Solid and Corrugated Fiberboard (Cardboard)
64. D5851 Standard Guide for Planning and Implementing a Water Monitoring Program

65. D5852 Standard Test Method for Erodibility Determination of Soil in the Field or in the Laboratory by the Jet Index Method
66. D6002 Standard Guide for Assessing the Compostability of Environmentally Degradable Plastics
67. D6006 Standard Guide for Assessing Biodegradability of Hydraulic Fluid
68. D6007 Standard Test Method for Determining Formaldehyde Concentration in Air from Wood Products Using a Small Scale Chamber
69. D6046 Standard Classification of Hydraulic Fluids for Environmental Impact
70. D6081 Standard Practice for Aquatic Toxicity Testing of Lubricants: Sample Preparation and Results Interpretation
71. D6108 Standard Test Method for Compressive Properties of Plastic Lumber and Shapes
72. D6109 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastic Lumber
73. D6112 Standard Test Methods for Compressive and Flexural creep and Creep-Rupture of Plastic Lumber and Shapes
74. D6117 Standard Test Methods for Mechanical Fasteners In Plastic Lumber and Shapes
75. D6155 Standard Specification for Nontraditional Coarse Aggregates for Bituminous Paving Mixtures
76. D6245 Standard Guide for Using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation
77. D6261 Standard Specification for Extruded and Compression Molded Basic Shapes Made from Thermoplastic Polyester (TPES)
78. D6262 Standard Specification for Extruded, Compression Molded, and Injection Molded Basic Shapes of Poly(aryl ether ketone) (PAEK)
79. D6270 Standard Practice for Use of Scrap Tires in Civil Engineering Applications
80. D6329 Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers
81. D6330 Standard Practice for Determination of Volatile Organic Compounds (Excluding Formaldehyde) Emissions from Wood-Based Panels Using Small Environmental Chambers Under Defined Test Conditions
82. D6345 Standard Guide for Selection of Methods for Active, Integrative Sampling of Volatile Organic Compounds in Air
83. D6400 Standard Specification for Compostable Plastics
84. D6435 Standard Test Method for Shear Properties of Plastic Lumber and Plastic Lumber Shapes
85. D6629 Standard Guide for Selection of Methods for Estimating Soil Loss by Erosion
86. D6662 Standard Specification for Polyolefin-Based Plastic Lumber Decking Boards
87. D6712 Standard Specification for Ultra-High-Molecular-Weight Polyethylene (UHMW-PE) Solid Plastic Shapes
88. D6886 Standard Test Method for Speciation of the Volatile Organic Compounds (VOCs) in Low VOC Content Waterborne Air-Dry Coatings by Gas Chromatography
89. D692 Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures
90. D696 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer
91. D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3))

92. D7186 Standard Practice for Quality Assurance Observation of Roof Construction and Repair
93. E1021 Standard Test Methods for Measuring Spectral Response of Photovoltaic Cells
94. E1038 Standard Test Method for Determining Resistance of Photovoltaic Modules to Hail by Impact with Propelled Ice Balls
95. E1039 Standard Test Method for Calibration of Silicon Non-Concentrator Photovoltaic Primary Reference Cells Under Global Irradiation
96. E1040 Standard Specification for Physical Characteristics of Nonconcentrator Terrestrial Photovoltaic Reference Cells
97. E1105 Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference
98. E1171 Standard Test Method for Photovoltaic Modules in Cyclic Temperature and Humidity Environments
99. E1333 Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Under Defined Test Conditions Using a Large Chamber
100. E1362 Standard Test Method for Calibration of Non-Concentrator Photovoltaic Secondary Reference Cells
101. E1433 Standard Guide for Selection of Standards on Environmental Acoustics
102. E1462 Standard Test Methods for Insulation Integrity and Ground Path Continuity of Photovoltaic Modules
103. E1596 Standard Test Methods for Solar Radiation Weathering of Photovoltaic Modules
104. E1597 Standard Test Method for Saltwater Pressure Immersion and Temperature Testing of Photovoltaic Modules for Marine Environments
105. E1609 Standard Guide for Development and Implementation of a Pollution Prevention Program
106. E1686 Standard Guide for Selection of Environmental Noise Measurements and Criteria
107. E1690 Standard Test Method for Determination of Ethanol Extractives in Biomass
108. E1721 Standard Test Method for Determination of Acid-Insoluble Residue in Biomass
109. E1755 Standard Test Method for Ash in Biomass
110. E1758 Standard Test Method for Determination of Carbohydrates in Biomass by High Performance Liquid Chromatography
111. E1780 Standard Guide for Measuring Outdoor Sound Received from a Nearby Fixed Source
112. E1799 Standard Practice for Visual Inspections of Photovoltaic Modules
113. E1802 Standard Test Methods for Wet Insulation Integrity Testing of Photovoltaic Modules
114. E1821 Standard Test Method for Determination of Carbohydrates in Biomass by Gas Chromatography
115. E1827 Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door
116. E1830 Standard Test Methods for Determining Mechanical Integrity of Photovoltaic Modules
117. E1861 Standard Guide for Use of Coal Combustion By-Products in Structural Fills

118. E1918 Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field
119. E1971 Standard Guide for Stewardship for the Cleaning of Commercial and Institutional Buildings
120. E1980 Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces
121. E1991 Standard Guide for Environmental Life Cycle Assessment of Building Materials/Products
122. E2047 Standard Test Method for Wet Insulation Integrity Testing of Photovoltaic Arrays
123. E2114 Standard Terminology for Sustainability Relative to the Performance of Buildings
124. E2128 Standard Guide for Evaluating Water Leakage of Building Walls
125. E2129 Standard Practice for Data Collection for Sustainability Assessment of Building Products
126. E2397 Standard Practice for Determination of Dead Loads and Live Loads associated with Green Roof Systems
127. E2398 Standard Test Method for Water Capture and Media Retention of Geocomposite Drain Layers for Green Roof Systems
128. E2399 Standard Test Method for Maximum Media Density for Dead Load Analysis of Green Roof Systems
129. E2400 Standard Guide for Selection, Installation, and Maintenance of Plants for Green Roof Systems
130. E241 Standard Guide for Limiting Water-Induced Damage to Buildings
131. E2432 Standard Guide for General Principles of Sustainability Relative to Buildings
132. E408 Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques
133. E413 Standard Classification for Rating Sound Insulation
134. E477 Standard Test Method for Measuring Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers
135. E648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
136. E683 Standard Practice for Installation and Service of Solar Space Heating Systems for One- and Two-Family Dwellings
137. E779 Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
138. E781 Standard Practice for Evaluating Absorptive Solar Receiver Materials When Exposed to Conditions Simulating Stagnation in Solar Collectors With Cover Plates
139. E782 Standard Practice for Exposure of Cover Materials for Solar Collectors to Natural Weathering Under Conditions Simulating Operational Mode
140. E823 Standard Practice for Nonoperational Exposure and Inspection of a Solar Collector
141. E881 Standard Practice for Exposure of Solar Collector Cover Materials to Natural Weathering Under Conditions Simulating Stagnation Mode
142. E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
143. E903 Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres
144. E948 Standard Test Method for Electrical Performance of Photovoltaic Cells Using Reference Cells Under Simulated Sunlight

145. F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
146. F2034 Standard Specification for Sheet Linoleum Floor Covering
147. F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

E. Bat Conservation International:

1. Bat Approved Bat Houses

F. Carpet and Rug Institute

1. Green Label & Green Label Plus Testing Programs, carpet-rug.org/testing/green-label-plus

G. Center for Resource Solutions

1. Green-e program

H. Environmental Protection Agency (EPA):

1. Comprehensive Procurement Guidelines
2. ENERGY STAR
3. Environmentally Preferable Purchasing Program Final Guidance
4. GreenScapes program
5. Heat Island Initiative
6. Indoor Air Quality Building Education and Assessment Model (I-BEAM)
7. National Environmental Performance Track
8. Pollution Prevention (P2)
9. Product Stewardship Program
10. Significant New Alternatives Policy (SNAP) Program

I. Federal Trade Commission:

1. Guide for the Use of Environmental Marketing Claims

J. Forest Stewardship Council:

1. Chain-Of-Custody
2. Forest Management

K. Green Building Initiative (GBI):

1. Green Globes - US

L. Green Seal:

1. GC-03 Anti-Corrosive Paints
2. GC-12 Occupancy Sensors
3. GC-13 Split-Ductless Air-Source Heat Pumps
4. GS-05 Compact Fluorescent Lamps
5. GS-11 Paints
6. GS-13 Windows
7. GS-14 Window Films
8. GS-31 Electric Chillers
9. GS-32 Photovoltaic Modules
10. GS-36 Commercial Adhesives

11. GS-37 Industrial & Institutional Cleaners

M. International Iron and Steel Institute:

1. CO2 Breakthrough Program

N. International Organization of Standardization:

1. Guide 64; Guide for Inclusion of Environmental Aspects in Product Standards
2. 9660 Information processing -- Volume and file structure of CD-ROM for information interchange
3. 14001 Environmental management systems – Specification with guidance for use
4. 14004 Environmental Management Systems – General Guidelines on Principles, Systems and Supporting Techniques
5. 14020 Environmental labels and declarations – General principles
6. 14024 Environmental labels and declarations – Type I environmental labelling - Principles and procedures
7. 14040 Environmental management – Life cycle assessment – Principles and framework

O. National Association of Home Builders:

1. Advanced Framing Techniques: Optimum Value Engineering

P. National Institute of Building Sciences:

1. MOIST program for transfer of heat and moisture
2. Whole Building Design Guide

Q. National Institute of Standards and Technology:

1. BEES (Building for Environmental and Economic Sustainability) Lifecycle Decision Support Tool

R. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):

1. IAQ Guidelines for Occupied Buildings Under Construction

S. Southcoast Air Quality Management District:

1. 1168 Adhesive And Sealant Applications

T. US Composting Council:

1. Seal of Testing Assurance Program

U. US Department of Agriculture:

1. Biobased Products – Definitions and Descriptions

V. US Green Building Council:

1. LEED™ 2009 Green Building Rating System
2. LEED™ v4 (version 4) Green Building Rating System

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

A. Permanent Enclosure: As determined by Contracting Officer (CO), permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and openings are closed with permanent construction or substantial temporary closures.

1.3 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in Contract Sum as required.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with National Electrical Contractors Association (NECA), National Electrical Manufacturers Association (NEMA), and Underwriter Laboratories (UL) standards and regulations for temporary electric service. Install service to comply with National Fire Protection Association (NFPA) 70.

B. Environmental Protection: Provide environmental protection as required by agency(ies) with jurisdiction and as indicated in Contract Documents. Coordinate with requirements of the following:

1. Regulatory Requirements
2. Noise and Acoustics Management
3. Environmental Management
4. Construction Waste Management

1.5 PROJECT CONDITIONS

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

PART 2 PRODUCTS

2.1 MATERIALS

A. Temporary materials may be new or used, but must be adequate in capacity for required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

B. Chain-Link Fencing: Minimum 2 inch (50 millimeters), 0.148 inch (3.76 millimeters) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 millimeter) high with galvanized steel pipe posts; minimum 2-3/8 inch (60 millimeters) OD (outside diameter) line posts and 2-7/8 inch (73 millimeters) OD corner and pull posts, with 1-5/8 inch (42 millimeters) OD top rails .

C. Privacy Screens: Minimum 175-GSM commercial grade knitted HDPE material with 90% privacy blockage, sized to fit all fence panels noted above. #2 brass grommers a corner and 2'-0" on centers at all edges for attachment to fencing. Color as approved by the Contracting Officer.

D. Safety Barrier Fence: Orange plastic fence, minimum height, 4 feet.

E. Barrier Tape: Yellow tape Imprinted with "CAUTION: CONSTRUCTION AREA," manufactured by Reef Industries, Inc., Houston, Texas, or approved equal.

2.2 TEMPORARY FACILITIES

A. Storage and Fabrication Sheds: Temporary weather tight sheds or other covered facilities for storage of materials subject to weather damage. Number and size of structures shall be subject to Contracting Officer's approval.

B. Toilets: Sufficiently lighted and ventilated toilet facilities in weatherproof, sight proof, handicap accessible, sturdy enclosures with privacy locks.

1. Provide separate toilet facilities for men and women.

2.3 EQUIPMENT

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

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 and as directed by the Contracting Officer.

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

3.2 TEMPORARY UTILITY INSTALLATION

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

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

B. Potable water is available on site. Make connections to existing facilities as needed. Facilities must be cleaned and maintained in a condition acceptable to NPS. At Substantial Completion, restore these facilities to condition existing before initial use.

C. Sanitary Facilities: Provide temporary toilets, and wash facilities for use by construction personnel.

1. Place in approved locations secluded from public observation and convenient to work stations. Relocate as work progress requires.
2. Maintain and clean toilet facilities at least weekly.
3. Completely remove sanitary facilities on completion of work.

D. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

E. Telephone Service: No telephone service is available on site for Contractor's use. Make arrangements with Telephone Company and pay costs.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 50 feet of building lines. Comply with NFPA 241.
2. Maintain support facilities until near Substantial Completion. Remove structures, equipment, and furnishings, and terminate services after punch list is 100 percent completed or when directed by Contracting Officer.

B. Traffic Controls: Erect and maintain barricades, lights, danger signals, and warning signs in accordance with Manual on Uniform Traffic Control Devices (MUTCD), Part IV, latest edition.

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. Illuminate barricades and obstructions at night; keep safety lights burning from sunset to sunrise.
4. Protect pedestrian traffic by guardrails or fences.
5. When pedestrian traffic is detoured onto a roadway, provide temporary walkways with protection as required at ends and overhead. For walkways, use lumber running parallel to direction of traffic movement and provide ramps at changes of elevation.

C. Parking: Provide temporary parking areas for construction personnel.

D. Dewatering Facilities and Drains: Comply with requirements of the agency(ies) with jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

E. Project Identification and Temporary Signs: Provide Project identification and other signs as indicated on Drawings. Fence, barricade, or otherwise block off the immediate work area to prevent unauthorized entry.

1. Provide temporary, directional signs for construction personnel and visitors.
2. Maintain and touchup signs so they are legible at all times.
3. Erect and maintain sufficient detour signs at road closures and along detour routes.

F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of agency(ies) with jurisdiction.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Cleaning of Equipment: Contractor shall ensure prior to moving on to Project Area, equipment, is free of soil, seeds, vegetative matter, or other debris that could contain or hold seeds. Ensure

equipment has been pressure washed and is free of exotic species. Equipment shall be considered free of soil, seeds, and other debris when visual inspection does not disclose such material. Disassembly of equipment components or specialized inspection tools are not required.

C. Temporary Erosion and Sedimentation Control: Refer to Section 01 57 23 "Temporary Storm Water Pollution Prevention".

D. Tree and Plant Protection: Refer to Section 01 11 00 "Summary of Work".

E. Site Enclosure Fence: Before construction operations begin, furnish and install chain link fencing to prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Locate pedestrian entrance gates as required to provide controlled personnel entry.
3. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Contracting Officer with one set of keys.

F. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

G. Barricades, Warning Signs, and Lights: Comply with requirements of Manual on Uniform Traffic Control Devices (MUTCD), part IV, 2003 edition for erecting structurally adequate barricades, including warning signs and lighting.

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

1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. 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 24-hour basis where required to achieve indicated results and 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.

END OF SECTION

SECTION 015719.12 - NOISE AND ACCOUSTICS MANAGEMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:

1. Special requirements for noise and acoustics management during construction operations.

1.2 DEFINITIONS

A. Ambient noise level: The total noise associated with a given environment, being usually a composite of normal or existing sounds from all sources near and far, excluding the noise source at issue.

B. Daytime: The hours from 7 A.M. to 9 P.M. on weekdays and 9 A.M. to 9 P.M. on weekends and holidays.

C. Nighttime: All non-daytime hours.

D. Property line: The real or imaginary line along the ground surface and its vertical extension, which separates real property owned or controlled by one person from contiguous real property owned or controlled by another person or from any public right-of-way or from any public space.

E. Receiving noise area: Any real property where people live or work and where noise is heard, excluding the project or source area.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 NOISE MANGEMENT

A. Noise Control: Perform construction operations to minimize noise. Perform noise-producing work in less sensitive hours of the day or week as directed by the Contracting Officer CO).

B. Repetitive and/or intermittent, high-level noise: Permitted only during Daytime.

1. Do not exceed the following dB(A) limitations at 50 feet:

Sound Level in dB(A)	Time Duration of Impact Noise
70	More than 12 minutes in any hour
80	More than 3 minutes in any hour

2. Maximum permissible construction equipment noise levels at 50 feet:

EARTHMOVING	dB(A)	MATERIALS HANDLING	dB(A)
Front Loaders	75	Concrete Mixers	75
Backhoes	75	Concrete Pumps	75
Dozers	75	Cranes	75
Tractors	75	Derricks Impact	75
Scrapers	80	Pile Drivers	95
Graders	75	Jack Hammers	75
Trucks	75	Rock Drills	80
Pavers; Stationary	80	Pneumatic Tools	80

Pumps	Generators	Compressors	75	75	75	Saws	Vibrators	75 75

C. Ambient Noise:

1. Maximum noise levels (dB (decibel)) for receiving noise area at property line shall be as follows:
   a. Residential receiving area
      Daytime: 65 dB
      Nighttime: 45 dB
   b. Commercial/Industrial receiving area
      Daytime: 67 dB
      Nighttime: 65 dB
   c. In the event the existing local ambient noise level exceeds the maximum allowable receiving noise level (dB), the receiving noise level maximum for construction operations shall be adjusted as follows:
   d. Residential receiving area: Maximum 3 additional dB above the local ambient as measured at property line.
   e. Commercial/Industrial receiving area: Maximum 5 additional dB above the local ambient as measured at the property line.

3.2 FIELD QUALITY CONTROL

A. Monitor noise produced from construction operations in accordance with ASTM E1780.

END OF SECTION

SECTION 015723 - TEMPORARY STORM WATER POLLUTION PREVENTION

PART 1 GENERAL

1.1 SUMMARY

A. Federal Regulations for controlling discharges of pollutants (including chemicals, erodible material, and trash) from municipal separate storm sewer systems, construction sites, and industrial activities, were brought under the National Pollution Discharge Elimination System (NPDES) permit process by amendments to the Clean Water Act (CWA), and promulgation of federal stormwater regulations issued by the United States Environmental Protection Agency (USEPA). The USEPA uses amount of ground disturbance as a measure of a project potential to generate pollution from erosion. NPDES Phase I regulates discharges from construction sites that disturb 5 acres or more. NPDES Phase II regulations expand existing General Permit requirements under Phase I to include/regulated discharges from construction sites that disturb land equal to or greater than one (1) acre and less than 5 acres, known as Small Construction Activity. Construction disturbances 1 acre and above typically require a formal NPDES permit and a formal Stormwater Pollution Prevention Plan (SWPPP) must be submitted to Agency(ies) with Jurisdiction for review and approval.

B. National Park Service (NPS) Standards and Guidelines require water quality be protected to ensure compliance with Organic Act. Contractor shall prepare an Under-An-Acre Pollution Prevention Plan (UPPP) for each project resulting in less than 1 acre of soil disturbance or not otherwise subject to requirements of NPDES program. (UPPP Guideline)

C. The work of this section consists of implementing measures to prevent discharges of pollutants, including temporary storm water pollution during construction activities, either through compliance with NPDES permit program, or in conformance with NPS guidance for UPPPs.

D. Work of this section consists of implementing measures to Temporary Storm Water Pollution during construction activities, either through compliance with NPDES permit program; or in conformance with NPS guidance for UPPPs.

1.2 DEFINITIONS

A. Definitions pertaining to sustainable development: As defined in ASTM E2114.

B. Environmental Pollution and Damage: The presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances; or degrade utility of the environment for aesthetic, cultural, or historical purposes.

C. National Pollution Discharge Elimination System (NPDES) Phase I: Regulates discharges from construction sites that disturb 5 acres or more.

D. NPDES Phase II: Regulations expand existing General Permit requirements under Phase I to include and regulate discharges from construction sites that disturb land equal to or greater than one (1) acre and less than 5 acres, known as Small Construction Activity.

E. Storm Water Pollution Prevention Plan (SWPPP): Developed and implemented stormwater management measures to protect surface water from pollutants during construction activities disturbing an acre or more in compliance with federal, state, and local requirements for permit approval under NPDES program.

F. UPPP: Developed and implemented pollution prevention plan (including stormwater management measures, if needed) to protect environment from pollutants on construction projects with less than one acre of disturbance in conformance with NPS guidelines.

1.3 SUBMITTALS

A. After contract award and before pre-construction conference, prepare and submit:

1. A UPPP in conformance with NPS guidelines and adherence to applicable construction storm water management practices.

B. Inspection Schedule: Submit schedule for inspection and monitoring of pollution prevention measures.

C. Inspection Schedule: Submit schedule for inspection and monitoring of storm water pollution prevention measures.

D. Erosion Control Products: Submit manufacturer's product information and installation recommendations for silt fence, filter fabric, erosion control blanket, straw bales, and other materials proposed for use on this project.

1.4 QUALITY ASSURANCE

A. Contractor shall prepare and submit a plan to Contracting Officer (CO) for review and concurrence.

B. Orientation Meeting: Contractor shall arrange and conduct an Erosion and Sediment Control meeting/briefing to inform parties, scheduled to be on-site during project, of measures to be implemented for proper erosion and sediment control (may be included as part of Pre-Construction Meeting).

1. Installation of silt fences, storm drain protection, and other forms of erosion and sediment control shall not begin until after this meeting has occurred.

C. Orientation Meeting: Contractor shall be responsible for arranging and conducting Pollution Prevention meeting/briefing to inform parties scheduled to be on-site during project of measures to be implemented for proper pollution prevention and control (may be included as part of Pre-Construction Meeting).

1. Installation of silt fences, storm drain protection, and other forms of pollution prevention controls shall not begin until after this meeting has occurred.

D. Pollution Prevention Manager: Contractor shall designate Pollution Prevention Manager who will be responsible for implementation, inspection, maintenance, and amendments to approved plan.

1. Pollution Prevention Manager shall be familiar with UPPP procedures and Best Management Practices (BMPs) and shall ensure emergency procedures and plan are updated as needed and available for inspection.
2. When changes in approved plan are required, Pollution Prevention Manager shall prepare and certify an amendment and submit to Contracting Officer for review and concurrence.

E. Pollution Prevention and Erosion Control Manager: Contractor shall designate Pollution Prevention and Erosion Control Manager responsible for implementation, inspection, maintenance, and amendments to approved plan.

1. Pollution Prevention and Erosion Control Manager shall be familiar with temporary storm water pollution prevention procedures and Best Management Practices and ensure emergency procedures and plan are updated as needed and available for inspection.
2. When changes in approved plan are required, Pollution Prevention and Erosion Control Manager shall prepare and certify an amendment and submit to Contracting Officer for review and concurrence.

PART 2 PRODUCTS

2.1 TEMPORARY STORM WATER POLLUTION PREVENTION PLAN

A. Provide UPPP which conforms to NPS requirements (utilize UPPP template) and include:

1. Responsible Parties
2. General Information: Project Scope, Project Details, Site Information, and Spill Prevention
3. Standards and Constraints
4. Project Scheduling
5. Known Data on Soil and Fill
6. Activities with Potential to Generate Sediment
7. Activities and Materials with Potential to Pollute Storm Water
8. Management and Reporting BMPs
9. Waste Management BMPs
10. Non-Storm Water Pollution Control BMPs
11. Soil Stabilization BMPs
12. Sediment Control BMPs
13. Other Pollution Control BMPs
14. References
15. Preparer's Certification
16. Appendices: Contact Information, Pollution Prevention Control Map or Sheet(s), Standard Installation Specifications for each BMP, and Blank forms.

PART 3 EXECUTION

3.1 ENVIRONMENTAL PROTECTION

A. Protection of Natural Resources: Comply with applicable regulations and these specifications. Preserve natural resources within project boundaries and outside limits of work performed under this Contract in their existing condition or restore to an equivalent or improved condition as approved by Contracting Officer.

B. Construction Zone: Arrange construction activities to minimize pollution (i.e., erosion, trash, etc.) to maximum practical extent.

1. Clearing, excavation, and grading shall be limited to those areas of project site necessary for construction. Minimize area exposed and unprotected.
2. Clearly mark and delineate limits of work activities.
3. Equipment shall not be allowed to operate outside limits of work or to disturb existing vegetation.
4. Excavation and grading shall be completed during dry season to maximum extent possible.

5. Material shall be stored away from locations where water is present to greatest extent practicable.

3.2 REGULATORY REQUIREMENTS

A. Contracting Officer Notification: Contractor shall notify Contracting Officer in writing and by telephone of these events:

1. Erosion and sediment control meeting/briefing.
2. Following installation of required sediment control structures.
3. Prior to removal of or modification to sediment control structures.
4. Prior to removal of sediment control structures.

3.3 SITE INSPECTIONS AND PLAN REVISIONS

A. Inspections: Contractor and Contracting Officer will perform a weekly inspection onsite.

1. Inspection shall include disturbed areas not completely stabilized, areas used for storage of materials, locations where vehicles enter or exit site, and other erosion and sediment controls included in the Plan.
2. Inspections shall be documented.
3. Inspection forms shall be retained onsite in Plan notebook throughout construction period.

B. Plan Revisions: It may be necessary to revise Plan during construction to make necessary improvements, revisions, or to respond to unforeseen conditions noted during construction or site inspections.

1. Plan shall specify mechanism whereby revisions may be proposed by Contractor or Contracting Officer.
2. Contractor and Contracting Officer will jointly review each revision to Plan before changes incorporated and implemented. Contractor will then provide revised copy of Plan to Contracting Officer.
3. Accepted modifications will be implemented within 7 calendar days following date of inspection when deficiencies or necessary corrections are first noted.

C. Negligence: Provide additional temporary erosion and pollution controls made necessary by Contractor's errors or negligence at no additional cost to Government.

3.4 HOUSEKEEPING AND SITE MANAGEMENT

A. Store materials onsite in conformance to Federal, state, local, and manufacturer's regulations and specifications. Use Best Management Practices to minimize risk of materials coming into contact with environmental conditions (i.e. water and wind) that could disperse them.

B. Manage solid waste in conformance to Federal, state, and local regulations. Best Management Practices should be used to minimize risk of materials coming into contact with environmental conditions (i.e. water and wind) that could disperse them.

C. Include a spill prevention and control plan with provisions placed in UPPP.

D. Manage hazardous waste (including contaminated soil) in conformance to Federal, state, local and NPS regulations and guidelines.

3.5 EROSION CONTROL MEASURES

A. Erosion control measures shall consist of Best Management Practices for storm water discharges, including silt fencing, barrier protectors, straw bales, temporary soil retention

blankets, excelsior drainage filters, sediment traps and berms.

B. Erosion control measures shall be used to contain only direct precipitation in construction zone. Contained water shall be allowed to percolate into ground or drain slowly through drainage filter sediment traps.

C. Reduce runoff velocity and direct surface runoff around and away from fuel containment, storage, and borrow areas.

D. Place drainage filters around catch basins to create sediment traps to control run-off from construction area.

E. Excess water used for dust control shall be contained within demolition areas by erosion control measures.

F. Contractor shall prevent deposition of materials onto paved areas. Contractor shall inspect paved areas for deposited materials weekly and remove materials immediately.

G. Furnish, install, maintain, and operate necessary control measures and other equipment necessary to prevent erosion as described in approved UPPP.

H. Before work begins, sufficient equipment shall be available on site to assure operation and adequacy of erosion control system can be maintained.

3.6 MAINTENANCE OF TEMPORARY FACILITIES

A. Ensure erosion and sediment control structures remain effective throughout excavation and grading operations. Relocate structures as necessary.

B. Inspect control structures after each significant rainfall. Promptly repair breaches which occur.

C. Contractor shall remove entrapped sediment from behind excelsior drainage filter after each storm.

3.7 REPORTING

A. If a discharge occurs or if project receives written notice or order from regulatory agency, Contractor shall immediately notify Contracting Officer and shall file written report to Agency(ies) with Jurisdiction within 7 days of discharge event, notice, or order. Corrective measures shall be implemented immediately following discharge, notice, or order. The report to the Agency(ies) with Jurisdiction shall contain:

1. Date, time, location, nature of operation, and type of discharge, including cause or nature of notice or order.
2. Best Management Practices deployed before discharge event, or prior to receiving notice or order.
3. Date of deployment and type of Best Management Practices deployed after discharge event, or after receiving notice or order, including additional Best Management Practices installed or planned to reduce or prevent re-occurrence.
4. An implementation and maintenance schedule for affected Best Management Practices.

3.8 REMOVAL OF TEMPORARY STORM WATER POLLUTION CONTROL MEASURES

A. Temporary control measures shall be removed with permission of Contracting Officer within 20 working days after final acceptance of project, and/or once grading is complete and slopes have stabilized.

END OF SECTION

SECTION 016700 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 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 environmental requirements.

1.2 DEFINITIONS

A. Products: Items purchased for incorporating into Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes "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, current as of date of Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled content materials are allowed , unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product demonstrated and approved through submittal process, or where indicated as a product substitution, to have 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. Definitions pertaining to sustainable development: As defined in ASTM E2114.

1.3 QUALITY ASSURANCE

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

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and 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 undamaged condition; in manufacturer's original sealed container or other packaging system; complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with Contract Documents. Ensure products are undamaged and properly protected.

5. Obtain materials in biodegradable or recyclable/reusable packaging which uses minimum amount of packaging possible.

C. Storage:

1. Allow for inspection and measurement of quantity or counting of units.
2. Store materials in manner to not endanger Project structure.
3. Store products subject to damage by the elements, under cover in weather tight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
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. Store loose granular materials in well-drained area on solid surfaces to prevent mixing with foreign matter.

1.5 PACKAGING

A. Where Contractor has option to provide one of listed products or equal, preference shall be given to products with minimal packaging and easily recyclable packaging as defined in ASTM D5834.

B. Maximize use of source reduction and recycling procedures outlined in ASTM D5834.

C. Provide minimum 45 percent post-consumer recycled content and minimum 100 percent recovered fiber content of industrial paperboard in accordance with EPA’s Comprehensive Procurement Guidelines and ASTM D5663.

D. Provide minimum 10 percent post-consumer recycled content and minimum 10 percent recovered fiber content of carrier board in accordance with EPA’s Comprehensive Procurement Guidelines and ASTM D5663.

E. Provide minimum 5 percent post-consumer recycled content and minimum 5 percent recovered fiber content of brown papers (e.g., wrapping papers and bags) in accordance with EPA’s Comprehensive Procurement Guidelines and ASTM D5663.

1.6 ENVIRONMENTALLY PREFERABLE PRODUCTS

A. Provide environmentally preferable products to greatest extent possible.

1. To greatest extent possible, provide products and materials with a lesser or reduced effect on the environment considering raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, and/or disposal of the product.
2. Eliminate use of ozone depleting compounds during and after construction where alternative environmentally preferable products are available, consistent with either Montreal Protocol and Title VI or Clean Air Act Amendments of 1990, or equivalent overall air quality benefits that take into account life cycle impacts.
3. Use products meeting or exceeding EPA’s recycled content recommendations for EPA-designated products. Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 10% (based on cost) of total value of the materials in project.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of Contract Documents.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for product specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by or incorporated into Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Special Warranties: Prepare written document containing appropriate terms and identification, ready for execution. Submit draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with Specifications, prepare written document using appropriate form properly executed.
3. Refer to Divisions 2 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

PART 2 PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products to comply with Contract Documents, undamaged and, unless otherwise indicated, 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 produced and used successfully in similar situations on other projects.
3. Government reserves right to limit selection to products with warranties not in conflict with requirements of Contract Documents.
4. Where products are accompanied by term "as selected," Contracting Officer will make selection.
5. Where products are accompanied by term "match sample," sample to be matched is Governments.
6. Descriptive, performance, and reference standard requirements in Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:

1. Product: Where Specifications name single product and manufacturer, provide named product that complies with requirements or approved equal.
2. Manufacturer/Source: Where Specifications name single manufacturer or source, provide product by named manufacturer or source that complies with requirements or approved equal.

3. Products: Where Specifications include list of names of both products and manufacturers, provide one of the products listed that complies with requirements or approved equal.
4. Manufacturers: Where Specifications include list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements or approved equal.
5. Available Products: Where Specifications include list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications include list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
7. Product Options: Where Specifications indicate sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide specified product, system, or approved equal.
8. Basis-of-Design Product: Where Specifications name product and include a list of manufacturers, provide specified product or a comparable product by one of the other named manufacturers, or approved equal. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics based on the product named.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select product that complies with requirements and matches Architect's sample. Contracting Officers decision will be final on whether a proposed product matches.
    a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
10. Visual Selection Specification: Where Specifications include phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
    a. Standard Range: Where Specifications include phrase "standard range of colors, patterns, textures" or similar phrase, Contracting Officer will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include phrase "full range of colors, patterns, textures" or similar phrase, Contracting Officer will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions: Contracting Officer will consider Contractor's request for comparable product when the following conditions are satisfied. If following conditions are not satisfied, Contracting Officer will return requests without action, except to record noncompliance with these requirements:

1. Evidence proposed product does not require revisions to Contract Documents, that it is consistent with Contract Documents and will produce indicated results and is compatible with other portions of Work.

2. Detailed comparison of significant qualities of proposed product with those named in Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 EXECUTION

3.1 PROTECTION AFTER INSTALLATION

A. Provide adequate coverings as necessary to protect installed materials from damage resulting from natural elements, traffic, and subsequent construction. Remove when no longer needed.

END OF SECTION 01 67 00

SECTION 017340 - EXECUTION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes general procedural requirements governing execution of Work including:

1. Coordination with utility service providers
2. Construction layout
3. Field engineering and surveying
4. General installation of products
5. Progress cleaning
6. Protection of installed construction
7. Correction of the Work

1.2 SUBMITTALS

A. Certificates: Submit certificate signed by land surveyor certifying location and elevation of improvements comply with requirements.

B. Landfill Receipts: Submit copy of receipts issued by landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

C. Certified Surveys: Submit two copies signed by land surveyor.

D. Quantity Surveys: Submit two copies showing quantities of work performed and actual construction completed in place.

1.3 QUALITY ASSURANCE

A. Land Surveyor Qualifications: Professional land surveyor legally qualified to practice in jurisdiction where Project is located and is experienced in providing land-surveying services of kind indicated.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 EXAMINATION

A. Existing Conditions: Existence and location of site improvements and other construction indicated as existing are not guaranteed.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: Existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify existence and location of underground utilities and other construction affecting Work.

1. Before construction, verify 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.

3.2 COORDINATION WITH UTILITY SERVICE PROVIDERS

A. Coordination with Utility Service Providers: Contact following Utility Service providers, sufficiently in advance to avoid delaying the work, to coordinate Contractor's portion of Work, testing requirements, inspections, etc.

1. Electrical: Service Contact: Contact _____ to coordinate Electrical service requirements.
    a. Construction Contractor Responsibilities: Contractor is responsible for _____.
2. Wastewater Service Contact: Contact _____ to coordinate Wastewater service requirements.
    a. Construction Contractor Responsibilities: Contractor is responsible for _____.

3.3 PREPARATION

A. Field Measurements: Take field measurements as required to fit Work properly. Recheck measurements before installing each product. Where portions of Work are indicated fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying Work.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of need for clarification of the Contract Documents caused by differing field conditions outside control of Contractor, submit request for information to Contracting Officer in accordance with Section 01 31 00 "Project Management and Coordination."

3.4 CONSTRUCTION LAYOUT

A. Verification: Verify layout information shown on Drawings, in relation to the existing benchmarks before proceeding to lay out Work. Notify Contracting Officer promptly if discrepancies are discovered.

B. General: Engage a land surveyor to lay out Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check location, level and plumb, of every major element as Work progresses.
5. Notify Contracting Officer when deviations from required lines and levels exceed allowable tolerances.
6. Close site surveys with an error closure equal to or less than the established standard.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Record Log: Maintain 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 log available for review by National Park Service (NPS).

3.5 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning Work. Preserve and protect permanent benchmarks and control points during construction operations. Controls destroyed by Contractor will be replaced by Contractor at their expense.

1. Existing Monuments: All benchmarks, land corners, and triangulation points, established by other surveys, existing within construction area shall be preserved. If existing monuments interfere with Work, secure written permission before removing them.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with NPS requirements for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

C. 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.

3.6 INSTALLATION

A. General: Locate Work and components of 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.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions for 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. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Hazardous Materials: Use products, cleaners, and installation materials not considered hazardous.

H. Quantity surveys: Shall be conducted, and data derived from these surveys shall be used in computing quantities of work performed and actual construction completed and in place.

1. Contractor shall conduct original and final surveys and surveys for any periods for which progress payments are requested. These surveys shall be conducted under direction of a representative of the Contracting Officer, unless Contracting Officer waives requirement in a specific instance. Government shall make such computations as are necessary to

determine quantities of work performed or finally in place. Contractor shall make computations based on surveys for any periods for which progress payments are requested.

2. Promptly upon completing a survey, Contractor shall furnish originals of field notes and other records relating to survey or layout of Work to Contracting Officer. Contractor shall retain copies of all such material furnished to Contracting Officer.

3.7 PROGRESS CLEANING

A. General: Clean Project site, work areas, and common areas daily. Coordinate progress cleaning for joint-use areas where more than one Installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in National Fire Protection Association (NFPA) 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 degrees Fahrenheit (27 degrees Celsius).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to level of cleanliness necessary for proper execution of Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of Work, broom-clean or vacuum entire work area, as appropriate.
3. Contractor shall provide progress cleaning that minimizes sources of food, water, and harborage available to pests.

D. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

E. Clean and protect construction in progress and adjoining materials already in place during handling and installation. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

F. Clean and provide maintenance on completed construction as frequently as necessary through remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

G. Limiting Exposures: Supervise construction operations so that no part of construction completed or in progress, is subject to harmful, dangerous, damaging, or deleterious exposure during construction period.

H. Final Cleaning: At completion of Work, remove remaining waste materials, rubbish, tools, equipment, machinery and surplus materials. Clean exposed surfaces and leave Project clean and ready for occupancy.

1. Provide final cleaning in accordance with ASTM E1971.

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

A. Remove and replace damaged surfaces exposed to view if surfaces cannot be repaired without visible evidence of repair.

B. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

END OF SECTION

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for:

1. Recycling nonhazardous demolition waste.
2. Disposing of nonhazardous demolition waste.

1.2 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. Solid Waste: Garbage, debris, sludge, or other discharged material (except hazardous waste) including solid, liquid, semisolid, or contained gaseous materials resulting from domestic, industrial, commercial, mining, or agricultural operations.

D. Debris: Non-hazardous solid waste generated during construction, demolition, or renovation of a structure which exceeds 2.5 inch (60 millimeter) particle size that is: a manufactured object; plant or animal matter; or natural geologic material (e.g. cobbles and boulders). A mixture of debris and other material such as soil or sludge is also subject to regulation as debris if mixture is comprised primarily of debris by volume, based on visual inspection.

E. 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.

F. Environmental Pollution and Damage: Presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances; or degrade utility of environment for aesthetic, cultural, or historical purposes.

G. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

H. Hazardous Materials: Material regulated as a hazardous material in accordance with 49 CFR 173 (Code of Federal Regulations), requires a Material Safety Data Sheet (MSDS) in accordance with 29 CFR 1910.1200, or which during end use, treatment, handling, storage, transportation or disposal meets or has components which meet or have potential to meet the definition of Hazardous Waste in accordance with 40 CFR 261.

I. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

J. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

1.3 PERFORMANCE REQUIREMENTS

A. General: Project shall minimize creation of construction, deconstruction, and demolition waste to protect and restore natural habitat and resources. Minimize factors contributing to waste such

as over packaging, improper storage, ordering error, poor planning, breakage, mishandling, and contamination. A Waste Management Plan shall be developed to ensure that existing site and building materials are reused, salvaged, or recycled. Minimize waste disposal in landfills.

B. If waste materials encountered during deconstruction/demolition or construction phase are found to contain lead, asbestos, polychlorinated biphenyls (PCBs), (such as fluorescent lamp ballasts), or other harmful substances, they are to be handled and removed in accordance with local, state, and federal laws and requirements concerning hazardous waste.

1.4 SUBMITTALS

A. Waste Management Plan: After award of contract and prior to scheduled Pre-Construction Conference, Contractor shall submit a draft Waste Management Plan to Contracting Officer for approval. Submit 3 copies of plan. Revise and resubmit Plan as required by Contracting Officer. Approval of Contractor's Plan will not relieve Contractor of responsibility for compliance with applicable environmental regulations.

B. Progress Documentation: Supplemental to Waste Management Plan, document solid waste disposal, diversion, and cost/revenue analysis and submit completed worksheet on a monthly basis. See Project Waste Management Plan Worksheet Sample, attached to the end of the Division 1 Specifications, and report totals to date for column headings.

C. 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.

D. 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.

E. Qualification Data: For Waste Management Coordinator.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating refrigerant that was present was recovered and recovery was performed according to Environmental Protection Agency (EPA) regulations. Include name and address of technician and date refrigerant was recovered.

G. Closeout Submittals

1. With Closeout Submittals, submit a summary of a Project Waste Management Plan worksheet for solid waste disposal and diversion.

1.5 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 Meeting: Conduct separate meeting or cover in Pre-Construction Conference and comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to waste management including:

1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.

2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

PART 2 PRODUCTS

2.1 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification and waste reduction work plan. Include separate sections in plan for 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 waste generated by the Work. 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. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
3. Handling and Transportation Procedures: Include method used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

PART 3 EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by Contracting Officer. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during entire duration of Contract.

B. Waste Management Coordinator: Engage waste management coordinator responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Contractor shall establish contacts with local recycling and reuse companies to set up lines of responsibility. Contractor shall be responsible for coordination in terms of identifying materials, pickup schedules, and standard quality for recycled materials.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

E. Separation facilities:

1. Contractor shall designate and Contracting Officer shall approve specific area or areas to facilitate separation of materials for potential reuse, salvage, recycling, and return.

2. Place waste and recycling bins near each other, and close to point of waste generation but out of traffic pattern.
3. Keep recycling and waste bin areas neat, clean, and clearly marked in order to avoid co-mingling of materials.
4. Protect bins during non-working hours from off-site contamination.
5. Check garbage dumpsters periodically for recyclables being thrown away and undocumented materials that could be recycled.

F. Materials handling procedures: Material to be recycled shall be protected from contamination and shall be handled, stored, and transported in a manner that meets requirements set by designated facilities for acceptance. Establish defined area for operations of each trade, especially woodcutting so off-cuts are kept in one area and can be sorted by dimension for future reuse.

3.2 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in dry location.
2. Polystyrene Packaging: Separate and bag materials.

3.3 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 in landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials to accumulate on-site.
2. Remove and transport debris in manner preventing spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Burning: Burning of waste materials allowed only at designated areas on Government property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

D. Disposal: Transport waste materials off Government property and legally dispose of them.

END OF SECTION

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including:

1. Project Record Drawings
2. Closeout Submittals
3. Substantial Completion and Final Inspection
4. Permit Closure and Transfer
5. Final Acceptance of the Work
6. Warranties

1.2 PROJECT RECORD DRAWINGS

A. Maintain one complete full-size set of contract drawings and one full-size set of vendor-supplied drawings. Clearly mark changes, deletions, and additions using National Park Service (NPS) drafting standards to show actual construction conditions. Show additions in red, deletions in green and special instructions in blue.

B. Keep record drawings current. Make record drawings available to Contracting Officer (CO) for inspection at the time of monthly progress payment requests. If project record drawings are not current, Contracting Officer may retain an appropriate amount of progress payment.

C. Submit complete record drawings on completion of total project. Include shop drawings, sketches, and additional drawings to be included in final set, with clear instructions showing the location of these drawings.

1.3 CLOSEOUT SUBMITTALS

A. A list of closeout requirements has been attached at the end of the Division 1 Specifications for your convenience. The intent is to provide an overall summary of requirements and not a comprehensive list. Terms and conditions of the contract require satisfaction of requirements of individual specification sections regardless of what is shown on the list. Submit the following before requesting final inspection:

1. Specific warranties, guarantees, workmanship bonds, final certifications, and similar documents.
2. NPS required forms for occupancy, Fire Sprinkler/Alarm acceptance, and other similar forms or certificates.
3. Project Record Documents, operation and maintenance manuals, final completion construction digital images recorded on CD-R (compact disc-recordable) or DVD-R (digital video disc-recordable) with index and descriptions, and similar final record information.
4. Environmental Record Documents: As specified in Division 1 and as follows:
    a. Environmental Product Data: As specified in Section Environmental Requirements for Products.
    b. Final Summary of Solid Waste Disposal and Diversion: As specified in Section 01 74 10 Construction Waste Management.

5. Posted Operating Instructions: As specified in individual sections. Furnish operating instructions attached to or posted adjacent to equipment. Include wiring diagrams, control diagrams, control sequence, start-up, adjustment, operation, lubrication, shut-down, safety precautions, procedures in the event of equipment failure, and other items of instruction recommended by manufacturer.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Contracting Officer. Label with manufacturer's name and model number where applicable.
    a. Special Tools: One set of special tools required to operate, adjust, dismantle, or repair equipment. Special tools are those not normally found in possession of mechanics or maintenance personnel.
7. Keys and Keying Schedule: Submit keys including duplicates. Wire keys for each lock securely together. Tag and plainly mark with lock number, equipment identification, or panel or switch number, and indicate location, building, and room name or number.
8. Approved pre-functional checklists and functional performance testing reports from commissioning documentation.
9. Terminate and remove temporary facilities, mockups, construction tools, and similar elements from Project site, complete final cleaning requirements, including touchup painting.
10. Instruct NPS personnel in operation, adjustment, and maintenance of products, equipment, and systems.

1.4 FINAL INSPECTION, SUBSTANTIAL COMPLETION AND ACCEPTANCE PROCEDURES

A. Request final inspection in writing when project or designated portion of project is substantially complete. Contracting Officer will proceed with inspection within 10 days of receipt of written request or will advise Contractor of items that prevent project from being substantially complete.

B. If work is determined substantially complete, following final inspection, Contracting Officer will prepare Punch List and issue a Letter of Substantial Completion.

C. If work is not determined substantially complete following final inspection, Contracting Officer will notify Contractor in writing. Contractor shall request new final inspection after completing work. Re-inspection costs may be charged against Contractor in accordance with Inspection of Construction contract clause.

D. Contractor shall complete Punch List within 30 calendar days, documented weather permitting.

E. If Contractor completes items of work on Punch List and contractually required items, Contracting Officer will issue Letter of final acceptance of work.

F. If Contractor fails to complete work within the time frame, Contracting Officer may correct work with an appropriate reduction in contract price or charge for re-inspection costs in accordance with Inspection of Construction contract clause.

1.5 PERMIT CLOSURE AND TRANSFER

A. When work covered by the permits is complete, create list of tasks required to close or transfer permits to Park. Submit to Contracting Officer for approval.

B. After substantial completion and Punch List completion, permits shall be closed and documented by Agency(ies) with Jurisdiction for the permit.

C. If responsibility for permits is to be transferred to Park, Park shall be informed of permit provisions completed and responsibilities transferring to Park staff.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties on request of Contracting Officer for designated portions of Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on table of contents of Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2 by 11 inch (215 by 280 millimeters) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify product or installation. Provide typed description of product or installation, including name of product and name, address, and telephone number of Installer.
3. Identify each binder on front and spine with typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF (portable document format) file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

C. Provide additional copies of each warranty in operation and maintenance manuals.

PART 2 PRODUCTS

2.1 MATERIALS

A. See Division 1 Specification Section "Execution" for information on cleaning agents.

PART 3 EXECUTION

3.1 FINAL CLEANING

A. General: Conduct final 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 following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Rake grounds that are neither planted nor paved to smooth, even-textured surface.
   c. Remove tools, construction equipment, machinery, and surplus material from Project site.

C. Waste Disposal: Comply with requirements of Section 01 74 19 "Construction Waste Management and Disposal."

END OF SECTION

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 SUMMARY

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

1. Manuals, general
2. Emergency manuals
3. Operation manuals for systems, subsystems, and equipment
4. Maintenance manuals for care and maintenance of products, materials, and finishes.

B. See Divisions 2 through 49 Sections for additional operation and maintenance manual requirements for Work in those Sections.

1.2 SUBMITTALS

A. Manual: Submit two copies of each manual in draft form or one electronic copy at least 15 days before final inspection. Contracting Officer (CO) will return copy or edit version with comments within 15 days of receipt.

B. Format: Submit operations and maintenance manuals in following format:

1. PDF (portable document format) electronic file. Assemble each manual into composite electronically indexed file. Submit on digital media acceptable to Contracting Officer.
   a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
   b. Enable inserted reviewer comments on draft submittals.
2. Hard copy manual: In accordance with Part 2 of this Section.
3. Correct or modify each manual to comply with Contracting Officers comments. Submit 4 copies of each corrected manual within 15 days of receipt of Contracting Officers comments.

PART 2 PRODUCTS

2.1 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize manual into separate sections for each system and subsystem, and separate sections for each piece of equipment not part of a system. Manual shall contain title page, table of contents, and manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include:

1. Project Title
2. Location
3. Park
4. Contract Number
5. Prime Contractors Name and Address
6. Date of Substantial Completion
7. Binder Volume Number

C. Table of Contents: List each product included in manual, identified by product name, indexed to content of the volume, and cross-referenced to Specification Section number in Project

Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. Assemble instructions for subsystems, equipment, and components of one system into a single binder if needed.

1. Binders: White, commercial quality, hard back, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2 by 11 inch (215 by 280 millimeter) paper; with clear plastic window sleeve on front and spine to hold label describing contents and pockets inside covers to hold folded oversize sheets.
   a. Cover Sheet: Identify binders on front and spine, with project title, location, park, contract number, prime contractor's name and address, date of substantial completion, and binder volume number. Insert cover sheet into clear plastic view pocket on front of binder. Insert sheet into clear plastic view pocket on spine with title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
2. Data: Fill binders to no more than 75 percent of capacity. Punch holes shall not obscure any data. When contents of a single tabbed section cover more than one item, provide colored paper sheets to separate the data for each item.
   a. Manufacturers' Data: Provide originals for color or copyrighted data. Black and white data may be originals or clean, good quality reproductions. No copies produced by facsimile transmission and sheets with stamps, such as submittal approval stamps. Include only sheets that apply to items installed; cross out inapplicable data.
   b. Equipment Data Sheet: Data, using form at end of this section.
   c. Poorly reproduced or illegible data will be rejected.
3. Dividers: Divider sheets with Mylar reinforced edges and pre-printed numbered tabs aligned with numbers and title lines on index sheet. Include typed list of products and major components of equipment included in section on each divider, cross-referenced to Specification Section number and title of Project Manual.
4. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
   b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 EMERGENCY MANUALS

A. Content: Organize manual into separate section for type of emergency, emergency instructions, and 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 for fire.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of National Park Service (NPS) operating

personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include instructions on stopping, shutdown instructions for each type of emergency, operating instructions for conditions outside normal operating limits, and required sequences for electric or electronic systems.

2.3 OPERATION AND MAINTENANCE MANUALS

A. Operation Requirements

1. Content: In addition to requirements in Section, include operation data required in individual Specification Sections and equipment descriptions, operating standards, operating procedures, operating logs, wiring and control diagrams, and license requirements.
2. Descriptions: Include:
    a. Product name and model number
    b. Manufacturer's name
    c. Equipment identification with serial number of each component
    d. Equipment function
    e. Operating characteristics
    f. Limiting conditions
    g. Performance curves
    h. Engineering data and tests
    i. Complete nomenclature and number of replacement parts
3. Operating Procedures: Include start-up, break-in, and control procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; and required sequences for electric or electronic systems.
4. Systems and Equipment Controls: Describe sequence of operation, and diagram controls as installed.

B. Maintenance Requirements for Systems and Equipment

1. 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, and equipment data sheets as described below.
2. 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.
3. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including maintenance instructions, drawings and diagrams for maintenance, nomenclature of parts and components, and recommended spare parts for each component part or piece of equipment:
4. Maintenance Procedures: Test and inspection instructions, troubleshooting guide, disassembly instructions, and adjusting instructions, and demonstration and training videotape if available, detailing essential maintenance and environmental procedures.

5. Maintenance and Service Schedules: Service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
6. Spare Parts List and Source Information: 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.
7. Warranties and Bonds: Copies of warranties and bonds and lists of circumstances and conditions that affect validity of warranties or bonds.

2.4 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into 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.

C. Product Information: Include:

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 inspection procedures, types of cleaning agents, methods of cleaning, schedule for cleaning and maintenance, and repair instructions.

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

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that affect validity of warranties or bonds.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers’ Maintenance Documentation: Manufacturers’ maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following and items detailing 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

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

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

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

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that affect validity of warranties or bonds.

1. Include procedures and required notifications for warranty claims.

PART 3 EXECUTION

3.1 GENERAL

A. At start of project, begin accumulating operation and maintenance data and initiate index. Install and index data in binders within 30 days after delivery of items. As custom written data and test results are produced, add to operation and maintenance data file.

B. List of Operation and Maintenance requirements has been attached at end of the Division 1 Specifications for your convenience. Intent is to provide an overall summary of requirements and not a comprehensive list. Terms and conditions of the contract require satisfaction of requirements of individual specification sections regardless of what is shown on the list.

C. Keep operation and maintenance data current. Make operation and maintenance binders available to Contracting Officer for inspection at time of monthly progress payment requests. If operation and maintenance binders are not current, Contracting Officer may retain an appropriate amount of the progress payment.

3.2 MANUAL PREPARATION

A. Manual Types

1. Emergency Manual: Assemble complete set of emergency information indicating procedures for use by emergency personnel and by NPS operating personnel for types of emergencies indicated.
2. Product Maintenance Manual: Assemble complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into Work.
3. Operation and Maintenance Manuals: Assemble complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

B. Manual Contents: Including:

1. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark sheet to identify product or component incorporated into Work. If data include more than one item in a tabular format, identify each item using appropriate references from Contract Documents. Identify data applicable to Work and delete references to information not applicable.
2. Custom Written Data: For data not in manufacturer's standard literature, provide text, drawings, and schematics specifically applicable to installed systems. Include step-by-step descriptions of operating procedures; identification of individual components and their functions; descriptions of how system components relate to one another and operate together to accomplish a common process or function; and sequence of operation for system control circuits. For seasonally operated systems, provide start-up and shutdown instructions.
3. Equipment Data Sheets: For each item of equipment included in operation and maintenance data, provide Equipment Data Sheet using form at the end of this section. For equipment consisting of a driven machine and a driver (for example, a pump and a motor), equipment data shall cover both the driven machine and the driver. For similar type equipment (for example, multiple exhaust fans of the same model and type), provide a single equipment data sheet with an attached schedule listing individual equipment items.

C. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

EQUIPMENT DATA SHEET
EQUIPMENT ITEM: **DESIGNATION:** **FUNCTION:**

LOCATION: **PROJECT:** **MODEL NUMBER:** **SERIAL NUMBER:**	
MANUFACTURER ADDRESS AND PHONE:	**SUPPLIER ADDRESS AND PHONE:**
PREVENTIVE MAINTENANCE TASKS:	
NAMEPLATE DATA:	
SPARE PARTS FURNISHED AND OTHER INFORMATION:	

END OF SECTION

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work of this section consists of demolition of the existing lift station site as prescribed in the plans. The existing lift station, bioxide tank, control panels, fencing, and generator, including the fuel storage tank, are to be demolished to facilitate the installation of the new equipment. The work includes removal and disposal.

1.2 SUBMITTALS

A. As specified in Section 01 33 23.

B. Submit schedule showing sequence of work and methods of demolition. Include schedule for shutting off and capping utilities and re-establishing utility services.

C. Submit plan for maintaining sewer service during construction.

1.3 QUALITY ASSURANCE

A. Comply with safety requirements for demolition through all jurisdictions having authority, including, but not limited to OSHA and the National Park Service (NPS).

1.4 PROJECT CONDITIONS

A. Keep dust and dirt pollution to a minimum.

B. Ensure safety of persons in demolition area. Provide temporary barricades as required.

C. Provide adequate fire protection. Keep area clear of hazardous substances as required.

D. Maintain site access to exits at all times.

E. Provide temporary weather protection to prevent damage to materials as needed.

1.5 SCHEDULING

A. Complete demolition that may damage new construction before starting new work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

A. Provide temporary supports and protection for portion of site to remain, such as existing concrete pads and other equipment. Protect nearby structures and vegetation as necessary.

B. Cap or disconnect utilities. Provide bypass connections as necessary to maintain utility service to upstream portions of the park and local connections.

3.2 RESTORATION AND CLEAN-UP

A. Repair and clean adjacent surfaces damaged or soiled by demolition work.

B. Restore utility service to normal operation.

C. All salvaged equipment shall remain the property of the Government and shall be turned over to the Contracting Officer. The Contracting Officer shall make determinations for which equipment and materials shall be salvaged.

END OF SECTION

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 DESCRIPTION AND DEFINITIONS

A. This division of the Specifications covers the complete electrical systems as indicated on the drawings or as specified herein. Provide all equipment, materials, labor, and supervision to install electrical systems. The requirements of this Section apply to all electrical work hereinafter described. The General and Special Conditions are considered a part of this Division of the Specifications and all provisions contained therein which affect this work are as binding as though incorporated herein.

1. The following words and phrases shall be interpreted as indicated:
   a. "approved": approved or accepted by Governing Officials or Authorities Having jurisdiction
   b. "materials": equipment and/or materials
   c. "or equal/or equivalent": an equivalent with respect to appearance or function as determined by the Architect/Engineer; submittal approval may be required - refer to individual specification sections
   d. "provide": furnish, install, connect, and test the operation thereof
   e. "work": materials provided - see above definitions
   f. "wiring": conductors/cabling and raceway system, including fittings, boxes, connectors, supports, hardware, labeling, and related accessories

1.2 QUALITY ASSURANCE

A. All electrical work shall be in accordance with the latest locally adopted edition of the following codes and agency standards:

1. The National Electrical Code, 2020 Edition.
2. The Life Safety Code (NFPA 101), 2018 Edition.
3. Occupation Safety and Health Administration (OSHA) regulations.
4. Regulations of the local serving utility company regarding metering and service entrance.
5. Accessibility Codes: Americans with Disabilities Act Guidelines (ADA), ANSI A117.1, and 2010 ADA Standards for Accessibility Design.
6. International Building Code 2018.
7. International Energy Conservation Code, 2018 Edition.
8. International Fire Code, 2018 Edition.
9. Municipal or other locally enforced ordinances governing electrical work.

B. Material Standards: All material shall conform to the standards where such standards have been established for the particular material indicated. Publications and standards of the organizations listed below are applicable to materials specified herein.

1. American National Standards Institute (ANSI)
2. Insulated Cable Engineers Association (ICEA)
3. Institute of Electrical and Electronic Engineers (IEEE)
4. National Electrical Manufacturers Association (NEMA)
5. National Fire Protection Association (NFPA)
6. Underwriters' Laboratories, Inc. (UL)

C. Listing and Labeling: Provide equipment assemblies that are listed and labeled.

1. The terms "listed" and "labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.3 PERMITS

A. Obtain all permits and inspections for the installation of this work and pay all charges incident thereto. Deliver to the Owner all certificates of said inspection issued by authorities having jurisdiction.

1.4 WARRANTY

A. The Contractor warrants to the Owner and Architect that materials and equipment furnished under this Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, will be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the Design-Builder, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. Refer to Division 1 for other warranty requirements.

1.5 PROJECT DOCUMENTS

A. Keep on hand at the project site a complete set of all project drawings and specifications, including, but not limited to, all architectural and engineering drawings. Refer to these documents, coordinate and install all work accordingly so that all electrical equipment will be properly located and accessible.

B. The drawings are diagrammatic and are intended to indicate the arrangements of electrical equipment. Do not scale drawings. Obtain dimensions for layout of equipment from drawings of other trades unless indicated on Electrical plans. Review drawings of other trades for door swings, cabinets, counters, and built-in equipment; conditions indicated on Architectural plans shall govern. Coordinate installation of electrical equipment with structural system and mechanical equipment and access thereto. Coordinate installation of electrical equipment with ductwork and piping, and wall thickness. Verify construction dimensions at the site and make changes to conform to the building as constructed. Work improperly installed due to lack of construction verification shall be corrected at no additional cost to the Owner.

C. Equipment layout is based on one manufacturer's product. Where equipment selected by the Contractor for use on the project differs from layout indicated, the Contractor shall be responsible for coordinating space requirements and connection arrangements.

D. Bring all discrepancies shown on different drawings, between drawings and specifications or between documents and field conditions to the immediate attention of the Architect.

1.6 SUBMITTALS

A. Shop Drawings and Product Data:

1. IMPORTANT: Refer to Section 013000 - Administrative Requirements for submittal format! Submittals that do not conform with the requirements of this section will be returned without review.
2. Submit data for materials and equipment to be used on the project to the Architect for review. Submittals shall be supported by descriptive material, catalog cuts, diagrams, and performance charts published by the manufacturer to show conformance to specification and drawing requirements. Model numbers alone will not be acceptable. Provide documentation of complete electrical characteristics for all equipment.
3. Provide equipment layout plans, drawn to ¼"=1'-0", showing the space arrangement of electrical spaces such as main service equipment area, electrical closets, and each area where electrical distribution equipment is to be installed. Base layout on dimensions of the equipment submitted for use on the project. Submit plans for review with shop drawings.
4. Refer to the individual sections for indication of equipment for which submittals are required.

B. Record Documents: Refer to Section 013000 - Administrative Requirements for requirements for record documents, as-built drawings, and related submittals.

1.7 EQUIPMENT REQUIRING ELECTRICAL SERVICE

A. Review all specification sections and drawings for equipment requiring electrical service. Provide service to and make connections to all equipment requiring electrical service.

B. Drawings indicate equipment with loads, horsepower ratings, voltages, and corresponding control equipment, feeders, and overcurrent devices which were used as a basis for design. If equipment actually furnished have loads other than those indicated on the drawings or specified herein, control equipment, feeders, and overcurrent devices shall be adjusted in size accordingly at no additional cost to the Owner. Such adjustment shall be subject to the review of the .

C. Incidental items not indicated on the drawings or mentioned in the specifications but that can legitimately and reasonably be inferred to belong to the work and in good practice to provide a complete system, shall be furnished and installed as though itemized here in detail.

1.8 QUALITY ASSURANCE

A. **NOTICE: Manufacturer's Startup Representative Qualifications:** Unless specifically noted otherwise in the specifications or drawings, when the project documents specify startup services by a manufacturer's factory technician or representative, those services may not be delegated to the contractor or subcontractor who performed the installation, but must be provided directly by the manufacturer's personnel or by the manufacturer's contracted independent third party representative.

1.9 SITE INVESTIGATION

A. Prior to submitting bids for the project, visit the site of the work to become aware of existing conditions.

PART 2 PRODUCTS

2.1 MATERIALS

A. Furnish all materials specified herein or indicated on the drawings. All materials shall be new, unless otherwise indicated.

B. Where Underwriters' Laboratories (UL) testing standards and listings exist for an item of material or equipment, the listed material shall bear the UL label.

PART 3 - EXECUTION

3.1 PRODUCT DELIVERY, STORAGE, HANDLING, AND PROTECTION

A. Inspect materials upon arrival at site and verify conformance with project requirements. Prevent unloading of unsatisfactory material. Handle materials in accordance with applicable standards and recommendations, and in a manner to prevent damage to materials. Store packaged materials in original undamaged condition with manufacturer's labels and seals intact. Containers which are broken, opened, damaged, or watermarked are unacceptable and shall be removed from the premises and replaced.

B. All material, except items specifically designed to be installed outdoors, shall be stored in an enclosed, dry building or trailer. Areas for general storage shall be provided. Provide temperature and/or humidity control where needed. All material for interior installation, including conductors, shall be stored in an enclosed weathertight structure and shall be protected from water, direct sunlight, cold or heat. Equipment stored other than as specified above shall be removed from the premises and replaced.

C. Equipment and materials shall not be installed until such time as the environmental conditions of the job site are suitable to protect the equipment or materials. Conditions shall be those for which the equipment or materials are designed to be installed.

3.2 CLEANING, PAINTING AND IDENTIFICATION

A. Remove oil, dirt, grease and foreign materials from all raceways, boxes, panelboard trims and cabinets to provide a clean surface for painting. Touch-up scratched or marred surfaces of lighting fixtures, panelboard and cabinet trims, or other equipment enclosures with paint furnished by the equipment manufacturer specifically for that purpose.

B. Where painting of trim covers for flush mounted panelboards, communication equipment cabinets, pull boxes, junction boxes, and control cabinets is part of this or any other Division of these specifications, remove trim covers before painting. Do not paint locks, latches, hinges, or exposed trim clamps.

C. Where plywood backboards are used to mount equipment provided under Divisions 26, 27, or 28, paint backboards with two coats of light gray paint. Provide fire-retardant plywood, 3/4" thick minimum.

D. Identify electrical components in the individual specification sections.

1. Nameplates for equipment shall be installed on the exterior with epoxy cement adhesive.

3.3 EXCAVATION, TRENCHING AND BACKFILLING

A. Verify existing underground utility locations before excavation is to begin. Perform all excavation to install underground circuiting and raceway systems indicated on the drawings or specified herein. During excavation, pile material for backfilling back from the banks of the trench to avoid overloading and to prevent cave-ins. Provide shoring per OSHA Standards. Remove and dispose of all excavated materials not to be used for backfill. Grade to prevent surface water from flowing into trenches and excavation. Remove any water accumulating therein by pumping.

B. Grade the bottom of trenches to provide uniform bearing and support for underground circuiting and raceway systems on undisturbed soil at every point along entire length. Tamp over depths with loose, granular, moist earth. Remove unstable soil that is not capable of supporting equipment or installation and replace with specified material for a minimum of 12" below invert of equipment or installation.

C. Backfill the trenches with excavated materials approved for backfilling, consisting of earth, loam, sandy clay, or sand and gravel, free from large clods of earth and stones, deposited in 6" layers and tamped until the installation has a cover of not less than the adjacent ground but not greater than 2" above existing ground. Backfill simultaneously on both sides of the trench. Compaction of the filled trench shall be at least equal to that of the surrounding undisturbed material. Do not settle backfill with water. Reopen any trenches not meeting compaction requirements or where settlement occurs, refill, compact, and restore surface, mounded over and smoothed off.

3.4 COORDINATION AND COOPERATION

A. Schedule the work, coordinate, and cooperate with all trades to avoid interferences, delays, and unnecessary work. If any conflicts occur which, in the installer's opinion, necessitate departures from the drawings and specifications, details of departures and reasons therefore shall be submitted in writing for the Architect's consideration.

B. Notify other trades of dedicated electrical space to ensure those spaces stay clear of pipes, duct work and other foreign systems.

3.5 OPERATION AND MAINTENANCE MANUALS AND INSTRUCTIONS

A. Provide printed material for binding in operation and maintenance manuals. Include electrical equipment shop drawings as a minimum, and additional shop and product drawings as required by individual specification sections. Refer to Section 013000 - Administrative Requirements for additional information on submittal requirements.

B. Instructions of Owner Personnel:

1. Before final project review, as designated by the Design Professional, provide a competent representative to instruct Owner's designated personnel in systems indicated.
2. Use Operation and Maintenance Manuals as basis of instruction. Review contents with personnel in detail to explain all aspects of operation and maintenance.
3. Prepare and insert additional data in Operation and Maintenance Manuals when the need for such data becomes apparent during instruction.

3.6 ELECTRICAL ACCEPTANCE TESTS AND MANUFACTURERS CERTIFICATION

A. Refer to the individual specification sections and the Electrical Acceptance Testing section for equipment or system test requirements. Testing documentation shall be provided for reference at the time of final project review.

B. Where specified under the individual system specification sections, the systems shall be reviewed for compliance with these specifications, installation in accordance with the manufacturer's recommendations, and system operation by a representative of the manufacturer.

3.7 CONSTRUCTION OBSERVATION ASSISTANCE

A. Provide personnel to assist the Architect or their representative during all construction observation visits. Provide tools and equipment to demonstrate the system operation and

provide access to equipment, including screwdrivers, wrenches, ladders, flashlights, circuit testing devices, meters, keys, etc.

B. Remove panelboard trims, motor control covers, device plates, junction box covers, etc. as directed for inspection of internal wiring. Turn over to the Owner one set of keys for all lockable electrical equipment on the project. Accessible ceilings shall be removed as directed for inspection of equipment installed above ceilings.

C. Energize and de-energize circuits and equipment as directed. Demonstrate operation of equipment and systems as directed.

D. Provide authorized representatives of the manufacturers to demonstrate to the Architect compliance with the Contract Documents at a time designated by the Architect.

END OF SECTION

SECTION 260505 - SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical demolition.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that abandoned wiring and equipment serve only abandoned facilities.

B. Demolition drawings are based on casual field observation and existing record documents.

C. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Disconnect electrical systems as indicated on drawings.

B. Coordinate utility service outages with utility company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, and extend existing installations to accommodate new construction.

B. Remove abandoned wiring and associated junction boxes to source of supply.

C. Remove exposed abandoned conduit, as required. Cut conduit flush with grade.

D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

E. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

F. Repair adjacent construction and finishes damaged during demolition and extension work.

G. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment that remain or that are to be reused.

END OF SECTION

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single conductor building wire.

B. Wiring connectors.

C. Electrical tape.

D. Wire pulling lubricant.

E. Cable ties.

1.2 RELATED REQUIREMENTS

A. Section 260505 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.

B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft 2011 (Reapproved 2017).

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation 2004 (Reapproved 2020).

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape 2017.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

G. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy 2021.

H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 44 - Thermoset-Insulated Wires and Cables Current Edition, Including All Revisions.

J. UL 83 - Thermoplastic-Insulated Wires and Cables Current Edition, Including All Revisions.

K. UL 267 - Outline of Investigation for Wire-Pulling Compounds Most Recent Edition, Including All Revisions.

L. UL 486A-486B - Wire Connectors Current Edition, Including All Revisions.

M. UL 486C - Splicing Wire Connectors Current Edition, Including All Revisions.

N. UL 486D - Sealed Wire Connector Systems Current Edition, Including All Revisions.

O. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Nonmetallic-sheathed cable is not permitted.

D. Underground feeder and branch-circuit cable is not permitted.

E. Service entrance cable is not permitted.

F. Armored cable is not permitted.

G. Metal-clad cable is not permitted.

2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductor Material:

1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
3. Tinned Copper Conductors: Comply with ASTM B33.

H. Minimum Conductor Size: 12 AWG.

a. Exceptions:
   1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
   2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
   3) 20 A, 277 V circuits longer than 150 feet (46 m): 10 AWG, for voltage drop.

I. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

J. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
   a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
3. Color Code:
   a. 240/120 V, 1 Phase, 3 Wire System:
      1) Phase A: Black.
      2) Phase B: Red.
      3) Neutral/Grounded: White.
   b. Equipment Ground, All Systems: Green.

2.3 SINGLE CONDUCTOR BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor Stranding:

1. Feeders and Branch Circuits:

a. Size 10 AWG and Smaller: Solid.
b. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation:

1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
   a. Installed Underground: Type XHHW-2.

2.4 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Wiring Connectors for Splices and Taps:

1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

C. Wiring Connectors for Terminations:

1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
4. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
5. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
6. Conductors for Control Circuits: Use crimped terminals for all connections.

D. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

E. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

F. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

G. Mechanical Connectors: Provide bolted type or set-screw type.

H. Compression Connectors: Provide circumferential type or hex type crimp configuration.

I. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

2.5 ACCESSORIES

A. Electrical Tape:

1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).

B. Wire Pulling Lubricant:

1. Listed and labeled as complying with UL 267.
2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
3. Suitable for use at installation temperature.

C. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 INSTALLATION

A. Circuiting Requirements:

1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. When circuit destination is indicated without specific routing, determine exact routing required.
3. Arrange circuiting to minimize splices.
4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Installation in Raceway:

1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
2. Pull all conductors and cables together into raceway at same time.
3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

G. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.

H. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

I. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

J. Make wiring connections using specified wiring connectors.

1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

K. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

L. Insulate ends of spare conductors using vinyl insulating electrical tape.

M. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

N. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground rod electrodes.

1.2 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings 2022.

C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 467 - Grounding and Bonding Equipment Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
2. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

B. Do not use products for applications other than as permitted by NFPA 70 and product listing.

C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

E. Grounding Electrode System:

1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
   a. Provide continuous grounding electrode conductors without splice or joint.
   b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
2. Ground Rod Electrode(s):
   a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
   b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
   c. Where location is not indicated, locate electrode(s) at least 5 feet (1.5 m) outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.

F. Service-Supplied System Grounding:

1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

G. Separately Derived System Grounding:

1. Separately derived systems include, but are not limited to:
   a. Generators, when neutral is switched in the transfer switch.
2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system,

where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.

4. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
5. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

H. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for metal building frame.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:

1. Use insulated copper conductors unless otherwise indicated.
   a. Exceptions:
      1) Use bare copper conductors where installed underground in direct contact with earth.
      2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
   a. Exceptions:

D. Ground Rod Electrodes:

1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.

D. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 260553.

END OF SECTION

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.2 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 260533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

C. Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

1.3 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2023.

D. MFMA-4 - Metal Framing Standards Publication 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
2. Coordinate work to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 033000.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Comply with the following. Where requirements differ, comply with most stringent.
   a. NFPA 70.
   b. Requirements of authorities having jurisdiction.
2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
   a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
   b. Outdoor and Damp or Wet Indoor Locations: Use stainless steel unless otherwise indicated.
   c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
   d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

D. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Steel: Use beam clamps, machine bolts, or welded threaded studs.
6. Sheet Metal: Use sheet metal screws.
7. Plastic and lead anchors are not permitted.

8. Hammer-driven anchors and fasteners are not permitted.
9. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
    b. Comply with MFMA-4.
    c. Channel Material: Use galvanized steel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:

1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

I. Secure fasteners in accordance with manufacturer's recommended torque settings.

J. Remove temporary supports.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 260533.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Rigid polyvinyl chloride (PVC) conduit.

1.2 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Cable assemblies consisting of conductors protected by integral metal armor.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260533.16 - Boxes for Electrical Systems.

E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2020.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

C. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2020.

D. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit 2004.

E. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) 2017.

F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.

G. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit 2020.

H. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing 2021.

I. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 6 - Electrical Rigid Metal Conduit-Steel Current Edition, Including All Revisions.

K. UL 514B - Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.

L. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings Current Edition, Including All Revisions.

M. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.

B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:

1. Exterior, Direct-Buried: Use rigid PVC conduit.
2. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC) where emerging from underground.

D. Exposed, Exterior: Use galvanized steel rigid metal conduit.

2.2 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling mandrel through them.

C. Provide conduit, fittings, supports, and accessories required for complete raceway system.

D. Provide products listed, classified, and labeled as suitable for purpose intended.

E. Minimum Conduit Size, Unless Otherwise Indicated:

1. Branch Circuits: 3/4 inch (21 mm) trade size.
2. Branch Circuit Homeruns: 3/4-inch (21 mm) trade size.
3. Control Circuits: 3/4 inch (21 mm) trade size.
4. Underground, Exterior: 1-inch (27 mm) trade size.

F. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:

1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.4 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

B. Fittings:

1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.5 ACCESSORIES

A. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

B. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

C. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf (5.6 kN).

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1.

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

E. Conduit Routing:

1. Unless dimensioned, conduit routing indicated is diagrammatic.
2. When conduit destination is indicated without specific routing, determine exact routing required.
3. Conceal conduits unless specifically indicated to be exposed.
4. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
5. Arrange conduit to provide no more than the equivalent of three 90 degree bends between pull points.
6. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
7. Route conduits above water and drain piping where possible.
8. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
9. Group parallel conduits in same area on common rack.

F. Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 260529.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Use conduit strap to support single surface-mounted conduit.
   a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
4. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
5. Use conduit clamp to support single conduit from beam clamp or threaded rod.
6. Use of spring steel conduit clips for support of conduits is not permitted.
7. Use of wire for support of conduits is not permitted.

G. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
5. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
6. Secure joints and connections to provide mechanical strength and electrical continuity.

H. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.

4. Conceal bends for conduit risers emerging above ground.
5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

I. Conduit Sealing:

1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
   a. Where conduits may transport moisture to contact live parts.
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation.

J. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.

K. Provide grounding and bonding; see Section 260526.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective conduits.

3.4 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.5 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 260533.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).

C. Underground boxes/enclosures.

1.2 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260533.13 - Conduit for Electrical Systems:

1. Conduit bodies and other fittings.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 262726 - Wiring Devices

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2016.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports 2013 (Reaffirmed 2020).

F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. SCTE 77 - Specifications for Underground Enclosure Integrity 2017.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.

J. UL 508A - Industrial Control Panels Current Edition, Including All Revisions.

K. UL 514A - Metallic Outlet Boxes Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working

clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the work with other trades to preserve insulation integrity.
6. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures and underground boxes/enclosures.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 BOXES

A. General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled as suitable for the purpose intended.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:

1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use raised covers suitable for the type of wall construction and device configuration where required.
4. Use shallow boxes where required by the type of wall construction.
5. Do not use "through-wall" boxes designed for access from both sides of wall.
6. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.

7. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
8. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
9. Minimum Box Size, Unless Otherwise Indicated:
   a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
10. Wall Plates: Comply with Section 262726.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):

1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
   a. Outdoor Locations: Type 3R, painted steel.
3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
   a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
   a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.

D. Underground Boxes/Enclosures:

1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
2. Size: As indicated on drawings.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches (300 mm).
4. Provide logo on cover to indicate type of service.
5. Applications:
   a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.
   b. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
6. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
   a. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

H. Box Locations:

1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.
2. Unless dimensioned, box locations indicated are approximate.
3. Locate boxes as required for devices installed under other sections or by others.
   a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.
4. Locate boxes so that wall plates do not cross masonry joints.
5. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.

I. Box Supports:

1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

J. Install boxes plumb and level.

K. Install boxes as required to preserve insulation integrity.

L. Underground Boxes/Enclosures:

1. Install enclosure on gravel base, minimum 6 inches (150 mm) deep.
2. Flush-mount enclosures located in concrete or paved areas.
3. Mount enclosures located in landscaped areas with top at 1 inch (25 mm) above finished grade.
4. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

M. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

N. Close unused box openings.

O. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

P. Provide grounding and bonding in accordance with Section 260526.

3.3 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.4 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

E. Underground warning tape.

F. Warning signs and labels.

1.2 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

1.3 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. NFPA 70E - Standard for Electrical Safety in the Workplace 2021.

C. UL 969 - Marking and Labeling Systems Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:

1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
2. Do not install identification products until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.7 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
    a. Enclosed switches, circuit breakers, and motor controllers:
        1) Identify voltage and phase.
        2) Identify power source and circuit number. Include location when not within sight of equipment.
        3) Identify load(s) served. Include location when not within sight of equipment.
    b. Transfer Switches:
        1) Identify voltage and phase.
        2) Identify power source and circuit number for both normal power source and standby power source. Include location when not within sight of equipment.
        3) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.
2. Emergency System Equipment:
    a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
    b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
3. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
    a. Service equipment.
    b. Industrial control panels.
4. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment indicated.
    a. Minimum Size: 3.5 by 5 inches (89 mm by 127 mm).
    b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.

B. Identification for Conductors and Cables:

1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
    a. At each source and load connection.
    b. Within equipment enclosures when conductors and cables enter or leave the enclosure.
4. Use underground warning tape to identify direct buried cables.

C. Identification for Raceways:

1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet (6.1 m).
2. Use underground warning tape to identify underground raceways.

D. Identification for Boxes:

1. Use voltage markers to identify highest voltage present.
2. Use voltage markers or color coded boxes to identify systems other than normal power system.

E. Identification for Devices:

1. Wiring Device and Wallplate Finishes: Comply with Section 262726.

2.2 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Materials:
   a. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:

1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
2. Legend:
   a. System designation where applicable:
      1) Emergency Power System: Identify with text "EMERGENCY".
   b. Equipment designation or other approved description.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
   a. System Designation: 1 inch (25 mm).
   b. Equipment Designation: 1/2 inch (13 mm).
5. Color:
   a. Normal Power System: White text on black background.
   b. Emergency Power System: White text on red background.

D. Format for General Information and Operating Instructions:

1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/4 inch (6 mm).
5. Color: Black text on white background unless otherwise indicated.

E. Format for Caution and Warning Messages:

1. Minimum Size: 2 inches (51 mm) by 4 inches (100 mm).
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/2 inch (13 mm).
5. Color: Black text on yellow background unless otherwise indicated.

2.3 WIRE AND CABLE MARKERS

A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

C. Legend: Power source and circuit number or other designation indicated.

D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

E. Minimum Text Height: 1/8 inch (3 mm).

F. Color: Black text on white background unless otherwise indicated.

2.4 VOLTAGE MARKERS

A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

B. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

C. Minimum Size:

1. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
2. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches (29 by 110 mm).
3. Markers for Junction Boxes: 1/2 by 2 1/4 inches (13 by 57 mm).

D. Legend:

1. Markers for Voltage Identification: Highest voltage present.
2. Markers for System Identification:
   a. Emergency Power System: Text "EMERGENCY".

E. Color: Black text on orange background unless otherwise indicated.

2.5 UNDERGROUND WARNING TAPE

A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).

C. Legend: Type of service, continuously repeated over full length of tape.

D. Color:

1. Tape for Buried Power Lines: Black text on red background.

2.6 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:

1. Materials:
   a. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
3. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.

C. Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:

1. Surface-Mounted Equipment: Enclosure front.
2. Flush-Mounted Equipment: Inside of equipment door.
3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
4. Elevated Equipment: Legible from the floor or working platform.
5. Conduits: Legible from the floor.
6. Boxes: Outside face of cover.
7. Conductors and Cables: Legible from the point of access.
8. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.

G. Secure rigid signs using stainless steel screws.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 260583 - WIRING CONNECTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical connections to equipment.

1.2 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 260533.16 - Boxes for Electrical Systems.

C. Section 262726 - Wiring Devices.

1.3 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices 1999 (Reaffirmed 2020).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications 2021.

C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.

1. Colors: Comply with NEMA WD 1.
2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Wiring Devices: As specified in Section 262726.

C. Wire and Cable: As specified in Section 260519.

D. Boxes: As specified in Section 260533.16.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

G. Install terminal block jumpers to complete equipment wiring requirements.

H. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 263213 - ENGINE GENERATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Packaged engine generator system and associated components and accessories:

1. Engine and engine accessory equipment.
2. Alternator (generator).
3. Generator set control system.
4. Generator set enclosure.

1.2 RELATED REQUIREMENTS

A. Section 231113 - Facility Fuel-Oil Piping:

1. Installation of diesel fuel system day tank specified in this section.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 263600 - Transfer Switches.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NECA/EGSA 404 - Standard for Installing Generator Sets 2014.

C. NEMA MG 1 - Motors and Generators 2021.

D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 110 - Standard for Emergency and Standby Power Systems 2022.

F. UL 1236 - Battery Chargers for Charging Engine-Starter Batteries Current Edition, Including All Revisions.

G. UL 2200 - Stationary Engine Generator Assemblies Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate compatibility of generator sets to be installed with work provided under other sections or by others.
2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for engine generator system.
3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
4. Coordinate the work to provide electrical circuits suitable for the power requirements of the actual auxiliary equipment and accessories to be installed.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features. Include alternator starting capabilities, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.

D. Fuel Storage Tank Calculations: Indicate maximum running time for generator set configuration provided.

E. Manufacturer's factory emissions certification.

F. Source quality control test reports.

G. Manufacturer’s detailed field testing procedures.

H. Field quality control test reports.

I. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.

J. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

K. Maintenance contracts.

L. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

1.6 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70 (National Electrical Code).

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store generator sets in accordance with manufacturer's instructions and NECA/EGSA 404.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to generator set components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 PACKAGED ENGINE GENERATOR SYSTEM

A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. System Description:

1. Application: Emergency/standby.
2. Configuration: Single packaged engine generator set operated independently (not in parallel).

D. Packaged Engine Generator Set:

1. Type: Gaseous (spark ignition).
2. Power Rating: As indicated on drawings, standby.
3. Voltage: As indicated on drawings.
4. Main Line Circuit Breaker:
    a. Type: Thermal magnetic.
    b. Trip Rating: Select according to generator set rating.
    c. Features:
        1) Auxiliary contacts.

E. Generator Set General Requirements:

1. Prototype tested in accordance with NFPA 110 for Level 1 systems.
2. Factory-assembled, with components mounted on suitable base.
3. List and label engine generator assembly as complying with UL 2200.
4. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.
5. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.
6. Main Line Circuit Breakers: Provide factory-installed line side connections with suitable lugs for load side connections.

F. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.

G. Starting and Load Acceptance Requirements:

1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.
2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate overcrank alarm condition and lock-out generator set from further cranking until manually reset.
3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).
4. Maximum Load Step: Supports 100 percent of rated load in one step.

H. Exhaust Emissions Requirements:

1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.
2. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer and Engineer. Where such modifications are made, provide field emissions testing as necessary for certification.

2.2 ENGINE AND ENGINE ACCESSORY EQUIPMENT

A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.

B. Engine Fuel System - Gaseous (Spark Ignition):

1. Fuel Source: Propane (LP), vapor withdrawal.
2. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.
3. Provide components/features indicated and as necessary for operation and/or required by applicable codes, including but not limited to:
   a. Carburetor.
   b. Gas pressure regulators.
   c. Fuel shutoff control valves.
   d. Low gas pressure switches.

C. Engine Starting System:

1. System Type: Electric, with DC solenoid-activated starting motor(s).
2. Battery(s):
   a. Battery Type: Lead-acid.
   b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.
   c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.
3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.
4. Battery Charger:

a. Provide dual rate battery charger with automatic float and equalize charging modes and minimum rating of 10 amps; suitable for maintaining the supplied battery(s) at full charge without manual intervention.
b. Capable of returning supplied battery(s) from fully discharged to fully charged condition within 24 hours, as required by NFPA 110 for Level 1 applications while carrying normal loads.
c. Recognized as complying with UL 1236.
d. Furnished with integral overcurrent protection; current limited to protect charger during engine cranking; reverse polarity protection.
e. Provide integral DC output ammeter and voltmeter with five percent accuracy.
f. Provide alarm output contacts as necessary for alarm indications.

5. Battery Heater: Provide thermostatically controlled battery heater to improve starting under cold ambient conditions.

D. Engine Speed Control System (Governor):

1. Single Engine Generator Sets (Not Operated in Parallel): Provide electronic isochronous governor for controlling engine speed/alternator frequency.
2. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.

E. Engine Lubrication System:

1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.

F. Engine Cooling System:

1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and engine-driven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.
2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.

G. Engine Air Intake and Exhaust System:

1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.
2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.

2.3 ALTERNATOR (GENERATOR)

A. Alternator: 4-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 1; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.

B. Exciter:

1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.
2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.
3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.

C. Temperature Rise: Comply with UL 2200.

D. Insulation System: NEMA MG 1, Class H; suitable for alternator temperature rise.

E. Enclosure: NEMA MG 1, drip-proof.

F. Total Harmonic Distortion: Not greater than five percent.

2.4 GENERATOR SET CONTROL SYSTEM

A. Provide microprocessor-based control system for automatic control, monitoring, and protection of generator set. Include sensors, wiring, and connections necessary for functions/indications specified.

B. Control Panel:

1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.
2. Generator Set Control Functions:
   a. Automatic Mode: Initiates generator set start/shutdown upon receiving corresponding signal from remote device (e.g. automatic transfer switch).
   b. Manual Mode: Initiates generator set start/shutdown upon direction from operator.
   c. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.
   d. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset.
   e. Cycle Cranking: Programmable crank time, rest time, and number of cycles.
   f. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).
   g. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.
3. Generator Set Status Indications:
   a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
   b. Current (Amps): For each phase.
   c. Frequency (Hz).
   d. Real power (W/kW).
   e. Reactive power (VAR/kVAR).
   f. Apparent power (VA/kVA).
   g. Power factor.
   h. Duty Level: Actual load as percentage of rated power.
   i. Engine speed (RPM).
   j. Battery voltage (Volts DC).
   k. Engine oil pressure.
   l. Engine coolant temperature.
   m. Engine run time.
   n. Generator powering load (position signal from transfer switch).
4. Generator Set Protection and Warning/Shutdown Indications:
   a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following protections/indications:
      1) Overcrank (shutdown).
      2) Low coolant temperature (warning).
      3) High coolant temperature (warning).
      4) High coolant temperature (shutdown).

5) Low oil pressure (shutdown).
6) Overspeed (shutdown).
7) Low fuel level (warning).
8) Low coolant level (warning/shutdown).
9) Generator control not in automatic mode (warning).
10) High battery voltage (warning).
11) Low cranking voltage (warning).
12) Low battery voltage (warning).
13) Battery charger failure (warning).

b. In addition to NFPA 110 requirements, provide the following protections/indications:
1) High AC voltage (shutdown).
2) Low AC voltage (shutdown).
3) High frequency (shutdown).
4) Low frequency (shutdown).
5) Overcurrent (shutdown).

c. Provide contacts for local and remote common alarm.
d. Provide lamp test function that illuminates all indicator lamps.

5. Other Control Panel Features:
a. Event log.

C. Remote Emergency Stop: Provide approved red, mushroom style remote emergency stop button where indicated or required by authorities having jurisdiction.

2.5 GENERATOR SET ENCLOSURE

A. Enclosure Type: Sound attenuating, weather protective.

B. Enclosure Material: Steel or aluminum.

C. Hardware Material: Stainless steel.

D. Color: Manufacturer's standard.

E. Access Doors: Lockable, with all locks keyed alike.

F. Openings: Designed to prevent bird/rodent entry.

G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance service.

H. Sound Attenuating Enclosures: Line enclosure with non-hydroscopic, self-extinguishing sound-attenuating material.

I. Utilize an upward discharging radiator hood.

2.6 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Perform production tests on generator sets at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

C. Generator Set production testing to include, at a minimum:

1. Operation at rated load and rated power factor.
2. Single step load pick-up.
3. Transient and steady state voltage and frequency performance.

4. Operation of safety shutdowns.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of generator sets and auxiliary equipment are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive equipment.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install generator sets and associated accessories in accordance with NECA/EGSA 404.

D. Arrange equipment to provide minimum clearances and required maintenance access.

E. Unless otherwise indicated, mount generator set on properly sized, minimum 6 inch (150 mm) high concrete pad constructed in accordance with Section 033000.

F. Provide required support and attachment in accordance with Section 260529.

G. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.

H. Install day tank in accordance with Section 231113.

I. Provide grounding and bonding in accordance with Section 260526.

J. Identify system wiring and components in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Provide services of a manufacturer's authorized representative to prepare and start systems and perform inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.

C. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.

D. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

E. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank and fuel.

F. Preliminary inspection and testing to include, at a minimum:

1. Inspect each system component for damage and defects.
2. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.
3. Check for proper oil and coolant levels.

G. Prepare and start system in accordance with manufacturer's instructions.

H. Perform acceptance test in accordance with NFPA 110.

I. Inspection and testing to include, at a minimum:

1. Verify compliance with starting and load acceptance requirements.
2. Verify voltage and frequency; make required adjustments as necessary.
3. Verify phase sequence.
4. Verify control system operation, including safety shutdowns.
5. Verify operation of auxiliary equipment and accessories (e.g. battery charger, heaters, etc.).
6. Perform load tests in accordance with NFPA 110 (1.5 hour building load test followed by 2 hour full load test).

J. Provide field emissions testing where necessary for certification.

K. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.4 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.5 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

E. After successful acceptance test and just prior to Substantial Completion, replace air, oil, and fuel filters.

3.6 PROTECTION

A. Protect installed engine generator system from subsequent construction operations.

3.7 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of engine generator system for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

END OF SECTION

SECTION 263600 - TRANSFER SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Transfer switches for low-voltage (600 V and less) applications and associated accessories:

1. Automatic transfer switches.

1.2 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 263213 - Engine Generators: For interface with transfer switches.

1. Includes code requirements applicable to work of this section.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

C. NEMA ICS 10 Part 1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment 2020.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.

E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 110 - Standard for Emergency and Standby Power Systems 2022.

G. UL 1008 - Transfer Switch Equipment Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate compatibility of transfer switches to be installed with work provided under other sections or by others.
2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
4. Coordinate the work with placement of supports, anchors, etc. required for mounting.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.

D. Source quality control test reports.

E. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.

1.6 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70 (National Electrical Code).
2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for system Level specified in Section 263213.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store transfer switches in accordance with manufacturer's instructions.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to transfer switch components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 TRANSFER SWITCHES

A. Provide complete power transfer system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Applications:

1. Utilize open transition transfer unless otherwise indicated or required.
2. Neutral Switching (Single Phase, Three Wire and Three Phase, Four Wire Systems):

D. Construction Type: Either "contactor type" (open contact) or "breaker type" (enclosed contact) transfer switches complying with specified requirements are acceptable.

E. Automatic Transfer Switch:

1. Transfer Switch Type: As indicated on the drawings.
2. Voltage: As indicated on the drawings.
3. Ampere Rating: As indicated on the drawings.
4. Neutral Configuration: Solid neutral (unswitched), except as indicated.
5. Load Served: As indicated on the drawings.
6. Primary Source: As indicated on the drawings.
7. Alternate Source: As indicated on the drawings.

F. Comply with NEMA ICS 10 Part 1, and list and label as complying with UL 1008 for the classification of the intended application (e.g. emergency, optional standby).

G. Do not use double throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.

H. Load Classification: Classified for total system load (any combination of motor, electric discharge lamp, resistive, and tungsten lamp loads with tungsten lamp loads not exceeding 30 percent of the continuous current rating) unless otherwise indicated or required.

I. Switching Methods:

1. Open Transition:
   a. Provide break-before-make transfer without a neutral position that is not connected to either source, and with interlocks to prevent simultaneous connection of the load to both sources.
2. Obtain control power for transfer operation from line side of source to which the load is to be transferred.

J. Service Conditions: Provide transfer switches suitable for continuous operation at indicated ratings under the service conditions at the installed location.

K. Enclosures:

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   a. Outdoor Locations: Type 3R or Type 4.
2. Provide lockable door(s) for outdoor locations.
3. Finish: Manufacturer's standard unless otherwise indicated.

L. Short Circuit Current Rating:

1. Withstand and Closing Rating: Provide transfer switches, when protected by the supply side overcurrent protective devices to be installed, with listed withstand and closing rating as indicated on the drawings.

M. Automatic Transfer Switches:

1. Description: Transfer switches with automatically initiated transfer between sources; electrically operated and mechanically held.
2. Control Functions:
    a. Automatic mode.
    b. Test Mode: Simulates failure of primary/normal source.
    c. Voltage and Frequency Sensing:
        1) Undervoltage sensing for each phase of primary/normal source; adjustable dropout/pickup settings.
        2) Undervoltage sensing for alternate/emergency source; adjustable dropout/pickup settings.
        3) Underfrequency sensing for alternate/emergency source; adjustable dropout/pickup settings.
    d. Outputs:
        1) Contacts for engine start/shutdown (except where direct generator communication interface is provided).
        2) Auxiliary contacts; one set(s) for each switch position.
    e. Adjustable Time Delays:
        1) Engine generator start time delay; delays engine start signal to override momentary primary/normal source failures.
        2) Transfer to alternate/emergency source time delay.
        3) Retransfer to primary/normal source time delay.
        4) Engine generator cooldown time delay; delays engine shutdown following retransfer to primary/normal source to permit generator to run unloaded for cooldown period.
    f. In-Phase Monitor (Open Transition Transfer Switches): Monitors phase angle difference between sources for initiating in-phase transfer.
    g. Engine Exerciser: Provides programmable scheduled exercising of engine generator selectable with or without transfer to load; provides memory retention during power outage.
3. Status Indications:
    a. Connected to alternate/emergency source.
    b. Connected to primary/normal source.
    c. Alternate/emergency source available.
4. Automatic Sequence of Operations:
    a. Upon failure of primary/normal source for a programmable time period (engine generator start time delay), initiate starting of engine generator where applicable.
    b. When alternate/emergency source is available, transfer load to alternate/emergency source after programmable time delay.
    c. When primary/normal source has been restored, retransfer to primary/normal source after a programmable time delay. Bypass time delay if alternate/emergency source fails and primary/normal source is available.
    d. Where applicable, initiate shutdown of engine generator after programmable engine cooldown time delay.

2.2 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Perform production tests on transfer switches at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of transfer switches are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive transfer switches.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required support and attachment in accordance with Section 260529.

E. Install transfer switches plumb and level.

F. Unless otherwise indicated, mount floor-mounted transfer switches on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.

G. Provide grounding and bonding in accordance with Section 260526.

H. Identify transfer switches and associated system wiring in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Prepare and start system in accordance with manufacturer's instructions.

C. Automatic Transfer Switches:

1. Inspect and test in accordance with NETA ATS, except Section 4.
2. Perform inspections and tests listed in NETA ATS, Section 7.22.3. The insulation-resistance tests listed as optional are not required.

D. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.4 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.5 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Training: Train Owner's personnel on operation, adjustment, and maintenance of transfer switches.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

3.6 PROTECTION

A. Protect installed transfer switches from subsequent construction operations.

END OF SECTION

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work of this section consist of site excavation and grading.

1.2 CLASSIFICATION

A. Rock excavation consists of material that cannot be excavated without blasting or using rippers, including boulders have a volume of 2 cubic yards or more.

B. All other excavation under this section will be considered unclassified regardless of the nature of material encountered.

1.3 PROJECT CONDITIONS

A. Maintain fills, slopes, and ditches within the limits of the new construction until final acceptance. Repair damaged areas at no additional expense to the Government.

PART 2 – PRODUCTS

2.1 EXISTING EMBANKMENT MATERIAL

A. Material for embankment construction shall be free from frozen material, debris, muck, detrimental quantities of organic materials, and other unsuitable materials.

2.2 IMPORTED BORROW

A. Clean, readily compactable soil or soil aggregate, with all particales passing a 6-inch square opening and not more than 35 percent by weight passing a No. 200 sieve, as determined by ASTM D422-63. The portion of material passing the No. 40 sieve shall have a plasticity index of not more than 10, as determined by ASTM D4318-95. Use all suitable existing embankment material before importing borrow.

PART 3 - EXECUTION

3.1 CLEARING AND GRUBBING

A. Trees and plants to remain will be identified by the Government prior to construction.

B. Remove all trees, brush, and vegetation from areas designated to be cleared. As directed, trim low hanging, unsound, or unsightly branches on trees and shrubs designated to remain. Make cuts flush with trunk or branch. Paint cuts larger than ½ inch in diameter with tree paint.

C. Remove all stumps, roots, and debris a minimum of 8 inches below original ground. Use hand methods for grubbing inside the drip line or trees to remain.

D. Dispose of excess material as approved by the Contracting Officer.

3.2 FIELD QUALITY CONTROL MEASURES

A. Testing required to determine compliance for the work or this section will be the responsibility of the subcontractor, at no additional expense to the Government.

B. ASTM D698-91 shall be used to determine maximum density and ASTM D1556-90 or a standard nuclear method shall be used to determine in-place density.

3.3 EXCAVATION

A. Excavate to lines and grades shown. Keep excavation free from water during construction. As directed, stockpile excavated material to be used in embankment construction. Excavate rock to a minimum depth of 6 inches and a maximum depth of 12 inches below subgrade.

3.4 EMBANKMENT CONSTRUCTION

A. Before placing embankment, scarify ground surface to provide ample bond between old and new material. Place embankment material in layers no exceeding 12 inches loose measurement. Compact each layer before placing the next layer. As the compaction of each layer progresses, continually level and manipulate to ensure uniform moisture density. Add water to obtain optimum moisture content.

3.5 COMPACTION

A. Compact the top 2.5 feet of embankments supporting walks, slabs, and other structures to 98% of the maximum density as determined by ASTM D698-91, at plus or minus 2% of the optimum moisture content.

B. Compact embankments below the top 2.5 feet and embankments not supporting walks, slabs, and other structures to 95% of the maximum density as determined by ASTM D698-91, at plus or minus 2% of the optimum moisture content.

3.6 DISPOSAL

A. Dispose of all surplus and unsuitable material as required by the Contracting Officer.

B. Unless otherwise specified by the Contracting Officer, all removed material becomes the property of the contractor and shall be disposed of outside the park.

END OF SECTION

SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 STATUTORY REQUIREMENTS

A. Obtain and pay for all permits required for temporary dewatering systems.

B. Original permits shall be prominently displayed on the site prior to dewatering as required by permits.

1.2 SCOPE OF WORK

A. Furnish, install, operate, monitor, maintain, and remove temporary dewatering systems as required and maintain groundwater levels below subgrades of excavations. Prevent surface water runoff from entering or accumulating in excavations.

B. Collect and properly dispose of all discharge water from dewatering in accordance with federal, state, and local requirements and permits.

C. Repair damage caused by dewatering operations.

D. Remove temporary dewatering when no longer needed. Restore all disturbed areas.

1.3 RELATED WORK

A. 31 20 00 Earth Moving

B. 31 25 00 Erosion and Sediment Control

C. 33 30 03 Sanitary Sewage Lift Station

D. 33 30 04 Miscellaneous Lift Station Accessories

E. 33 31 15 HDPE Piping for Sanitary Sewer

1.4 SUBMITTALS

A. As specified in Section 01 33 23.

1.5 DEFINITIONS

A. Where the Phrase “in-the-dry” is used in this section, it shall be defined as in situ soil moisture content of no more than 2 percentage points above the optimum moisture content for that soil.

PART 2 - PRODUCTS (NOT USED)

PART 3 – (NOT USED)

PART 4 – EXECUTION

4.1 GENERAL

A. Control surface water and groundwater such that excavations to final grade is made in-the-dry, and bearing soils are maintained undisturbed. Prevent softening, or instability of, or disturbance to, the subgrade due to water seepage.

B. Provide Protection against flotation for all work.

C. The impact of anticipated subsurface soil/water conditions shall be considered when selecting methods of excavation and temporary dewatering. Where groundwater levels are above the

proposed bottoms of excavations, a pumped dewatering system is expected for predrainage of the soils prior to excavation to final grade and for maintenance of the lowered groundwater level until construction has been completed to such an extent that the foundation, structure, pipe, conduit, or fill will not be floated or otherwise damaged. Type of dewatering system, spacing of dewatering units and other details of the work are expected to vary with the soil/water conditions at a particular location.

4.2 SURFACE WATER CONTROL

A. Control surface water runoff to prevent flow into excavations. Provide temporary measures such as dikes, ditches, and sumps.

4.3 EXCAVATION DEWATERING

A. Provide and maintain adequate equipment and facilities to remove promptly all water entering excavations. Excavations shall be kept in-the-dry, so as to maintain and undisturbed subgrade condition throughout construction below grade, including backfill and fill placement.

B. Collect precipitation or surface runoff in shallow ditches around the perimeter of the excavation dewatered and restored to proper conditions prior to reinstalling the pipe and conduit.

C. Pipe and conduit shall not be installed in water or allowed to be submerged prior to backfilling. Pipe and conduit which becomes submerged shall be removed and the excavation dewatered and restored to proper conditions prior to reinstalling the pipe and conduits.

D. Excavations for foundations, slabs, and structures shall be maintained in-the-dry for a minimum of 4 days after concrete placement. In no event shall water be allowed to enter and excavation and rise to cause unbalanced pressure on foundations, slabs, and structures until the concrete or mortar has set at least 24 hours.

E. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade at the bottom of the excavation. If the subgrade becomes disturbed for any reason, the unsuitable subgrade material shall be removed and replaced with concrete, compacted granular fill, or other approved material to restore the bearing capacity of the subgrade to its original undisturbed condition.

F. Dewatering shall be conducted in a manner that does not cause loss of ground or disturbance to the pipe bedding or soil that supports overlying or adjacent structures.

4.4 DISPOSAL OF DRAINAGE

A. All water discharged from temporary dewatering shall be disposed of in such a manner as will not contravene any permit condition or cause injury to public health, to property, to the work completed or in progress, to the surface of the streets, or cause any interference with the use of the same by the public. Before starting the excavation, submit for approval, proposed methods of handling water and locations at which the water will be disposed to the Contracting Officer. Existing or new sanitary sewer systems shall not be used to dispose of drainage unless the written permission of the utility or owner is obtained.

END OF SECTION

SECTION 312500 - EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

A. In general, the work to be done includes measure necessary to control erosion and sediment control within the construction area to the acceptance of the Florida Department of Environmental Protection (FDEP).

B. The contractor shall be responsible for implementation and maintenance of all Best Management Practices (BMP) necessary to protect against the transfer of water borne sediment, Any violation shall be the monetary responsibility of the Contractor.

1.2 SUBMITTALS

A. Erosion and Sediment Control plan including layout of silt fence and other necessary BMPs shall be submitted to the Contracting Officer.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 ALL BMPS

A. All BMPs shall be installed at a minimum in accordance with the State of Florida Erosion and Sediment Control Designer and Reviewer Manual July 2013 Edition. Newer editions shall be followed if available to the Contractor at the time of Construction.

END OF SECTION

SECTION 322523 - SITE WORK CONCRETE REQUIREMENTS

PART 1 – GENERAL

1.1 SCOPE

A. This specification section covers all materials, equipment, and methods to be used by the Contractor in mixing, placing, testing, finishing, and curing cast-in-place concrete. The Contractor shall furnish all cement, aggregate, water, admixtures, and other materials, and all labor, equipment, and supplies necessary or convenient to him for completing the work described in these Contract Documents. Cast-in-place concrete reinforcement and form work shall be as specified in the sections entitled "Concrete Reinforcing" and "Concrete Forming" respectively of these Specifications.

1.2 CLASSIFICATION OF CONCRETE

A. Concrete shall be either Class A or Class B, as indicated on the Drawings or specified in these Specifications. If the class is not otherwise specified, the Contractor shall furnish Class A concrete. In general, Class A concrete shall be used for reinforced concrete cast-in-place in forms for slabs, footings, foundations, manholes, and similar reinforced concrete structures coming under the scope of ACI 318. Class B concrete shall be plain concrete and shall be used for pipe cradles, pipe and conduit encasement, bedding, grade correction, anchors, collars, thrust blocks, massive sections, and other non-reinforced concrete.

1.3 GENERAL REQUIREMENTS

A. All cast-in-place concrete shall be accurately formed and properly placed and finished as shown on the Drawings and specified herein. The materials, aggregate grading, cement content, and placement methods specified herein are intended to provide a concrete that satisfies the minimum strength requirements, exhibits sufficient plasticity and cohesiveness to facilitate placement and reduce honeycombing and porosity, and incorporate a minimum water-to-cement ratio to minimize bleeding and shrinkage and to provide maximum water tightness. However, the Contractor may submit to the Contracting Officer for review and approval alternate material requirements and placement techniques for achieving the desired results. All Class A cast-in-place concrete shall be designed in accordance with the applicable requirements of ACI 318, latest edition.

1.4 PRELIMINARY MIX DESIGN

A. Before starting any concreting operations, the Contractor shall submit to the Contracting Officer for approval a preliminary mix design for each class of concrete and for each size and gradation of aggregate and each consistency within a given class of concrete intended for use in the work. The preliminary mix design submittals shall contain the following information for each (including those items listed in the latest ASTM designations, if different from those specified). Submit written report for each proposed concrete mix design to the Contracting Officer at least 15 days prior to start of concrete work. Do not begin concrete production until all concrete mix designs have been reviewed by and are acceptable to the Contracting Officer.

B. Fine Aggregate (Sample per ASTM D 75)

1. Source and type
2. Sieve analysis per ASTM C 136

3. Magnesium Sulfate soundness per ASTM C 88
4. Deleterious substance per ASTM C 117, C 123, and C 142
5. Saturated surface dry weight per cubic yard of concrete
6. Bulk specific gravity per ASTM 127
7. Fineness modulus as defined in ASTM C 125

C. Coarse Aggregate (Sampled per ASTM D 75)

1. Source and type
2. Sieve analysis per ASTM C 136
3. Abrasion loss per ASTM C 535
4. Magnesium Sulfate soundness per ASTM C 88
5. Deleterious substances per ASTM C 117, C 123, AND C 142
6. Saturated surface dry weight per cubic yard of concrete
7. Bulk specific gravity per ASTM 128

D. Cement (Sampled per ASTM C 183)

1. Manufacturer, type, and ASTM designation
2. Sacks per cubic yard of concrete
3. Total gallons of water per sack (or cubic foot) of cement
4. Compressive strength at seven (7) days per ASTM C 109
5. Chemical analysis per ASTM C 114

E. Slump per ASTM C 143

F. Air Content per ASTM C 231

G. Unit Weight per ASTM C 138

H. Time To Initial Set at 70 Degrees F. per ASTM C 403

I. Compressive Strength at seven (7), fourteen (14), and twenty-eight (28) days ages per ASTM C 192, and C 39. A total of nine (9) standard test cylinders shall be prepared and cured in the laboratory for each preliminary mix design, three (3) of which shall be tested each at seven (7), fourteen (14), and twenty-eight (28) day ages.

J. Admixtures

1. Manufacturer, type, and ASTM designation
2. Dosage and point of introduction into the mix.

K. A preliminary mix design shall not be considered acceptable if the concrete resulting from that mix design does not produce an average twenty-eight (28) day compressive strength at least one-thousand-two-hundred pounds-per-square-inch (1,200 psi) higher than that required, unless a standard deviation for compressive strength testing has been established for the concrete supplier using the methods described in ACI 214. If a standard deviation has been established, the strength used as a basis for selecting concrete proportions shall exceed the required twenty-eight (28) day strength by the amounts given in ACI 318, Section 4.2.2.1, based on the appropriate value of the standard deviation. If a standard deviation is utilized, the Contractor or concrete supplier shall furnish written evidence to the Contracting Officer that the standard deviation has been determined in accordance with the methods described in ACI 214. A written statement from an independent testing laboratory may be considered satisfactory evidence of compliance

L. Tests for compressive strength and all sampling and testing of aggregate and cement shall be conducted in accordance with the specified ASTM standards by an independent testing laboratory acceptable to the Contracting Officer. Alternately, when approved by the Contracting Officer, testing of cement and aggregate may be conducted at the point of manufacture by reputable cement and aggregate suppliers who regularly provide such testing services by experienced, competent personnel.

M. Tests for slump, air content, unit weight, and time to initial set may be conducted by the concrete supplier, providing such tests are performed in accordance with the specified ASTM standards by experienced, competent personnel using proper equipment.

N. The Contractor shall submit with each preliminary mix design four (4) copies of certified laboratory or mill test reports on all aggregate and cement incorporated in the preliminary mix design and four (4) copies of certified laboratory test reports on the compressive strength of the resulting concrete. Test reports on aggregate and cement shall contain written evidence that clearly indicates that all cement and aggregate covered by the test reports conform in all respects to the applicable material requirements of this specification section.

O. Approval of the preliminary mix designs shall in no way be interpreted to relieve the Contractor of any responsibilities, duties, or obligations for providing concrete conform in to the requirements of this specification section. If, during the course of concreting operations, the Contractor desires to use an alternate mix design differing from the approved mix design in order to obtain a desired workability, density, strength, or uniformity, he shall submit to the Contracting Officer for approval the information specified herein on the proposed alternate mix design prior to its use.

P. If, based on the result of laboratory or field tests conducted during concreting operations, concrete prepared according to an approved mix design fails to satisfy the requirements of this specification section, the Contracting Officer shall have the right to require that the Contractor develop and submit in the manner specified an alternate mix design that will provide concrete conforming to the requirements of this section.

Q. Statistical methods and interpretation of test results will be as described in ACI 214, and ACI 318, latest edition. Any increased material costs resulting from changes in mix designs during construction shall be paid for by the Contractor and no separate payment will be made.

R. The cost of all materials, labor, equipment and all sampling and testing services required for the preliminary mix designs or for alternate mix designs during construction shall be paid for by the Contractor and no separate payment will be made.

1.5 QUALITY CONTROL DURING CONSTRUCTION

A. CERTIFICATION OF MATERIAL COMPLIANCE – During concreting operations, the Contractor shall furnish the Contracting Officer written evidence that clearly indicates that the cement and aggregate used in each batch of concrete delivered to or mixed at the job site conforms in all respects to the applicable material requirements of this specification section. Satisfactory certified mill test reports from the cement or aggregate supplier may be considered as evidence of compliance provided that such testing is performed in accordance with the specified ASTM standards by experienced, competent personnel on a regular basis.

1. In case of doubt as to the adequacy or accuracy of mill tests, the Contracting Officer may require that the Contractor furnish, at no additional cost, test reports on the cement and

aggregate from an independent testing laboratory acceptable to the Contacting Officer. Certified reports or certificates indicating compliance of cement and aggregate shall be submitted to the Contracting Officer before such materials are incorporated into the work. The Contractor shall be responsible for any delays in the progress of the work due to delays in testing and reporting

2. Certified reports submitted to the CONTRACTING OFFICER for laboratory or mill tests on cement and aggregate shall be based on tests conducted not earlier than ninety (90) days prior to incorporation of these materials into the work. The cost of all sampling and testing of cement and aggregate necessary to furnish satisfactory evidence of compliance shall be borne by the CONTRACTOR and no separate payment will be made

B. FIELD SAMPLING AND TESTING - During concreting operations, the Contacting Officer will periodically require additional field inspection, sampling, and testing of cement, aggregate, and/or concrete by an independent testing laboratory in order to determine if the requirements of this specification section are being satisfied. Field sampling and testing of cement, aggregate, and concrete will be performed according to the following latest ASTM Standards at a frequency determined by the Contracting Officer.

1. Aggregate
   a. Sampling - ASTM D 75
   b. Testing - Any test specified in ASTM C 33
2. Cement
   a. Sampling - ASTM C 183
   b. Testing - Any test specified in ASTM C 150
3. Concrete
   a. Sampling - ASTM C 172
   b. Slump Test - ASTM C 143
   c. Air Content Test - ASTM C 231
   d. Making and Curing Test Cylinders - ASTM C 31
   e. Compression Strength Tests - ASTM C 39

C. Compressive strength testing will consist of making, curing, and testing cylinders of concrete. A total of four (4) test cylinders will be prepared from each sample of concrete to be tested. Two (2) test cylinders will be broken at an age of seven (7) days; two (2) test cylinders will be broken at an age of twenty-eight (28) days. The minimum number of samples and test cylinders to be taken is as follows:

Concrete Class	Total Size of Pour	Number of Samples	Number of Cylinders
Class A	1 to 4 cu. yds.	1	4
Class A or B	4 to 100 cu. yds.	1	4
Class A or B	101 to 200 cu. yds.	2	8
Class A or B	201 to 300 cu. yds.	3	12
Class A or B	Over 300 cu. yds.	1/100 cu. yd.	4/100 cu. yd.

D. Test cylinders will normally be laboratory-cured. However, the Contracting Officer may require tests on field-cured specimens to check the adequacy of curing operations. A slump test and an air content test will be performed on each sample of concrete tested for compressive strength.

E. Cement and aggregate will be subject to inspection, sampling, and field testing at the batching plant. Concrete will be subject to inspection, sampling, and field testing at the place of concrete placement. All field sampling, field testing, making, and curing of field test cylinders, and laboratory testing performed during concreting operations for the purpose of determining if the requirements of this specification section are being satisfied shall be conducted by an independent testing laboratory selected by the Contractor

F. The Contactor shall furnish the testing laboratory representative satisfactory samples of cement, aggregate, and concrete for inspection and testing purposes. The CONTRACTOR shall furnish any barrows, shovels, mixing boards, shaded area for preparing test cylinders, and similar equipment required by the testing laboratory representative for securing samples, making test cylinders, and conducting field tests. No materials or concrete which fail to conform to the requirements of this specification section shall be incorporated into the work.

1.6 SHOP DRAWINGS AND ENGINEERING DATA

A. Complete engineering and product data shall be submitted to the Contracting Officer on all admixtures, curing compounds, hardeners, sealers, and waterstops in accordance with the requirements of these Specifications.

PART 2 - PRODUCTS

2.1 GENERAL

A. Concrete shall be composed of Portland Cement, fine aggregate, coarse aggregate, admixtures as specified herein, and water, so proportioned and mixed as to produce a plastic, workable mixture meeting the requirements of this specification section. Materials and concrete not conforming to the requirements specified herein shall not be incorporated in the work.

2.2 MATERIALS

A. Cement shall be standard Portland Cement, of American manufacture, conforming to ASTM C 150, Type I. Only one brand of commercial Portland cement shall be used in the exposed concrete of the structure. Cement reclaimed by cleaning bags or from leaking containers shall not be used in this work. Each bag shall weigh approximately ninety-four pounds (94 lbs) and contain one cubic foot (1 ft3).

B. Fine aggregate shall be natural siliceous river sand, consisting of hard, clean, sharp, strong, durable, and uncoated particles, conforming to the requirements of ASTM C 33. The mortar strength developed in such test shall be ninety percent (90%) of that developed by standard Ottawa sand tested under identical conditions. Fine aggregate shall be graded in conformance with the requirements of ASTM C 33, except that it shall have a fineness modulus of 2.40 minimum and 3.00 maximum and the material passing the No. 200 sieve shall not exceed 3.0 percent by weight of the total sample.

1. Coal and lignite shall not exceed 0.5 percent by weight of the total sample for all concrete. The fineness modulus of fine aggregate incorporated in the work shall not vary more than 0.10 plus or minus from the fineness modulus of the fine aggregate in the appropriate preliminary mix design approved by the Contracting Officer. If the locally available sources of fine aggregate will not yield the required grading, the Contacting Officer may approve alternate gradations if such deviations do not adversely affect the work. However, the amount retained on any individual sieve size shall not exceed thirty-five percent (35%)

of the sample and the amount passing the No. 50 sieve shall not be less than fifteen percent (15%) of the sample.

C. Coarse aggregate shall consist of clean, natural, washed gravel or crushed stone, suitably processed and conforming to the requirements of ASTM C 33, Class Designation 3S. Coarse aggregate as delivered to the mixing plant shall be graded, or individual sizes shall be so combined as to fall within the grading requirements corresponding to the following grading size numbers, as contained in Table 2 of ASTM C 33:

Maximum Aggregate Size (Inches)	Grading Size No.
3/4	67
1	57
1 - 1/2	467
2	357

D. The maximum size of aggregate shall be no larger than one-fifth (1/5) of the narrowest dimension between sides of forms within which concrete is to be cast nor larger than three-fourths of the minimum clear spacing between reinforcing bars, or between bars and forms. Coarse aggregate shall be limited to three-fourth inch (3/4”) maximum size for pumped concrete.

1. Water used in mixing concrete shall be fresh, clean, potable water free from injurious amounts of oil, acid, alkali, vegetable, sewage, and/or organic matter. Water shall be considered as weighing 8.36 pounds per gallon.

E. Admixtures – All concrete shall contain an air entraining admixture conforming to ASTM C 260 in order to provide an entrained air content of five percent (5%) plus one percent (1%) by volume. Air entraining admixtures shall be W. R. Grace "Darex AEA", Master Builders "MB-VR", Protex "AES", Sika "AEA", or equal.

1. All concrete shall contain a chloride-free, water reducing admixture or plasticizer conforming to ASTM C 494, Type A. Water reducing admixtures shall be W. R. Grace "WRDA-HC", Sika "Plastocrete", Gifford-Hill "PSI Normal", Master Builders "Pozzolith Normal", Chem-Masters "WR-77", or equal.
2. Accelerators and retarders may be used under adverse placement conditions when authorized in writing by the Contracting Officer. Accelerators shall be Calcium Chloride conforming to ASTM D 98, dispensed as a solution. Calcium Chloride content shall not exceed one percent (1%) of the cement content by weight. Retarders shall be Chloride-free water reducing and retarding admixtures conforming to ASTM C 494, Type D. Retarders shall be W. R. Grace "Daratard-HC", Sika "Plastiment", Protex "Protard", Gifford-Hill "PSI Retarder", Master Builders "Pozzolith Retarder", or equal.
3. The admixture content, batching method, and time of introduction into the mix shall be in strict accordance with the manufacturer's recommendations.

F. Forming Materials

1. Provide form materials with sufficient strength and stability to withstand the pressure of placed concrete without excessive bow or deflection.
2. Exposed Concrete Surfaces: Materials suitable to project conditions.

2.3 MEMBRANE CURING COMPOUND

A. Membrane curing compound shall have a one-hundred percent (100%) resin base and shall be of the colorless type with a fugitive dye added conforming to ASTM C 309, Type I, Class B. The membrane curing compound shall contain sufficient dye to produce a definite, distinguishing color. Curing compound shall be compatible with liquid hardeners and epoxy sealers. Membrane curing compound shall be Protex "LR-151", Sonneborn "Hydrocide-309", W. R. Grace "Horncure 30D", Chem-Masters "Kurex 3", or equal.

2.4 POLYETHYLENE FILM

A. Polyethylene film shall conform to Product Standard PS 17 and, unless otherwise specified or shown on the Drawings, shall have a thickness of six (6) mils.

2.5 EPOXY BONDING AGENT

A. Epoxy bonding agents shall be specially formulated to bond fresh concrete to existing concrete. Epoxy bonding agents shall be two (2) component polysulfide or polyamide epoxies containing one-hundred percent (100$) solids. Epoxy bonding agents shall be insensitive to moisture during cure. When cured at a temperature of sixty-three degrees Fahrenheit (63° F), neat epoxy bonding agent shall have a one (1) day compressive strength of not less than five-thousand pounds-per-square-inch (5,000 psi) and a twenty-eight (28) day compressive strength of not less than twelve-thousand pounds-per-square-inch (12,000 psi), when tested in accordance with ASTM D 695, and shall have a twenty-eight (28) day tensile strength of not less than three-thousand-five-hundred pounds-per-square-inch (3,500 psi), when tested in accordance with ASTM D 638.

2.6 WATERSTOPS

A. Waterstops shall be manufactured of polyvinyl chloride (PVC) and shall be of the ribbed type with center bulb. Waterstops shall have a nominal width of six inches (6”) and shall be as manufactured by W. R. Meadows, Vulcan Metal Products, W. R. Grace, or equal. Waterstops placed in concrete shall be continuous. Lapped joints shall not be permitted.

2.7 CHEMICAL HARDENER

A. Unless otherwise specified, all interior concrete floors of shops, garages, and vehicle service areas shall be treated with a liquid hardener composed of Magnesium and Zinc fluorosilicates, combined with an anionic surfactant for improved wetting penetration. Liquid hardener shall be colorless, nontoxic, nonflammable, and compatible with and providing good adhesion for subsequent toppings and/or coatings. Liquid hardener shall be suitable for use on new or old concrete floors and shall comply with Corps of Engineer Specification 204. Liquid hardener shall be Sonneborn "Lapidolith", Protex "Lithoplate", L & M "Fluo Hard", or equal.

2.8 EPOXY FLOOR SEALER

A. Epoxy floor sealer shall be a two (2) component, one-hundred percent (100%) solids, epoxy coating that provides a smooth, tough, flexible, wear abrasion, and chemical resistant surface. Epoxy floor sealer shall be applied only where shown on the Drawings. Sealer shall be U.S.D.A. approved for use in food processing plants. Unless otherwise specified, sealer shall be colored gray. Epoxy sealer shall be Chem-Masters "Durakote", Sonneborn "Sonoplex", L&M "Dynaflor", or equal.

2.9 WET-WELL AND RECTANGULAR CONCRETE CHAMBER INTERIOR COATINGS

A. Unless otherwise specified, all interior concrete shall be coated with Sherwin-Williams Hi-Solid Catalyzed Epoxy – white B62W01 epoxy system, or equal, and shall be applied according to Manufacturer's recommendations.

2.10 VAPOR BARRIER

A. Unless otherwise specified, all interior concrete slabs on grade in buildings shall be furnished with an FHA approved vapor barrier under the concrete slab. Vapor barrier shall be constructed of a multi-ply lamination of polyethylene film and glass scrim reinforced paper to form a moisture, scuff, and puncture resistant membrane. Moisture permanence shall not exceed 0.10 perms in accordance with ASTM E96, Procedure A. Vapor barrier shall be St. Regis Paper Company "Moistop", Glas-Kraft "Plybar", or equal.

2.11 STRENGTH

A. Concrete ingredients shall be selected, proportioned, and mixed in such a manner as will produce a watertight durable concrete that will develop the following minimum compressive strengths at an age of twenty-eight (28) days when sampled, cured, and tested in accordance with the procedures specified in ASTM C 31 and C 39:

Concrete Class	Age	Average of Three Consecutive Samples	Minimum Any One Specimen
Class A	28 days	4,000 psi	3,500 psi
Class B	28 days	2,500 psi	2,000 psi

B. Should the average compressive strength of three (3) consecutive specimens or the compressive strength of any single specimen fall below the minimum strengths specified above, the Contracting Officer shall have the right to order a change in the mix design for the remaining portion of the work. The Contracting Officer shall also have the right to order additional curing of the affected concrete followed by cores taken in accordance with ASTM C 42 and ACI 318, all at the expense of the Contractor.

C. If the additional curing does not bring the average compressive strength of three (3) cores taken in the affected area to at least the minimum strength specified, the Contracting Officer may require that the Contractor strengthen the structure by means of additional concrete and steel or he may require that the Contractor replace the affected portions. The cost of all such changes in mix designs and any modifications to or replacement of deficient concrete shall be borne by the Contractor at no additional cost.

2.12 CONSISTENCY

A. Concrete shall be of such consistency and composition that it can be worked readily into the corners and angles of the forms and around the reinforcement without excessive spading and without permitting the materials to segregate or free water to collect on the surface. When dropped from the discharge chute, the concrete mass should flatten out at the center and spread out slowly at the edges.

B. The proportions shall be adjusted to secure the lowest water-cement ratio which is consistent with good workability, a plastic cohesive mixture, and one which is within the following slump range as determined in accordance with ASTM C143:

Concrete Use	Slump in Inches
Wall	2-1/2 to 4
Floors and Slab	2 to 3
Beams	2 to 3
Blocks and Footings	2 to 4

C. Concrete having a slump greater than one inch (1”) over the specified maximum shall be rejected. In pumped concrete, the maximum slump of the concrete at the suction of the pump may be increased above the maximum specified slump by the amount of slump loss in the pumping system up to a maximum of one inch (1”). The amount of slump loss shall be the difference between slump tests made at both ends of pumping system, and shall be limited to a total loss of one inch (1”).

D. If tests indicate a loss greater than one inch (1”), the Contractor shall take corrective measures acceptable to the Contracting Officer. For thin sections and construction with limited clearance between reinforcing steel and when placement conditions preclude the use of vibrators, the Contracting Officer may authorize the use of concrete having a slump of five inches (5”).

PART 3 - EXECUTION

3.1 STORAGE OF MATERIALS

A. Cement shall be shipped to the site of the mixer plant in bulk or in paper or cloth bags, at the option of the Contractor. Upon arrival, it shall be stored immediately in a thoroughly dry, weather-tight, and properly ventilated building or enclosure with adequate provisions for the prevention of absorption of moisture. It shall be stored in a manner that will permit easy access for inspection and identification of each shipment. If cement is to be stored at the job site, storage facilities shall be provided by and at the expense of the Contractor and approved by the Contracting Officer, prior to arrival of the first shipment. Cement which has become caked or lumpy shall not be used.

B. Sand and coarse aggregates shall be stored in separate stockpiles at points selected to provide maximum drainage and to prevent the inclusion of a foreign material during re-handling. Stockpiles of coarse aggregates shall be built in horizontal layers to avoid segregation and breakage. Where concrete volumes require batching of various aggregate sizes, a separate stockpile for each size shall be maintained. The bottom six inches (6”) of aggregate piles shall not be used.

3.2 PROPORTIONING

A. Concrete materials shall be accurately proportioned and mixed to produce a homogeneous and workable mixture having the consistency and minimum compressive strength specified herein. Concrete materials shall be proportioned by weight. The types of equipment and methods used for measuring ingredients shall be acceptable to the Contacting Officer. The amount of water and cement used shall be the minimum amount necessary to produce a concrete mixture of the required strength and consistency, but in no case shall the water-to-cement ratio exceed that specified herein nor shall the cement content be less than that specified herein.

B. Compressive strength may not necessarily be the most critical factor in proportioning concrete mixes since other factors, such as durability and water tightness, may impose lower water-

cement ratios than are required to meet strength requirements. In such cases compressive strength will, of necessity, be in excess of that specified. Minimum cement contents and maximum water-to-cement ratios shall be as follows:

Factor	Class of Concrete	Maximum Aggregate Size			
		2”	1-1/2”	1”	3/4"
Minimum Cement Factor, Sacks /cu yd	A	5.3	5.8	6.2	6.6
	B	5.0	5.5	5.9	6.3
Maximum Water-to-Cement Ratio, lb/lb	A	0.49	0.49	0.49	0.49
	B	0.62	0.62	0.62	0.62
Maximum Water-to-Cement Ratio, gal/sack	A	5.5	5.5	5.5	5.5
	B	7.0	7.0	7.0	7.0

C. The water content of the mix shall be based on the total amount of water in the mixture, including any free water in the aggregate or adhering to the surface of the aggregate, but not including water absorbed by the aggregate. The total volume of aggregate to be used in each cubic yard of concrete shall be determined by recognized standards for designing concrete mixes, utilizing the actual screen analysis of the aggregates. The proportion of fine and course aggregate shall be such that the ratio of the course to the fine based on weight shall not be less than 1.0 nor more than 2.0, nor shall the amount of coarse material be such as to produce harshness in placing or honeycombing in the structure.

D. Mix designs may be adjusted when material characteristics, job conditions, weather, test results or other circumstances warrant. Any adjustment shall produce the lowest water-cement ratio which is consistent with good workability and produces a plastic cohesive mixture. Do not use revised mix designs until all revisions have been reviewed by and are acceptable to CONTRACTING OFFICER.

E. Use air-entraining admixtures in all concrete. Provide not less than four percent (4%) nor more than eight percent (8%) entrained air for all concrete exposed to freezing and thawing conditions; and, from two percent (2%) to four percent (4%) for all other concrete.

3.3 MIXING CONCRETE

A. The mixing equipment used by the Contractor shall be capable of combining the aggregates, cement, admixtures, and water within the time specified into a thoroughly mixed and uniform mass. Concrete shall be mixed by one of the three following methods: (1) by the operation of one or more batch-type mixing plants, each with a rated capacity of one-half cubic yard (1/2 CY) or more, installed at the site of the work; (2) by the operation of a proportioning plant installed in the vicinity of the work and the use of transit mixers for mixing concrete and transporting it to the forms; or (3) by the use of ready-mixed concrete from a central mixing and proportioning plant.

B. The method selected by the Contractor shall be subject to the approval of the Contracting Officer. The mixing and proportioning plants shall be provided with adequate equipment and facilities for accurate measurement and control of the quantities of material and water used in the concrete and for readily changing the proportions to conform to the varying conditions and requirements of the work.

1. Stationary Mixed Concrete - Stationary mixing shall be done in a batch mixer of approved type which will ensure a uniform distribution of the materials throughout the mass. The equipment at the mixing plant shall be so constructed that all materials including the water entering the drum can be accurately proportioned and be under control. The cement and aggregate shall be proportioned by weight. No volumetric batch shall be allowed.
2. The mixer shall be equipped with an automatic timing device made to lock the discharge level before aggregate and cement enter the drum, and to release such level only after the specified mixing time has elapsed. Stationary mixers shall be in accordance with the "Concrete Mixer Standards" adopted by the Mixer Manufacturer's of the Associated General CONTRACTORS of America and shall bear a plate giving the manufacturer’s rated capacity of the mixer.
3. The entire batch shall be discharged before recharging. The volume of the mixed material per batch shall not exceed the manufacturer’s rated capacity of the mixer. Mixing of each batch shall continue for the period indicated herein, during which time the drum shall rotate at a peripheral speed as recommended by the manufacturer.
4. The mixing time shall be as follows:

Capacity of Mixer	Mixing Time in Minutes
1/2 cubic yards	1-1/4
3/4 to 1-1/2 cubic yards	1-1/2
Larger than 1-1/2 cubic yards	2

5. The mixing time shall be measured from the time that all cement and aggregates and most of the water are in the mixer. Excessive over mixing, requiring additional water to preserve the required consistency will not be permitted. All of the mixing water shall be introduce before one-fourth (1/4) of the total mixing time has elapsed.

C. Transit Mixed Concrete

1. The type, capacity, and manner of operation of the mixing and transporting equipment for transit ready-mixed concrete shall conform to the current "Standards for Operation of Truck Mixers and Agitators of the National Ready-Mixed Concrete Association," the "Truck Mixer and Agitator Standards of the Truck Mixer Manufacturers Bureau," and ASTM C94.
2. Transit mix concrete trucks shall be equipped with an automatic device for recording the number of revolutions of the drum during the mixing period. Each mixer and agitator shall have attached thereto in a prominent place, a metal plate or plates, installed by the manufacturer, on which is plainly marked the capacity of the drum in terms of the volume of mixed concrete and the speed of rotation for the agitating and mixing speeds of the mixing drum or blades. Each mixer shall have identification number painted on the truck in such a location that it can be easily read from the batching platform.

3. The total volume of materials introduced into the mixer shall not exceed the manufacturer's guaranteed mixing capacity. If the concrete so mixed does not meet the uniformity requirements of this subsection, the amount of materials charged into the mixer shall be reduced. The drum of the mixer shall be completely emptied of any previously mixed load. The proper proportions of aggregate, cement, and water for each load of concrete shall be placed in the mixer and shall be mixed therein for not less than seventy (70) nor more than one-hundred (100) revolutions of the drum or blades at the speed designated by the manufacturer of the equipment as the mixing speed. Additional revolutions of the drum shall be at the speed designated by the manufacturer of the equipment as the agitating speed; however, immediately prior to discharging the concrete, the drum shall be revolved at the mixing speed for a minimum of three (3) minutes.
4. The revolving of the drum shall be continuous until the concrete is completely emptied from the drum. When Class A concrete is being placed, all wash water shall be emptied from the mixer before any portion of the succeeding load is placed therein. For Class B concrete the mixer shall be empty or may carry no more than ten (10) gallons of water in the drum. Water added at the point of discharge shall only take place with the approval and in the presence of the Contracting Officer. Water so added shall be mixed into the load for a minimum mixing time of three (3) minutes.
5. Water shall not be added to the load during the transit. The total elapsed time between the addition of water to the cement and aggregate or the addition of cement to the water and aggregate and the placement of the concrete in the forms shall not exceed ninety (90) minutes. During hot weather or conditions contributing to quick setting, the total elapsed time permitted may be reduced at the direction of the CONTRACTING OFFICER to forty-five (45) minutes. When the concrete cannot be delivered to the forms within the time period specified, a water-reducing and retarding admixture may be used subject to the approval of the CONTRACTING OFFICER. Such use of a water reducing retarder will be permitted only as necessary to supplement (not to replace) other acceptable hot weather procedures.
6. The retarding admixture used shall not interfere with strength development and other properties of the concrete and its use shall be carefully controlled by the concrete supplier. Before any such admixture is permitted, it shall be tested with job site materials under job conditions to determine its compatibility with the other materials and its ability under these conditions to produce the desired properties.
7. Addition of water at the job site to offset evaporation of mixing water shall be done with the Contracting Officer's approval and in his presence using water in the form of a cement paste having the same water-to-cement ratio as the batch in the transit mixer. Following addition of the cement paste, the mixer drum or blades shall be rotated a minimum of seventy (70) revolutions. Addition of water during transit to offset evaporation losses shall not be permitted.
8. Prolonged mixing, even at agitating speed, shall be avoided where feasible by stopping the mixer and then agitating intermittently. A legible certified weigh master's certificate shall be prepared for each load of ready-mixed concrete. A legible copy of the certified weigh master's certificate shall be submitted to the Contracting Officer by the truck operator at the time of delivery. The weigh master's certificate shall contain the following information:
    a. Name of Vendor

b. Name of Contractor
c. Number of cubic yards in the load
d. Actual weights of cement and of each size of aggregate in the load
e. Amount of water added at the plant
f. Amount of free water in the aggregate
g. Brand and type of cement
h. Brand and amount of admixture
i. Time and date of batching

D. When mix proportions have been approved for a project and are identified by a mix number, the Contractin Officer may waive the foregoing and accept a legible certified weigh master's certificate which shall contain the following information:

1. Name of Vendor
2. Name of Contractor
3. Number of cubic yards in the load
4. Mix designation number
5. Amount of water added at the plant (including free water in aggregate)
6. Time and date of batching.
7. Space shall be provided on the certificate so that amount of water and cement added on the job may be indicated.

3.4 CONVEYING CONCRETE

A. Concrete shall be conveyed from mixer to place of final placement by methods which will prevent separation or loss of the material.

B. If the concrete is to be transported more than fifty feet (50') in carts or buggies, they shall be equipped with pneumatic tires.

C. Concrete delivered to the carts, buggies or conveyors from spouts, troughs, or mixer trucks shall not have a free fall of more than three feet (3'). Separation or loss of ingredients shall be prevented while transporting the concrete.

D. Delivery carts, buggies, conveyor trucks or barrows shall be kept on temporary runways built over the floor system. Runway supports shall not bear upon reinforcing steel or fresh concrete.

3.5 PLACING CONCRETE

A. General

1. Prior to placing concrete, the Contractor shall ensure that all reinforcement is securely and properly fastened in position and protected against displacement, that all items to be embedded in the concrete are in place and securely anchored in position, that all forms have been thoroughly coated or wetted, that all form ties at construction joints have been retightened, that concrete surfaces to be covered have had all free water, form coating, loose concrete, and debris removed, and that all conveyances, buggies, and barrows are clean and wetted.
2. The Contractor shall inform the Contracting Officer at least twenty-four (24) hours in advance of the times and places at which he intends to place concrete. The Contracting Officer will make a final inspection of forms, reinforcing steel, screeds, construction joints, openings, anchors, pipe sleeves, conduit, and inserts. No concrete pour shall be started until the condition of the forms and place of pouring has been inspected and

approved by the Contracting Officer.

3. Accurately position, support and secure reinforcing against displacement. Support reinforcing with non-corrosive or plastic coated metal chairs, runners, bolsters, spacers and hangers located at sufficient frequency to limit reinforcing deflection between supports to a maximum of three-eighth inches (3/8").
4. Install welded wire fabric in as long lengths as practicable, lapping at least eight inches (8") with transverse wires overlapping by at least two inches (2").
5. Concrete shall not be placed when the sun, wind, heat, or humidity prevents proper placement and consolidation. No water or cement shall be added to the mix without the Contractor Officer's approval or in his absence. No partially hardened concrete shall be deposited.

B. Placing Concrete

1. Comply with ACI 318, placing concrete in a continuous operation within planned joints or sections. Do not begin placement until work of other trades affecting concrete is completed.
2. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, in continuous vertical motions, so that concrete is worked around reinforcing and other embedded items and into forms.
3. Do not transport any concrete within forms by using vibration equipment. Transport of concrete within forms shall be performed only by hand spading as necessary.
4. Protect concrete from physical damage or reduced strength due to hot or cold weather extremes during mixing, placement and curing.
5. Unless otherwise specified, all concrete shall be placed upon clean, damp surfaces, free from water, and never upon soft mud, dry absorbent earth or rock, or upon fills that have not been subjected to approved tamping to provide ultimate settlement. Groundwater shall be kept below subgrade until the concrete has set. When subgrade is dry earth, it shall be thoroughly dampened with water to ensure that no moisture will be absorbed from fresh concrete.
6. Where concrete is placed against gravel or crushed rock which does not contain at least twenty-five percent (25%) of the material passing a No. 4 sieve or where shown on the Drawings or directed by the Contracting Officer, surfaces against which concrete is cast shall be covered with polyethylene film to protect the concrete from loss of water. Joints in the film shall be lapped at least twelve inches (12”) and taped. The polyethylene film shall be protected against puncture from the underlying crushed rock by a cushion of natural or imported sand meeting the requirements of ASTM D 1073 placed on top of the crushed rock. Where concrete is placed against rock, all loose pieces of rock shall be removed and the exposed surface cleaned with a high pressure hose.
7. Place vapor barrier under designated interior concrete slabs on grade. Sheeting shall extend the full area of the slab and shall be turned up or down to footings as indicated. Lap all seams at least twelve inches (12”) and seal per manufacturer's instructions. Install reinforcement with care so as not to puncture vapor barrier. Tape all cuts, tears, punctures, and pipe penetrations before pouring concrete.
8. To prevent segregation of the mix, concrete shall be deposited in its final position in batches without being moved laterally in the forms more than five feet (5’). A crane and a bottom dump concrete bucket shall be used wherever possible. Unless authorized by the

Contracting Officer, no concrete shall be dropped freely into place from a height of greater than five feet (5'). Concrete shall be deposited in walls by means of prefabricated, rectangular tremies, constructed in short sections and spaced laterally not over five feet (5') apart.

9. Special care shall be observed to avoid slopping concrete over forms when placing. The limits of each concrete pour shall be predetermined by the CONTRACTOR and shall be acceptable to the Contracting Officer. All concrete within such limits shall be placed in one continuous operation. After the concrete has been deposited, it shall be distributed over the entire area within the forms in approximately horizontal layers of not more than eighteen inches (18") in depth and shall be brought up evenly in all parts of the form.
10. Each layer of concrete shall be plastic when covered with the following layer and the forms shall be filled at a rate of vertical rise of not less than two feet per hour (2'/hr) nor more than six feet per hour (6'/hr). Should a layer of concrete reach its initial set before the next lift can be placed or should more than sixty (60) minutes elapse between placement of successive concrete lifts, the Contractor shall cease placement of concrete until the surface of the previous lift is prepared in accordance with the procedures specified in Part 3.08, Construction Joints, of this specification section.
11. Workmen shall not walk on concrete during placing or finishing with any earth or foreign matter on footgear. Hand spreading shall be done with forks and shovels, not rakes. Concrete shall be placed and compacted in wall or column forms before any reinforcing steel is placed in the structural system to be supported by such walls or columns. The portion of any wall or column placed monolithically with a floor or roof slab shall not exceed six feet (6') of vertical height. Concrete in walls or columns shall set at least two 2) hours before concrete is placed in the structural systems to be supported by such walls or columns. Brackets, haunches and fillets shall be poured monolithic with the floor or roof slab system.

C. Compaction

1. During and immediately after placement, concrete shall be thoroughly compacted and worked into all corners and angles, and around reinforcement and embedded fixtures in a manner to fill all voids, prevent honeycombing against the forms and avoid segregation of coarse aggregate. This operation shall be performed by the use of spades or forks and internal vibrators. Vibration shall be transmitted directly to the concrete and in no case shall it be transmitted through the forms. Vibrator driving mechanisms shall revolve at not less than seven-thousand revolutions-per-minute (7,000 rpm).
2. The vibration shall be sufficiently intense to cause the concrete to flow and settle readily into place and to visibly affect the concrete over a radius of at least eighteen inches (18"). Vibration shall be supplemented by manual forking or spading adjacent to the forms on exposed faces in order to secure smooth, dense surfaces. Special care shall be taken to ensure consolidation around reinforcement, pipes and other shapes built into the work. Vibrators shall be kept in motion at all times to prevent excessive vibration in one spot. The operation shall be continuous and all concrete shall be in final position before initial set has started. In addition to the vibrators in actual use while concrete is being placed, the Contractor shall have on hand at least one operable vibrator as a spare in case of equipment failure.

3. No concrete shall be placed until all vibrating equipment, including spares, is at the placement site. Concrete shall be thoroughly compacted prior to top finishing. All laitance, debris, and surplus water shall be removed from concrete surfaces at tops of forms by screeding, scraping, or other effective means. Wherever the top of a wall will be exposed to weathering, the forms shall be overfilled and after the concrete has been compacted, the excess shall be screeded off.

D. Placement Sequence

1. Unless otherwise indicated on the Drawings or directed by the Contracting Officer, the following placement sequence shall be followed to reduce the effect of shrinkage in producing cracking:
2. Bottom Slab - A center section (as outlined by the construction joints shown on the Drawings) shall be placed first. Not less than seventy-two (72) hours after the center section has been placed, the Contractor may proceed with the placement of an adjoining section. Sections shall be placed alternately, first on one side and then on the other side of previously placed sections. Pours shall be scheduled so that two (2) adjacent sides of each section are free, except at closures.
3. Walls - Walls shall be divided into sections by the construction joints shown on the Drawings. A section near the center of each wall shall be placed first. Sections shall be placed alternately, first on one side and then on the other side of the previously placed section. Pours shall be schedule so that one (1) end of each section is free, except at corner closures.
4. Footings - Footings, except for wall footings, shall be poured in one operation with no joints.

E. Requirements Due to Adverse Weather Conditions

1. No concrete shall be placed during rain. No concrete shall be placed if rain is forecast, unless there is sufficient time to complete the placement and finishing. All concrete placed prior to rain shall be protected by whatever means necessary to prevent damage to finish or water entering the mix. Protection equipment and materials shall be on hand prior to placement operations.
2. Freshly placed concrete shall be protected from scour by flowing water and from mud deposits or other injurious conditions. Except as modified herein, cold weather concreting shall comply with ACI 306. The temperature of concrete at the time of placing shall be not less than shown in the following table for the corresponding ambient outdoor air temperature (in shade) existing at the time of placement:

Ambient Outdoor Air Temperature	Minimum Concrete Temperature
Below 35 Degrees F.	70 Degrees F.
Between 35 and 45 Degrees F.	60 Degrees F.
Above 45 Degrees F.	45 Degrees F.

3. Placing of concrete when the ambient air temperature at the time of placement is forty-five degrees Fahrenheit (45° F) or less shall be done only when specifically authorized by the Contracting Officer using concrete heated in a manner acceptable to the Contracting Officer. If the use of heated concrete is authorized, the temperature of the concrete at the time of placement shall not exceed eighty degrees Fahrenheit (80° F). Adequate means

shall be provided for maintaining the temperature of the air surrounding the concrete at seventy degrees Fahrenheit (70º F) for three (3) days, or fifty degrees Fahrenheit (50º F) for five (5) days, or for as long as is necessary to ensure proper curing of the concrete.

4. Rapid cooling of the concrete shall be prevented. Housing or covering or other protection used in connection with heating shall remain in place and intact at least twenty-four (24) hours after the artificial heat is discontinued. The use of Calcium Chloride or other chemicals to prevent freezing shall not be permitted. Except as modified herein, hot weather concreting shall comply with the requirements of ACI 305. Hot weather precautions shall be taken whenever the maximum ambient outdoor air temperature (in shade) during the day exceeds eighty-five degrees Fahrenheit (85° F).
5. When rapid mixing water evaporation in transit causes the concrete to be delivered in an unworkable condition, initial correction may be made at the job site, provided that water added is in the form of cement paste having the same water-to-cement ratio as the batch in the truck, and provided that the drum or mixer blades be operated at mixing speed for at least seventy (70) revolutions after the paste addition. Once need for water has been observed, subsequent additions shall be at the batching plant until the need has passed.
6. Correction shall consist of a simultaneous and proportionate increase of water and cement, up to ten percent (10%) of the stated quantity of each material in the bath. Such increases in cement shall not constitute grounds for an increase in the Contract Price. The temperature of concrete at the time of placement shall not exceed eighty-five degrees Fahrenheit (85° F).
7. During hot weather, extra caution shall be taken to prevent rapid evaporation of water. Forms shall be kept cool by frequent wettings. Flat work shall be protected from drying winds, direct sun, and high temperatures whenever conditions of temperature and humidity are such as to cause plastic shrinkage cracking. In order to prevent plastic shrinkage cracking due to rapid evaporation of moisture, no concrete shall be placed when the rate of evaporation, determined by using Figure 2.1.4 in ACI 305, equals or exceeds 0.2 pounds per square foot per hour (0.2 lbs/ft2/hr).

3.6 FINISHING

A. Finishing Formed Surfaces

1. All permanently exposed surfaces shall be expected to be smooth and of uniform texture and appearance. Surfaces to be rubbed shall include all submerged concrete surfaces that can be seen when water is drained. Rubbing may be omitted for minor blemishes on buried surfaces or on exposed surfaces that cannot normally be seen, such as inside covered tanks. Final determination for which surfaces are to be rubbed is to be the decision of the Contracting Officer.
2. All holes, pits, or imperfections in the surface of the concrete shall be cleaned with a wire brush, thoroughly wetted and completely filled with damp cement mortar composed of (one) 1 part Portland Cement to two (2) parts fine aggregate. The entire surface shall be left smooth and all lines or markings shall be smoothed over to obtain uniform appearance.
3. In the event the Contractor fails to obtain a satisfactory appearance of the concrete in the opinion of the Contracting Officer, the entire surface shall be thoroughly wetted down, kept wet continuously, and rubbed with a No. 20 Carborundum stone until all lines, markings, and surplus materials have been removed from the surface, and until the surface

shows a uniform smooth finish. After rubbing is completed, the concrete surface shall be washed clean with water. Rubbing may be done either by hand or with power tools.

B. Finishing Unformed Surfaces

1. No surface treatment will be required for buried or permanently submerged concrete not forming an integral part of a structure, except that required to obtain the surface elevations or contours and surfaces free of laitance. The unformed surfaces of all other concrete shall be screeded and given an initial float finish followed by additional floating followed by troweling where required. Care shall be taken that no excess water is present when the finish is made. No special concrete or cement mortar topping course shall be used unless so shown on the Drawing.
    a. Scre – All slabs shall be screeded to an even surface by the use of a straight edge and screeding strips accurately and securely set to the proper level. Screeds shall be such type and so arranged so as not to interfere with the top bar reinforcement. Screeding shall provide a concrete surface conforming to the proper elevation and contour with all aggregates completely embedded in mortar. All screeded surfaces shall be free of surface irregularities with a height or depth in excess of one-fourth inch (1/4") as measured from a ten-foot (10') straight edge.
    b. Floating – Screeded surfaces shall be given an initial float finish as soon as the concrete has stiffened sufficiently for proper working. Any piece of coarse aggregate which is disturbed by the float or which causes a surface irregularity shall be removed and replaced with mortar. Initial floating shall produce a surface of uniform texture and appearance with no unnecessary working of the surface.
        1) Initial floating shall be followed by a second floating at the time of initial set. The second floating shall produce a finish of uniform texture and color. Unless additional finishing is specifically required, the completed finish for unformed surfaces shall be the float finish produced by the second floating. Floating shall be performed with hand floats or suitable mechanical compactor floats.
    c. Brooming – Surfaces of equipment bases and curbs and sidewalks shall be given a light broom finish providing a nonslip surface. Brooming shall be done after the second floating and for traffic areas shall be at right angles to the normal traffic direction.
    d. Troweling - Surfaces to be covered with resilient floor coverings and other surfaces designated on the Drawings to be troweled shall be steel trowel finished. Trowel finishing will not be required for floors which are normally submerged. Troweling shall be performed after the second floating when the surface has hardened sufficiently to prevent an excess of fines being drawn to the surface. Troweling shall produce a dense, smooth, uniform surface free from blemishes and trowel marks.
    e. Edging - All permanently exposed edges of unformed surfaces shall be chamfered with a three-fourth inch (3/4") approved edging tool unless other edge treatment is indicated on the Drawings.

3.7 CURING

A. All concrete shall be protected from loss of moisture by curing for at least fourteen (14) days following placement. Curing operations shall take place immediately after concrete finishing is complete or forms are removed. Breaking of form ties or otherwise breaking the seal between the concrete surface and the form shall be considered form removal.

B. Curing shall be accomplished by water curing, membrane curing, film curing, or any other curing method acceptable to the Contracting Officer which does not injure or discolor exposed surfaces nor destroy the bond on surfaces to receive subsequent concrete pours or protective coatings.

1. Water Curing
   a. Concrete surfaces being water-cured shall be kept constantly and visibly wet for a period of not less than fourteen (14) days. Water saturation of concrete surfaces shall begin as quickly as possible after the initial set of the concrete. The rate of water application shall be regulated to provide complete surface saturation with a minimum of runoff.
2. Slabs poured on grade and decks may be water-cured by ponding or by covering with wet burlap sacks, sand, or sawdust and keeping this covering continually and visibly wet during this period. Standard canvas seep hose placed in parallel runs on eight-foot (8') centers is recommended for ponding. Walls may be cured by leaving the forms tied in place and keeping the forms and all exposed surfaces of the concrete continually and visibly wet for the duration of the curing period.
3. Membrane Curing
   a. Membrane-curing compound may be used in lieu of water curing on Class B concrete and on concrete which will not be covered later with mortar, liquid hardener, or additional concrete. Except as modified herein, membrane-curing compounds shall be applied in strict accordance with the manufacturer's recommendations. Membrane-curing compounds shall conform to the requirements of Part 2.04, Membrane Curing Compound, of this specification section.
   b. Membrane-curing compound shall be spray applied in two (2) separate coats, each having a surface coverage of not more than three-hundred square feet per gallon (300 ft2/gal). Unformed surfaces shall be covered with curing compound within thirty (30) minutes after final finishing. If forms are removed before the end of the specified curing period, curing compound shall be immediately applied to the formed surface before they dry out.
   c. Curing compound shall be suitably protected against abrasion during the curing period. Whenever the membrane will be subject to damage from traffic or other cause, it shall be protected after drying for twenty-four (24) hours by a layer of sand or fine earth not less than one inch (1") thick or by other means acceptable to the Contracting Officer. Compound applied improperly or compound applied without sufficient dye to produce a distinguishing color shall be reapplied to the satisfaction of the Contracting Officer.
4. Film Curing
   a. Film curing with polyethylene sheeting may be used in lieu of water curing on concrete which will be covered later with mortar or additional concrete or will otherwise be covered or hidden from view. Film curing shall begin as quickly as possible after initial set of the concrete. Polyethylene sheeting shall completely cover the surfaces. Sheeting shall overlap the edges sufficiently for proper sealing and anchorage. Joints between sheets shall be overlapped a minimum of twelve inches (12") and sealed. All tears, holes, and other damage shall be promptly repaired. Covering shall be anchored continuously at edges and shall be anchored on the

surface as necessary to prevent billowing.

3.8 CONSTRUCTION JOINTS

A. Construction joints shall be made only at locations indicated on the Drawings or specified herein. Construction joints shall not be made at other locations without the concurrence of the Contracting Officer. No vertical construction joints shall be used in walls unless specifically approved by the Contracting Officer. The work shall be laid out and conducted so as to minimize the number of construction joints.

B. All construction joints shall be keyed. Keys shall be continuous and shall have a width equal to one-third (1/3) of the thickness of the wall and a depth equal to one-sixth (1/6) of the thickness of the wall. Unless indicated otherwise on the Drawings, no keys smaller than three inches (3") in width and 1-1/2 inches in depth shall be used.

C. Waterstops of the type specified shall be installed where indicated on the Drawings and in all construction joints in concrete walls and slabs having one face exposed in a dry pit or room and having the other face in contact with backfill, sub grade, groundwater, or other liquid. A jet of air and water shall be applied to the surface of horizontal construction joints to remove all laitance when the concrete has set sufficiently for the jet to expose the coarse aggregate without loosening same.

D. Immediately prior to placing another lift, the surface shall be thoroughly cleaned and washed by water jet followed by air jet to remove standing water. The surface of the concrete shall then be covered by a uniform, evenly distributed layer of cement-sand mortar to a thickness of one inch (1"). The cement-sand mortar shall be composed of a mixture of 1.3 parts by volume Portland Cement and one (1) part by volume fine aggregate, and shall have a water-to-cement ratio equal to that of the concrete to follow.

3.9 EXPANSION JOINTS

A. Expansion joints shall be provided as shown on the Drawings. Details of the expansion joints and materials of construction shall be as shown on the Drawings and specified in these Contract Documents. If not shown on the Drawings, expansion joints shall consist of full-depth, pre-formed, one-half inch (1/2") asphalt plank material conforming to ASTM D 994.

3.10 BONDING NEW CONCRETE TO EXISTING CONCRETE

A. Where new concrete is to be cast against and permanently bonded to an existing concrete surface, the existing concrete shall be chipped or cut back from the surface a minimum distance of 1-1/2 inches or as necessary to expose sound concrete, remove loose or weathered concrete, and provide a roughened surface for bonding to the new concrete. Edges shall be cut square and feathered edges will not be permitted. All loose material remaining after chipping or cutting operations shall be removed by sandblasting and/or stiff wire brushing.

B. Where chipping back of existing concrete is not possible and where approved by the Contracting Officer, the surface of existing concrete may be prepared by sandblasting or acid etching. If sandblasting or etching is used, the surface of the existing concrete shall be bare, clean, dry, and structurally sound. All grease, oil, wax, or other residue shall be removed by scraping, followed by washing with a nonionic detergent or a suitable solvent compatible with the epoxy bonding agent to be used. Animal fats may be removed by scrubbing with a ten percent (10%) solution of caustic soda to saponify them.

C. After all loose material, grease, etc., have been removed, the surface of the existing concrete shall be etched by either sandblasting or scrubbing with a ten to twenty percent (10% to 20%) solution of hydrochloric acid in water applied at a rate of one quart per square yard (1 qt/yd2) followed by a thorough rinsing with clean water. The surface shall then be allowed to dry completely before application of the epoxy bonding agent. Goggles, rubber boots, and rubber gloves shall be worn by workmen when applying caustic soda or acids.

D. When the surface is dry and just prior to placing the new concrete, an epoxy bonding agent shall be applied to the surface of the existing concrete with a whitewash brush or stiff broom. The epoxy bonding agent shall be spread evenly over the surface to be bonded, avoiding skips and holidays, to wet film thickness of forty (40) to sixty (60) mils. The new concrete shall be placed as soon as the epoxy bonding agent becomes tacky.

E. In the event that the epoxy bonding agent is allowed to dry before placement of the new concrete, the surface shall be recoated with epoxy. The epoxy bonding agent shall comply with the material requirements of Part 2.06, Epoxy Bonding Agents, of this specification section and shall be applied in strict conformance to the manufacturer's recommendations. Adequate safety precautions shall be taken during the handling and use of the epoxy bonding agent.

3.11 EMBEDDED ITEMS

A. Wherever steel, wrought or cast iron piping, fittings, valves, collars, sleeves, structural steel, electrical conduits, appurtenances and fixtures, equipment, anchorages, or castings are shown for embedment in the concrete, such items must be on hand before concrete is poured. They shall be set in place accurately and firmly braced before concrete is poured around them. No cutouts for future installation of these items shall be permitted.

B. Before placing concrete, the Contractor shall see that all embedded parts are accurately positioned and firmly and securely fastened in place. They shall be thoroughly clean and free from any coating, rust, scale, oil, or other foreign matter. The embedding of wood in concrete shall be avoided whenever possible. If wood is to be embedded, it shall be thoroughly wetted before the concrete is placed. After placement, surfaces not in contact with concrete shall be cleaned of concrete spatter and other foreign substances.

C. Conduit shall be installed between the reinforcing steel in walls or slabs which have reinforcement in both faces. In slabs which have only a single layer of reinforcing steel, conduit shall be placed under the reinforcement. Unless installed in pipe sleeves, anchor bolts shall have sufficient threads to permit a nut and washer to be installed on the concrete side of the form or template. A second nut and washer shall be installed on the other side of the form or template and the two nuts shall be adjusted so that the bolt will be held rigidly in proper position.

D. The Contractor shall be responsible for coordinating all work and ensuring that all embedded items or openings to be built into the concrete are placed in the forms before concrete is placed. The contractor shall be responsible for conferring with his subcontractors and suppliers regarding their requirements for embedments and openings. Forms, sleeves, and inserts shall be set, and concrete shall be cast to the lines and grades indicated on the Drawings and as detailed in these Contract Documents. The maximum deviation from true line and grade shall not exceed the tolerance listed below. Deviation in alignment of slabs or wall shall not exceed a rate of one-eighth inch (1/8") in ten feet (10') within the tolerances specified.

Item	Maximum Tolerances	
Sleeves and Inserts	+1/8”	-1/8”
Projected ends of anchor bolts	+1/4”	-0.0”
Anchor bolt setting	+1/16”	-1/16”
Concrete Forms	+1/8”	-1/8”

E. All slabs shall be carefully finished true to grade such that the surface is free draining and contains no depressions which can hold or collect water.

F. Regardless of the tolerances listed herein, it shall be the responsibly of the CONTRACTOR to limit deviations in line and grade to tolerance which will permit proper installation and operation of mechanical equipment and piping.

3.12 WATER TIGHTNESS

A. It is the intention of this specification section to provide impervious concrete. All pits below groundwater level and all structures for holding or carrying water shall be watertight. A loss of not more than one-fourth inch (1/4”) depth in twenty-four (24) hours will be permitted when water-holding structures are filled. All exposed surfaces of water-holding structures and interior surfaces of pits below groundwater level shall be free from visible damp spots or seepage before acceptance.

B. Repeated tests and repairs may be required by the Contracting Officer to obtain watertight structures. All structure shall be drained at the completion of tests unless otherwise directed by the Contracting Officer. The cost and expense of all testing for water tightness and of providing a watertight structure shall be borne by the Contractor. Methods of repair shall be acceptable to the Contractor Officer. The use of special admixtures or integral waterproofing compounds in concrete required to be watertight is not required but may be permitted, provided the materials and methods are approved in writing by the Contracting Officer.

3.13 CONCRETE EMBEDMENT AND ENCASEMENT OF PIPE

A. Concrete for embedment and encasement shall be installed where and as indicated on the Drawings and at such locations where installation conditions require such pipe reinforcement because of unforeseen conditions encountered in the work, as determined by the Contractor Officer. Embedment and encasement of pipe shall be preceded by the following preliminary steps:

1. All loose material shall be removed from the trench prior to placing concrete. All concrete shall have a continuous contact with undisturbed soil on sides and bottom of trench.
2. A base course of concrete shall be accurately screeded to such grade and elevation that the pipe will be at specified grade when pipe bells are supported on, and in contact with, the top surface of such base course.
3. Each length of pipe shall be rigidly held in alignment and anchored, to prevent flotation, in a manner acceptable to the Contractor Officer.

3.14 PILE DRIVING AND CONCRETE WORK

A. The Contractor shall not drive foundation piling which may damage freshly placed or existing concrete structures. Minimum distance between concrete less than seven (7) days old and pile driving operations shall be one-hundred feet (100’). Any damage made to concrete structures from pile driving operations shall be repaired by the Contractor at his expense.

3.15 DEFECTIVE WORK AND METHODS OF REPAIR

A. All defective or damaged work shall be removed and replaced or repaired as directed by the Contracting Officer. Any work which has not been constructed in accordance with these Contract Documents shall be considered defective. No defective or damaged work shall be patched, repaired, or covered without prior inspection and approval of the Contracting Officer. Defects in formed concrete surfaces shall be repaired within twenty-four (24) hours of placement, to the satisfaction of the Contracting Officer, and defective concrete shall be replaced within forty-eight (48) hours after the adjacent forms have been removed.

B. All concrete which is honeycombed or otherwise defective shall be cut out and removed to sound concrete, with edges square cut to avoid feathering. Except as modified herein, concrete repair work shall conform to Chapter 9 of ACI 301 and shall be performed in a manner that will not interfere with thorough curing of surrounding concrete. All repair work shall be adequately cured. Where authorized by the Contracting Officer, repair may be accomplished by patching conducted as specified herein. However, permission to patch shall not waive the Contracting Officer's right to have the defective work completely removed if the patch or repairs do not, in the Contracting Officer's opinion; satisfactorily restore the quality and appearance of the work. Patching shall be conducted as follows:

1. Chip away defective areas at least 1-1/2 inches deep perpendicular to the surface, wet the area and six inches (6”) around it to prevent absorption of water from patching mortar, and brush a sand-cement grout consisting of one part fine aggregate to one part Portland Cement into the surface, following with patching mortar.
2. Patching mortar shall be no richer than one (1) part Portland Cement to three (3) parts fine aggregate using white Portland Cement to replace a portion of the gray cement as determined by a trial patch and shall contain only the minimum mixing water required for placing. Re-temper the mortar if necessary without the addition of water by allowing it to stand for one hour during which time it shall be mixed with a trowel to prevent setting.
3. Mortar shall be compacted into place and screeded to leave the patch higher than the surrounding surface, then left undisturbed for one or two hours to permit initial shrinkage before being finally finished to match the adjoining surface. Cure patch in accordance with the requirements of Part 3.07, Curing, of this specification section.

3.16 LOADS APPLIED TO NEW CONCRETE

A. Loads including, but not limited to, earth loads, loads exerted from bracing or shoring, wind loads, hydrostatic or hydraulic loads, equipment or vehicle loads, or loads exerted by stacked materials, shall not be permitted until the concrete has reached its specified twenty-eight (28) day strength. Concrete which has cracked due to overloading, loading before required strength has developed, or otherwise damaged shall be repaired or replaced as determined by the Contracting Officer.

3.17 TESTING LABORATORY

A. The testing laboratory shall have access to all places where concrete materials and concretes are manufactured, stored, proportioned, mixed, placed, and tested. Duties shall include, but not necessarily be limited to the following:

1. Make, store, transport, cure, and test compression specimens made during placing of concrete. Compression test specimens shall be tested in accordance with ASTM C 39.

Test reports shall show all pertinent data, such as class of concrete, exact location of pour, air temperature, date of pour, time of pour, truck number for ready-mixed concrete, date on which specimen was broken, age of specimen, compressive strength of specimen, concrete slump test results and air content of concrete from which the specimen was made. One (1) copy each of all tests shall be sent to the Contractor and two (2) copies each to the Contracting Officer.

2. Each strength test requires four (4) standard test cylinders.
3. Samples for strength tests of each class of concrete placed each day shall be taken not less than one (1) time per day, nor less than one (1) time for each one-hundred cubic yards (100 CY) of concrete, nor less than once for each five-thousand square feet (5,000 ft2) of surface area for slabs or walls.
4. Each class of concrete shall be tested with at least five (5) strength tests.
5. From each set of four (4) cylinders, two (2) shall be tested at twenty-eight (28) days and shall comprise a strength test under the definition of these Specifications. One cylinder shall be broken at seven (7) days and will be used as an aid in determining the early strength of the concrete and the twenty-eight (28) day strength, and one (1) cylinder retained in reserve for later testing if required.
6. Test for unit weight of concrete when the first load of each class of concrete is delivered and thereafter at the discretion of the testing laboratory.

B. Periodically inspect the batching plant and file a report with the Contracting Officer stating whether the supplier's equipment and methods meet the requirements of these Specifications.

C. Temperature and Placing Record: Temperature record shall be made each day during the concreting operations. Records shall also include location, quantity, and starting and finishing time of placement for all concrete work. Copy distribution shall be as specified above for test reports.

END OF SECTION

CONCRETE PREPLACEMENT SIGN-OFF CARD

Project:_____

Inspection Date:_____ Concrete Placement Date:_____

Expected Time of Concrete Placement:_____

Estimated Quantity:_____

Mix Design Strength:_____

Location of Structure:_____

Member (walls, beams, etc.):_____

Weather Conditions:_____

Method of Pour: Chute_____ Bucket_____ Pump_____

Conveyor_____ Other_____

Work	Status		Signature	Date
Formwork				
Reinforcing				
Mechanical				
Electrical				
Instrumentation				
Plumbing				
Process				
Metal Embeds				
Miscellaneous Specialties				
Clean-Up/OK to Place				

The Contractor certifies that the above work to be cast is prepared in accordance with the Contract Documents.

Contractor (Superintendent): _____
Date: _____
Resident Inspector: _____
Date: _____

SECTION 323113 - CHAIN LINK FENCING AND GATES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Contractor to furnish and install chain link fencing around the project as specified in the drawings.

1.2 SUBMITTALS

A. As specified in Section 01 33 23.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Chain link fence and gate frameworks shall withstand wind load of 100 mph and the stresses for fence height and under exposure conditions according to ASCE/SEI 7.

2.2 CHAIN LINK FENCE FABRIC

A. Contractor to provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to “CLFMI Product Manual” and requirements indicated below:

1. Fabric Height: As indicated on drawings
2. Steel wire for Fabric: Wire shall be 6 gauge.
3. Zinc coated fabric: ASTM A 392, Type II, Class I, 1.2 oz./sq. ft. with zinc coating applied before weaving.

B. Selvage: Twisted top and knuckled bottom.

2.3 FENCE FRAMEWORK

A. Posts and rails shall be constructed in accordance with ASTM F1043 for Framework including rails, braces, and line; terminal and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F1043 or ASTM F1083 based on the following:

1. Fence Height: as indicated on drawings.
2. Group IA, round steel pipe, schedule 40.
3. Horizontal framework members and brace rails in accordance with ASTM F 1043.
4. Metallic coating for steel framework shall be in accordance with ASTM F1083.

2.4 FITTINGS

A. Provide fittings according to ASTM F626. All fittings shall be galvanized per ASTM F1083 with not less than 1.2 ounces of zinc per square foot of surface area.

B. Post Caps and Rail and Brace Ends: Provide pressed steel caps and ends.

1. Caps shall be designed to snugly cover posts to exclude moisture. Supply dome style caps for terminal posts and loop type for line posts
2. Ends shall be cup-shaped to receive rail and brace ends.

C. Top Rail Sleeves: Shall be tubular steel, 0.051-inch thickness, 7-inch length, expansion type.

D. Tension Bars: Shall be steel strip, 5/8-inch width, 3/16-inch thickness.

E. Tension Bands: Shall be pressed steel, 14 gauge thickness, 3/4-inch width.

F. Brace Bands: Shall be pressed steel, 12 gauge thickness, 3/4-inch width.

G. Truss Rods: Shall be steel rod, 3/8-inch diameter, merchant quality with turnbuckle (take up)

H. Tie Wires: For attaching chain-link fence fabric to posts, rails, and frames; shall be 0.148-inch diameter wire.

I. Barbed Wire Arms: Pressed steel with clips, slots, or other means for attaching strands of barbed wire, and means for attaching to posts, for each post unless otherwise indicated, and as follows:

1. Provide line posts with arms that accommodate top rail.
2. Provide corner arms at fence corner posts unless extended posts are indicated.
3. Single-Arm Type: Type I, 45° slanted arm.

2.5 CONCRETE

A. Anchoring concrete shall be in 3500 psi, as specified in Section 32 25 00.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Do not begin installation before final grading is completed unless otherwise permitted by Engineer and/or Contracting Officer.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 CHAIN-LINK FENCE INSTALLATION

A. Install chain-link fencing according to ASTM F 567 and more stringent requirements specified.

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated on the Drawings, in firm, undisturbed soil.

C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete.
2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
   a. Shape and smooth concrete crown 2 inches above grade to shed water.

D. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more. For runs exceeding 500 feet, space pull posts an equal distance between corner or end posts.

E. Line Posts: Space line posts uniformly at maximum 10 feet o.c.

F. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch-diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:

1. Extended along top and bottom of fence fabric.

3.4 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

END OF SECTION

SECTION 330597 - UNDERGROUND UTILITY WARNING TAPE

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section includes plastic ribbon tape for placement above direct-buried utility.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer’s catalog information for each product required.

PART 2 – PRODUCTS

2.1 RIBBON TAPE

A. Pro-Mark or Engineer's Approved Equal.

2.2 DESCRIPTION

A. Material: Polyethlyene

B. Brightly colored, continuously printed

C. Minimum size: 6 inches wide by 4 mils thick.

D. Manufactured for direct burial service.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Ribbon tape: as recommended by manufacturer.

END OF SECTION

SECTION 333003 - SANITARY SEWAGE LIFT STATION

PART 1 - GENERAL

1.1 SCOPE:

A. Furnish all labor, materials, equipment and incidentals required to install, place in operation and field test submersible wastewater pumps, mixer, wetwells, valve boxes, concrete slabs, control panel and telemetry/SCADA as hereinafter specified. The station shall be complete with pumps, mixer, piping, valves, electrical work (including motor controls), telemetry/SCADA, instrumentation, structures, connections and appurtenances, tested and ready for service.

B. These specifications are intended to give a general description of what is required, but do not cover all details which will vary in accordance with the requirements of the equipment as offered. It is, however, intended to cover the furnishing, the shop testing, the delivery and complete installation and field testing, of all materials, equipment and appurtenances for the complete pumping units as herein specified, whether specifically mentioned in these specifications or not.

C. The Contractor shall confirm the pump, mixer, piping, and guide bar system can be accommodated and maintained with the hatch opening size.

D. Related Documents described elsewhere:

1. Shop Drawings, Working Drawings and Samples: Section 1340.
2. FDOT Standard Specifications for Road and Bridge Construction, current edition. Specific Sections but not limited to:
    a. Prevention, Control, and Abatement of Erosion and Water Pollution:
        1) Section 104
    b. Excavation for Structures and Pipe: Section 125
    c. Reinforcing for Concrete: Section 415
    d. Performance Turf: Section 570

1.2 SITE CONDITIONS:

A. Prior to submitting his bid, the Contractor shall satisfy himself as to the character and amount of different soil material, groundwater and the subsurface conditions to be encountered in the work to be performed. Information and data, when furnished, are for the Contractor's general information. However, it is expressly understood that any interpretation or conclusion drawn therefrom is totally the responsibility of the Contractor.

PART 2 – PRODUCTS

2.1 APPROVAL OF MATERIAL AND EQUIPMENT:

A. All materials and equipment shall be new and unused when delivered to the site and shall be subject to inspection by the Contracting Officer and Engineer before installation.

B. It is the intent of these Specifications that, to assure overall system quality and operational unity, the pumps, motors, starters, controls, and other auxiliary equipment and materials as shall be furnished and/or coordinated by the pump manufacturer who shall assume responsibility for the satisfactory operation of the pumping system including pumps, motors, mixers, controls, starters, telemetry and accessories.

C. Within 60 days after notice to proceed is issued, the Contractor shall submit, for the approval of the Engineer, shop drawings and/or manufacturer's description sheets for the following materials and/or equipment:

a. Piping and Fittings	f. Guide Rails
b. Discharge Elbow	g. Valves
c. Submersible Pumps	h. Impeller & Volute
d. Mixer	i. Mixer Propeller
e. Wet well	j. Access Hatches

D. Submittals shall include an electronic copy for each item. Drawings and manufacturer's descriptive materials shall include sufficient detail to clearly establish that the item submitted meets the specifications.

E. Items installed without approval of the Engineer shall be subject to removal and replacement at no additional cost to the Contracting Officer.

2.2 SUBMERSIBLE PUMPS:

A. Furnish and install two submersible grinder wastewater pumps in the sewage pumping stations as detailed on the drawings.

B. The pumps shall be totally submersible, electrically operated, capable of pumping raw, unscreened sewage and each unit shall meet the following characteristics:

1. Shutoff Head (Feet): 235
2. Design Capacity (GPM): 109 120
3. Design TDH (Feet): 177 150
4. Motor Horsepower (Maximum): 15
5. Electrical Service: 230V/3 Ph
6. Discharge Size (Inches): 3
7. Motor RPM (Maximum): 3500

C. The pumps shall be GRINDER type capable of handling raw, unscreened wastewater. The discharge elbow shall be permanently installed in the wet well along with the discharge piping. The pumps shall be automatically and firmly connected to the discharge connection elbow when lowered into place. The pumps shall be easily removable for inspection or service, having no bolts, nuts, or other fasteners to be disconnected. There shall be no need for personnel to enter the pump well. Sealing of the pumping unit to the discharge to the discharge connection elbow shall be accomplished by a mechanical, watertight contact.

D. All major parts such as the stator casing, oil casing, sliding bracket shall be of gray iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes and other irregularities. Where watertight sealing is required, O-rings made of nitrile rubber shall be used. All exposed nuts and bolts shall be of AISI type 316 stainless steel. All metal surfaces that come into contact with the sewage, other than stainless steel, shall be protected by a min. 6 mils thickness, factory applied 2-component epoxy resin coating on the exterior of the pump.

E. The grinder cutter mechanism shall be of wear resistant chromium white iron A532 II C 15% CrMo-Hc. The impeller shall be a vortex design.

F. The motor shall be able to operate dry without damage while pumping under load. Motors shall be sufficiently cooled by the surrounding environment or pumped media such that pump is

capable of continuous operation, in a totally, partially, or non-submerged condition. The pump shall be capable of running dry continuously in a totally dry condition. A water jacket shall not be required.

G. The pump manufacturer shall warrant the units being supplied to the Contracting Officer against defects in workmanship and material for a period of five (5) year non-prorated under normal municipal use, operation and service.

H. Submersible pumps shall be one of the models as follows:

1. Manufactured by KSB, model KRT-S-40-250/122XG
2. Absolutely no alternatives or equals will be considered.

2.3 SUBMERSIBLE PUMP GUIDE BAR ASSEMBLY

A. Each pumping unit shall be equipped with a guide bar assembly as recommended by the pump manufacturer. Guide bars shall be utilized to direct the pump in proper alignment with the stationary discharge piping. Bars shall be a minimum of 2-inch diameter, 316 stainless steel. The pump shall be automatically connected to the discharge connection when lowered into place and shall be easily removed for inspection or service. There shall be no need for personnel to enter wet well. Sealing of the pumping unit to the discharge connection shall be accomplished by a simple linear downward motion of the pump. All material used to fabricate the upper guide holder and cable holder shall be 316 stainless steel. All bolts, anchors, and other fasteners shall be 316 stainless steel.

B. A sliding guide bracket shall be an integral part of the pump unit. The entire weight of the pumping unit shall be guided by no less than two guide bars that are a minimum 2” diameter; each made of SCH-40 316 stainless steel. No portion of the pump shall bear directly on the floor of the sump.

2.4 FLOAT MOUNTING ASSEMBLY

A. A float pole assembly shall be provided for mounting and positioning of floats. The float pole assembly shall consist of a 1” SCH-10 pipe with lifting chain mounted to welded eye. Chain and pipe shall each be long enough to position the floats at the required depths. Float pole mounting assembly shall be provided with six (6) 3/8” dia. 316 stainless steel hooks for hanging floats cords. Floats must be mounted to pole with pipe clamps and shall be oriented so as to avoid flow from incoming pipes impinging on hanging floats to as great an extent possible. Sufficient amount of weights must be welded to bottom of pole for stability. Continuous cords are to run from pump(s) and level controls to control panel. No splices shall be made in wiring. All components of the assembly including but not limited to hooks, fasteners, chain, welded eye, pipe, clamps and weights must be of 316 stainless steel.

2.5 LIFTING CHAIN

A. Each pumping unit shall be provided with a 316 stainless steel lifting chain, to permit raising the pump for inspection or repair. The lifting chain shall be provided with a shackle at each end of like strength and material for creating a lifting loop sufficient for standard lifting devices. The lifting chain shall be of sufficient length to extend from the pumping unit at one end to the top of the wet well at the other end, plus an additional five

B. (5) feet. The access frame shall provide (3) 3/8” dia. 316 stainless steel hooks, per pump, to attach the lifting chain and cables when not in use. The lifting chain shall be sized according to the pump manufacturers’ recommendations but under no circumstances less.

END OF SECTION

SECTION 333004 - MISCELLANEOUS LIFT STATION ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ball Valves
2. Pressure Gauge
3. Emergency Pump Connection
4. Level Control System
5. Float Switches
6. High Water Alarm with Alarm Silence
7. Mixer
8. Control System

1.2 REFERENCES

A. Reference Standards

1. Reference standards cited in this Specification refer to the current reference standard published at the time of the latest revision date logged at the end of this Specification, unless a date is specifically cited.
2. ASTM International (ASTM):
   a. D3350, Standard Specification for Polyethylene Plastic Pipe and Fittings Materials.
   b. F2620, Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.

1.3 SUBMITTALS

A. Submittals shall be in accordance with Section 01 33 00.

1.4 QUALITY ASSURANCE

A. Qualifications

1. Manufacturers
   a. Finished pipe shall be the product of 1 manufacturer for each size, unless otherwise specified by the Contracting Officer.
      1) Change orders, specials and field changes may be provided by a different manufacturer upon Contracting Officer approval.
   b. Pipe manufacturing operations shall be performed under the control of the manufacturer.
   c. All pipe furnished shall be in conformance with ASTM D3350.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements

B. Pipe, valves, fittings and other materials shall be transported, stored and handled in accordance with the manufacturer’s guidelines.

PART 2 - PRODUCTS

2.1 EQUIPMENT, PRODUCT TYPES AND MATERIALS

A. Ball Valves

1. Above ground pipe/valve manifold shall be equipped with 316 stainless steel low torque, full port ball valves as indicated in the drawings.
2. Ball valves shall be flanged, with 316 stainless steel operating handle and hardware, as manufactured by American. Pressure rating shall be 150 psi minimum.
3. Cast iron, epoxy coated flanged check valves with external lever arm and weights to be provided.

B. Pressure Gauge

1. Check valves shall be equipped with tapped connection on the check valve cap and provided with pressure gauge, diaphragm, necessary pipe nipples and shut-off valve. All materials including diaphragm shall be 316 stainless steel.
2. Gauges shall be liquid filled, back mount and have minimum 3 ½ inch dial, with stainless steel casing. The psi range must be from (0) zero to a value greater than design pump shutoff but no more 1 ½ times the maximum pressure the pump provides at dead head.

C. Emergency Pump Connection

1. Valve vault/manifold shall be equipped with emergency pump connection as indicated in the drawings.
2. Emergency pump connections shall include a 316 stainless steel ball valve and quick connect camlock fitting. The 316 stainless steel camlock fittings must be provide with dust covers that have been tapped with a ¼” 316 stainless steel ball valve.

D. Level Control System

1. Functional Description. Float switches shall be supplied to control wet well level and alarm signal. A quantity of three floats shall be provided to control the liquid level in duplex pump stations. One additional float switch shall be provided for a high-water level alarm.
2. The floats shall be mounted on the previously specified float mounting assembly.
    a. The level control system shall be the float type, mounted in the wet well utilizing the float mounting assembly. Rising and falling liquid level in the wet well shall cause switches within the floats to open and close, providing start and stop signals for the level control components.
    b. Sequence of Operation. The level control system shall start the motor for one pump when the liquid level in the wet well rises to the "lead pump start level". When the liquid is lowered to the "pump stop level", the system shall stop this pump. These actions shall constitute one pumping cycle. Should the wet well level rise to the "lag pump start level", the system shall start the second pump so that both pumps are operating to pump down the well. Both pumps shall stop at the same "stop" level.
    c. Automatic Pump Alternation. The level control system shall utilize the alternator relay to select first one pump, then the second pump, to run as lead pump for a pumping cycle. Alternation shall occur at the end of a pumping cycle.

E. Float Switches

1. Four float switch assemblies shall be supplied for installation by the Contractor.
2. Cable shall be continuous with no splices from the float switch to the control cabinet.
3. All float switches shall be rated for explosion proof atmospheres and terminated into intrinsically safe relays, barriers as required or functionally equivalent to meet

specifications.

4. All float switches and relays must have a ten (10) year warranty.

F. High Water Alarm with Alarm Silence

1. Pump station manufacturer shall furnish a float switch assembly, intrinsically safe relay, for high water alarm function. Should the wet well level rise to the high water alarm level, the float switch assembly and intrinsically safe relay shall energize the signal relay. The signal relay shall complete a 115-volt AC circuit for external alarm devices. The signal relay shall maintain the alarm signal until the wet well level has been lowered and the circuit has been manually reset.
2. An alarm silence switch and relay shall be provided to permit maintenance personnel to de-energize the external alarm device while corrective actions are underway. After silencing the alarm device, manual reset of the signal relay shall provide automatic reset of the alarm silence relay.

G. Mixer

1. It is the intent that one mixer and mixer mast shall be supplied for installation into each fiberglass wet well structure.
2. The mixer shall have a maximum propeller rotating speed 1750 RPM with stainless steel, ASTM A276 Type 316 Titanium stabilizer propeller and motor shaft. Motor housing shall be cast iron, ASTM A48, Class 40B with 316 stainless steel hardware. The mixer shall be explosion proof and have both temperature protection and leak detection capabilities.
3. A 316 stainless steel lifting chain must be provided per manufacturer recommendations or minimum 3/16”.
4. The Contractor to provide a permanently installed guide mast assembly which allows for mixer installation, operation and retrieval without the need to enter the basin. The mast assembly shall allow for adjustment of mixer’s vertical location. The mast shall be 2” square tube supplied with factory welded sockets at the top, bottom and intermediate levels as needed to provide support at a maximum of 10 ft intervals. Sockets shall insure easy mast rotation, and shall work in conjunction with supplied mounting brackets to secure the unit to the tank wall. The top mast bracket shall include a rotary positioning plate which allows the mast to be secured in a sufficient range of rotation for adjustments; adjustments shall be possible without the need to drain the basin. Wall extension brackets, if required, shall be provided to insure a straight and true installation. The mixer shall be guided along the mast through an integral mounting bracket fastened to the mixer motor end cap. An adjustable mixer stop bracket shall be furnished to support the mixer at manufacturers recommended height.
5. The mixer shall rest on the lower chair assembly which is affixed to the inside portion of each base elbow flange.
6. The mixer manufacturer shall warrant the mixer and motor to the Owner against defects in workmanship and materials for a period of five (5) years, non-prorated, from date of first beneficial use.

H. Control System

1. The Contractor shall furnish and install a Control System including panels, circuitry, emergency power capabilities, starters, relays and other required equipment for a fully functioning lift station.

2. Control Panel:
    a. The control panel and all appurtenances must be constructed of 304 stainless steel and completely powder coated “white”, both inside and outside.
    b. The panel shall be designed to be pedestal mounted on a concrete pad with and air-break box and removeable/hinged expanded metal panels with stainless steel bug screen backing.
    c. All conduits shall terminate in the air-break box and all associated cables shall enter the bottom of the control panel with properly sized NEMA 4x compression glands to create an air/watertight connection. The control panel shall be sized properly to facilitate relay logic components, Telemetry/SCADA and mixer controls.
    d. Panel doors must provide an air/watertight seal when closed. Doors must have pad lockable three-point latches.
    e. Both the main doors and inner door dead front must have hold open latches that are capable of holding the doors in the open position until needed closure upon which will be performed manually.
    f. Inner dead front door must have engraved labeling fastened with 316 SST hardware.
    g. The pump push to test run light switches, switches and remote telemetry keypad must be mounted on the inner door dead front door.
    h. The panel must have interior lighting sufficient for maintenance work during low light/night conditions.
    i. An HOA switch must be provided for both pumps and the mixer as well as runtime meters for each.
3. Controller
    a. RTU shall be capable of operation using the same floats as relay logic.
    b. RTU must be capable of operating as primary or secondary using switching device to toggle between relay logic and the PLC.
4. Telemetry/SCADA Monitoring System
    a. The telemetry/SCADA monitoring system must be capable of providing both internet and cellular application monitoring.
    b. The monitor system must be able to provide:
        1) Pump and mixer runtime reports
        2) Number of starts per day for pumps and mixer
        3) High level, excessive runtime, seal failure alarms
        4) Daily Flow Meter totalizer reports.
    c. The monitor system shall have enough memory to backup a minimum of 3 years’ worth of information.

I. Spare/Replacement Parts

1. In addition to the parts required for the full operation of the sewage pump station, the Contractor shall furnish spare/backup parts as listed below:
    a. One complete set of floats and necessary float relays;
    b. Intrinsically safe relay;
    c. Phase monitor;
    d. Telemetry/SCADA unit;
    e. One full box (6) of each fuse type;
    f. One spare pump with guide claw;

g. One spare mixer with guide claw;
h. Each part shall be packaged and labeled with part description and in a container with associated lift station name/number as it would be identified by the National Park Service;
i. Of which, shall be included with the bill of materials list from panel integrator

PART 3 - EXECUTION

3.1 INSPECTION AND TESTING

A. Operating personnel shall be trained in operation and maintenance of equipment at start up. Instruction shall be given in operation, service, adjustments, and routine maintenance. Recommended spare part lists and maintenance schedules shall be provided.

B. Field tests shall not be conducted until such time that the entire installation is complete and ready for testing.

C. The manufacturer shall furnish the services of a factory representative who shall have complete knowledge of proper operation and maintenance to inspect the final installation.

END OF SECTION

SECTION 333115 - HIGH DENSITY POLYETHYLENE (HDPE) PIPE FOR SANITARY SEWER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. High Density Polyethylene (HDPE) pipe.

1.2 REFERENCES

A. Reference Standards

1. Reference standards cited in this Specification refer to the current reference standard published at the time of the latest revision date logged at the end of this Specification, unless a date is specifically cited.
2. ASTM International (ASTM):
   a. D3350, Standard Specification for Polyethylene Plastic Pipe and Fittings Materials.
   b. F2620, Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.

1.3 SUBMITTALS

A. Submittals shall be in accordance with Section 01 33 00.

1.4 QUALITY ASSURANCE

A. Qualifications

1. Manufacturers
   a. Finished pipe shall be the product of 1 manufacturer for each size, unless otherwise specified by the Contracting Officer.
      1) Change orders, specials and field changes may be provided by a different manufacturer upon Contracting Officer approval.
   b. Pipe manufacturing operations shall be performed under the control of the manufacturer.
   c. All pipe furnished shall be in conformance with ASTM D3350.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements

B. Pipe and fittings shall be transported, stored and handled in accordance with the manufacturer’s guidelines.

PART 2 - PRODUCTS

2.1 EQUIPMENT, PRODUCT TYPES AND MATERIALS

A. Materials

1. Pipe and Fittings
   a. Material shall be minimum DR-17 Extra High Molecular Weight, High Density Polyethylene PE 3408, Cell Class PE345464D or E (inner wall shall be white or light in color) per ASTM D3350.
   b. Material shall be homogeneous throughout and free of:

1) Abrasion, cutting or gouging of the outside surface extending to more than 10 percent of the wall thickness in depth
2) Cracks
3) Kinking (generally due to excessive or abrupt bending)
4) Flattening
5) Holes
6) Blisters
7) Other defects

c. Pipe with gashes, nicks, abrasions or any such physical damage which may have occurred during storage and/or handling, which are larger/deeper than 10 percent of the wall thickness shall not be used and shall be removed from the construction site.
d. Pipe and fittings shall be uniform in color, density and other physical properties.
1) Pipe and fittings not meeting these criteria will be rejected.
e. Pipe Markings
1) Meet the minimum requirements of ASTM D3350.
2) Minimum pipe markings shall be as follows:
(a) Marking intervals shall be at 6-inch intervals
(b) Manufacturer's Name or Trademark and production record
(c) Nominal pipe size
(d) ASTM or Standard Dimension Ratio (SDR) designation
(e) Cell classification
(f) Seal of testing agency that verified the suitability of the pipe

2. Polyethylene Repair Clamp
a. Smith-Blair Full Circle Clamp Style 228 or 263 or engineer approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General

1. Install pipe, fittings, specials and appurtenances as specified herein and in accordance with the pipe manufacturer's recommendations.
2. Lay pipe to the lines and grades as indicated in the Drawings.

B. Pipe Handling

1. Haul and distribute pipe and fittings at the project site.
2. Handle piping with care to avoid damage.
a. Inspect each joint of pipe and reject or repair any damaged pipe prior to lowering into the trench.
b. Use only nylon ropes, slings or other lifting devices that will not damage the surface of the pipe for handling the pipe.
3. At the close of each operating day:
a. Keep the pipe clean and free of debris, dirt, animals and trash – during and after the laying operation.
b. Effectively seal the open end of the pipe using a gasketed night cap.

C. Pipe Joining

a. Join pipe in accordance with ASTM F2620.

b. Operators must be certified by the manufacturer to use the fusion equipment.
c. Follow the time and temperature recommendations of the manufacturer.
d. Joints shall be stronger than the pipe itself, be properly aligned and contain no gaps or voids.
e. Remove bead projection on the outside of the pipe to reduce drag during pipe installation process.

END OF SECTION

SECTION 333900 - FIBERGLASS WET WELLS

PART 1: GENERAL

1.1 SCOPE OF WORK

A. The product listed under this section shall include all labor, materials and equipment necessary to furnish a Fiberglass Reinforced Plastic (FRP) Wet Well. FRP Wet Wells shall be one-piece units manufactured to meet or exceed all specifications of ASTM D3753. Fiberglass reinforced polyester wet wells shall be manufactured from commercial grade unsaturated polyester resin with fiberglass reinforcements as manufactured by the following approved manufacturers:

B. Fiberglass Tank Solutions (FTS) or approved equal.

1.2 SUBMITTALS

A. General - The manufacturer shall supply a complete set of scale drawings detailing dimensions of heights, diameter, elevations to invert, pipe sizes and any other necessary details.

B. Anti-Flotation (Buoyancy) Calculations - A set of signed and sealed (by a Professional Engineer) anti-flotation calculations shall be provided which meet the following criteria:

1. Wet well weight and soil pressure on concrete base collar may be used to calculate down forces, but pump and piping weights shall not be used.
2. Assume groundwater is at grade.
3. A factor of safety of 1.2, minimum, must be used.
4. The design calculations shall include the design conditions as noted on the drawings.

C. Engineering Design Report - Manufacturer shall provide a complete Composite Engineering Design using a Finite Element Analysis for the wet well. The calculations shall include:

1. Design Inputs
2. Design of Cylindrical Shell
3. Flat Top Head Design
4. Bottom Head Design
5. Pump Anchorage on Flat Bottom
6. Component Weight
7. Buoyancy Calculations
8. Lifting Trunnion Design
9. Access Cover Opening Reinforcement
10. Design Summaries and Sketches
11. P.E. Stamp for the Design

D. Mounting Plate Calculations - Pumps shall be anchored to a mounting plate per manufacturer’s recommendations. The complete design (signed and sealed by a Professional Engineer licensed in State of Florida) shall be submitted for Contracting Officer’s review/approval.

1.3 QUALITY ASSURANCES

A. Comply with the latest published editions of AWWA and ASTM Standards:

ASTM D883	Standard Terminology Related to Plastics
ASTM D3299	Standard Specification for Filament-Wound Glass-Fiber-Reinforced Thermoset Resin Corrosion-Resistant Tanks

ASTM D3753	Standard Specifications for Glass-Fiber-Reinforced Polyester Manholes and Wet Wells
ANSI / AWWA D120- 09	AWWA Standard for Thermosetting Fiberglass-Reinforced Plastic Tanks

PART 2: PRODUCTS

2.1 MATERIALS

A. Resin – The resins used shall be commercial grade unsaturated 100% polyester resins. Interior corrosion liner shall be a Vinyl Ester resin.

B. Reinforcing Materials – The reinforcing materials shall be a commercial Grade "E" type glass in the form of mat, continuous roving, chopped roving, roving fabric, or a combination of the above, having a coupling agent that will provide a suitable bond between the glass reinforcements and the resin.

C. Surfacing Materials – If reinforcing materials are used on the surface exposed to the contained substance, it shall be a commercial grade chemical-resistant glass that includes a C-Veil or Nexus liner that will provide a suitable bond with the resin and leaves a resin rich surface.

D. Interior Materials - A minimum of a 10mm interior laminate layer of the tank construction shall include the reinforcing materials, C-Veil or Nexus, and a commercial grade Vinyl Ester resin for added chemical resistance.

E. Fillers and Additives – Fillers, when used, shall be inert to the environment and wet well construction. Additives, such as thixotropic agents, catalysts, promoters, etc., may be added as required by the specific manufacturing process to be used. The resulting reinforced plastic material must meet the requirement of this specification. No sand fillers will be allowed.

2.2 FABRICATION

A. Exterior Surface – The exterior surface shall be relatively smooth with no sharp projections. Hand-work finish is acceptable if enough resin is present to eliminate fiber show. The exterior surface shall be free of blisters larger than 1/2 inch in diameter, delamination and fiber show.

B. Interior Surface – The interior surface shall be resin rich with no exposed fibers. The surface shall be free of crazing, delamination, blisters larger than 1/2 inch in diameter, and wrinkles of 1/8 inch or greater in depth. Surface pits shall be permitted if they are less than 3/4 inch in diameter and less than 1/16 inch deep.

C. Defects Not Permitted –

1. Exposed fibers – Glass fibers not wet out with resin.
2. Resin runs: runs of resin and sand on the surface.
3. Dry areas: areas with glass not wet out with resin.
4. Delamination: separation in the laminate.
5. Blisters – Light colored areas larger than ½ inch in diameter. Crazing: cracks caused by sharp objects.
6. Pits or Voids – Air pockets.
7. Wrinkles – Smooth irregularities in the surface.
8. Sharp Projection – Fiber or resin projections necessitating gloves for handling.

D. Installation of Brackets – Manufacturer or Manufacturer-certified field personnel shall glass in all stainless-steel fasteners and brackets, discharge piping brackets, etc. Manufacturer of wet well shall be responsible for integrity of all field glassing.

E. Markings – Each wet well shall have wet well data integrated into fiberglass and affixed inside and top outside walls at or near the top. Data on the inside of the wet well should be legible from the top of the completed lift station installation. Product data shall not be written in ink or paint. Production/serial numbers shall be kept on file by Manufacturer for a minimum of 20 years and shall be accompanied by project data for future reference and recall. Data required includes the following as an example:

1. Manufacturer's Name
2. ASTM Designation
3. Production or Serial Number
4. Production date
5. Wet Well Depth
6. Wet Well Diameter
7. Warranty Length

F. Wet Well Top Flange - The wet well flange shall have an outside diameter of at least 3.0 inches greater than the diameter of the wet well.

2.3 FIBERGLASS CONSTRUCTION METHODS

A. Wet Well Penetrations – Cutouts/stub-outs must be installed by the manufacturer. Installations in the field are not recommended and may void the manufacturer's warranty. Penetrations of FRP pipe will be performed using resin and reinforced hand lay-up procedures. All resin and fiberglass shall be the same type and grade as used in the manufacturer of the basin.

B. Pipe Installation – Discharge wall penetrations are to have sleeves large enough to accept O.D. of pipe discharge flange. All discharge sleeves shall be sealed via a gas tight-water tight Link Seal system or approved equal. Influent pipe connections shall be made with a Press Seal Boot with stainless steel band or approved equal.

2.4 DESIGN FEATURES

A. Top Slab Support – Pour reinforced concrete slab support a minimum of two feet outside of fiberglass wet well wall and minimum of six inches thick. Slab designs will be the responsibility of the design firm of record for the project, to include reinforcement and concrete mix for the specific load requirements. All top loaded slabs will provide structural loads to be placed on soil backfill outside the shadow of the fiberglass tank.

B. Wet Well Top – Wet well top shall be aluminum and part of access frame and cover and designed for 300 PSF as noted on the drawings. Hatches shall be as specified in this specification and as detailed on the Contract drawings.

C. Frame and Covers

1. Access frame and covers shall be round type by US Fabrication and suitably sized for pumping units furnished as specified on the Construction plans and details. Access frame and covers shall be constructed of skid-proof aluminum with a minimum load rating of 300 pounds per square foot loading in accordance with the drawings. Frame and covers shall be furnished complete with stainless steel staple assembly (not recessed) for the

locking mechanism, hold-open device, upper guide holder and cable holder. Access covers shall be hinged to open as indicated on the drawings. Hatches shall be sized to provide a 4-inch minimum clearance between hatch and pump volute (measured from all sides and includes the pump and rail system). Hatches shall be gasketed to minimize water intrusion and odors, with drain piping. All hatch openings shall be provided with aluminum powder coated orange safety grates.

2. All hinges, fasteners and miscellaneous hardware shall be 316 stainless steel. For tamper proof and security purposes, the hinges shall be bolted to the door(s) with stainless steel carriage bolts and nuts. The nuts shall be welded to the bolts on both the door(s) and frame. Park Staff will provide pad locks, as required. Locks shall be easily accessed and SST lam- lock-type locking mechanisms will be allowed to help keep leafs pulled against the gasket. quarter turn locking machinisms with 15/16th nut heads shall be provided on each side of the single leaf to pull cover down tight when needed.

D. Interior Piping & Pump Discharges

1. Pump discharge systems shall be constructed using either Ductile Iron, Stainless Steel, or Poly Propylene, per the plans.
2. Pump guide rails shall be Sch. 40 Stainless Steel sized per the plans.

2.5 WARRANTY

A. The fiberglass Manufacturer shall warrant the fiberglass wet well against defects for at least 10 year after the date of acceptance by the Contracting Officer. Defects are defined as cracking, delaminating, or leaking. The warranty shall require the Manufacturer to supply all necessary labor, materials, and equipment to repair defects to the satisfaction of the Contracting Officer. The Contractor and/or Manufacturer shall not make any exemption or exception to the above stated conditions or warranty. Manufacturer’s recommended installation procedures to assure 1-year warranty provided to the Contracting Officer to be included in submittal package.

PART 3: INSTALLATION

3.1 GENERAL

A. The FRP wet well shall be installed in the location shown on the plans in accordance with the Manufacturer’s recommendations and these specifications. The limit of excavation for the FRP shall allow for placing and removing forms, installing sheeting, shoring, bracing, etc. The Contractor shall pile excavated material in a manner that will not endanger the work and will avoid obstructing sidewalks, driveways, power poles, etc.

3.2 HANDLING

A. The wet well shall not be dropped or impacted. Wet wells shall be chocked if stored horizontally. If wet wells must be moved by rolling, the ground transverses shall be smooth and free of rocks,

1. debris, etc. FRP wet wells may be lifted by the installation of three lifting lugs as specified by the Manufacturer on the outside surface near the top or by a sling or "choker" connection around the center. Use of chains or cables in contact with the wet well surface is prohibited. Wet wells may be lifted horizontally using one support point.

3.3 WET WELL INSTALLATION

A. Bottom of excavation should be compacted to a minimum 95 percent Modified Proctor Density. Pour reinforced concrete base a minimum of one foot deep and at least two feet in diameter larger than the fiberglass wet well outside diameter.

3.4 VERTICAL SIDES (SHEETING, SHORING AND BRACING)

A. When necessary to protect existing or proposed structures or other improvements, the Contractor shall maintain vertical sides of the excavation. The limit shall not exceed three feet outside the footing on a vertical plane parallel to the footing except where specifically approved otherwise by the Engineer. The Contractor shall provide and install any sheeting, shoring, and bracing as necessary to provide a safe work area as required protecting workers, structures, equipment, power design and adequacy of all sheeting, shoring, and bracing. For excavations deeper than 20 vertical feet, which utilize sheeting, shoring or bracing, the sheeting, shoring and bracing plan shall be designed by a Florida Professional Engineer, (signed and sealed). This plan shall be submitted to the Contracting Officer for review and approval, prior to construction. The construction of sheeting, shoring and bracing shall be in accordance with the approved plan. All major field modifications shall be approved by the Professional Engineer. The sheeting, shoring, and bracing shall be removed as the excavation is backfilled in such manner as to prevent injurious caving. Excavation shall meet OSHA Excavation Standards (29 CFR sub- part P 1926.650) at a minimum.

3.5 SLOPING SIDES

A. Where sufficient space is available, the Contractor shall be allowed to back slope the sides of the excavation. The back slope shall be such that the excavation shall be safe from caving. The type of material being excavated shall govern the back slope used, but in any case the back slope shall be no steeper than 1 foot horizontal to 1 foot vertical without sheeting or shoring.

3.6 DE-WATERING

A. The Contractor shall keep excavation free from water by use of cofferdams, bailing, pumping, well pointing, or any combination as the particular situation may warrant. All de-watering devices shall be installed in such a manner as to provide clearance for construction, removal of forms, and inspection of exterior of form work. It is the intent of these specifications that the foundation be placed on a firm dry bed. The foundation bed shall be kept in a de-watered condition a sufficient period of time to ensure the safety of the structure. The excavation shall be protected from excessive rainfall, drainage and drying. The excavation shall be inspected and approved by the Contracting Officer before work on the structure is started. It is the intent of these specifications that the Contractor provides a relatively smooth, firm foundation bed for footing and slabs that bear directly on the undisturbed earth without additional cost, regardless of the soil conditions encountered. The Contracting Officer will be the sole judge as to whether these conditions have been met.

3.7 UNAUTHORIZED EXCAVATION

A. Excavation for slabs, footings, etc., that bear on earth shall not be carried below the elevation shown on the drawings. In the event the excavation is carried on below the indicated elevation,

1. the Contractor shall bring the slab, footing etc., to the required grade by filling with concrete having a minimum compressive strength of at least 3,000 psi at 28 days.

3.8 BACKFILL MATERIAL

A. Unless shown otherwise on the drawings, suitable backfill in accordance with the Manufacturer's Installation Guidelines shall be used for backfill around the wet well for a distance of two feet from the outside surface and extending from bottom of the excavation to the bottom of the top slab. The material chosen shall be free of large lumps or clods (which will not readily break down under compaction), clay or rocks larger than 3/4-inch size. This material will be subject to approval by the Contracting Officer. Backfill material shall be free of vegetation or other extraneous material.

3.9 SCHEDULE OF BACKFILLING

A. The Contractor may begin backfilling of wet well as soon as the concrete has been allowed to cure and the forms removed.

3.10 BACKFILL

A. Backfill shall be place at a minimum in layers of not more than 12 loose measure inches and mechanically tamped to at least 95 percent Modified Proctor Density. Flooding will not be permitted. Backfill shall be placed in such a manner as to prevent any wedging action against the structure.

END OF SECTION