MESA VERDE
NATIONAL PARK

REPLACE WATER TREATMENT PLANT
PUMPS AND AIR COMPRESSOR
MEVE
PMIS NO. 305703 & 259082

PROJECT SPECIFICATIONS

NATIONAL PARK SERVICE
INTERMOUNTAIN REGION
APRIL, 2022

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SECTION 011100 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

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3. Contractor use of site.
4. Public use of site.
5. Occupancy requirements for buildings.
6. Work Restrictions.
7. Special Construction Requirements.
8. References.
9. Additional Reports.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Location: Mesa Verde National Park is located approximately 10 miles west of Cortez, CO on Hwy 160. The Water Treatment Plant (WTP) is located just southwest of the intersection of Hwy 160 and Mesa Top Ruins Road. To drive to the WTP; Exit Hwy 160 at Mesa Top Ruins Road, head south, the first right turn (less than ¼ mile) leads directly to the WTP. The first left turn leads to the Visitor Center. If you get to the park entrance station (fee station), you have gone too far.

B. The Work consists of the following:

1. Base Contract: The Work includes:
   a. Replacing the existing air compressor installed with the microfiltration system.
   b. Adding a redundant air compressor.
   c. All associated air piping, filters, dryers, and other appurtenances necessary to connect both compressors to the existing air receiver, including wiring, conduits, local disconnects, etc.
   d. Replacing all three (3) high service pumps and motors in-kind.
   e. Providing new soft starts for each pump.
   f. All associated setting hardware, conduit, conductor, etc necessary to install each pump including integrating the new pump controls into the existing WTP control system.

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

1.3 WORK UNDER OTHER CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

1.4 CONTRACTOR USE OF SITE

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

1. Limits: Confine construction operations to area shown on drawings.

B. Storage of Materials: Confine storage of materials to areas shown on drawings.

C. Driveways and Entrances: Keep driveways, access road and entrances serving premises clear and available to Government, Government's employees, and emergency vehicles at all times. Do not use these areas 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.

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

E. Construction Trailer: Establishment of a construction trailer within the park will not be permitted.

F. Hauling Restrictions: Comply with all legal load restrictions in the hauling of materials. Load restrictions on park roads are identical to the state load restrictions with such additional regulations as may be imposed by the Park Superintendent. Information regarding rules and regulations for vehicular traffic on park roads may be obtained from the Office of the Park Superintendent. A special permit will not relieve Contractor of liability for damage which may result from moving of equipment.

1.5 PUBLIC USE OF SITE

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

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

1.6 OCCUPANCY REQUIRMENTS FOR BUILDINGS

A. Existing Buildings

1. Full Government Occupancy: Government will occupy buildings that will be under construction during the entire contract period. Cooperate with Government during construction operations to minimize conflicts and facilitate Government usage. Perform

the 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 the CO.
b. Maintain existing building in a weather tight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

1.7 WORK RESTRICTIONS

A. Seasonal Restrictions:
1. WTP outages will not be permitted between May 1st and September 30th due to high fire danger and the need for potable water for fire fighting purposes.
2. WTP outages will be permitted between October 1st and April 30th, when required, upon specific approval of Contracting Officer for a maximum of seven (7) days.

B. On-Site Work Hours: Work shall be generally performed during normal business working hours of 7:00 a.m. to 4:30 p.m., Monday through Friday, except when otherwise indicated.

1. No work shall be performed beyond normal working hours, on weekends or federal holidays without prior approval of the Contracting Officer.

C. Existing Utilities
1. Contractor shall be responsible for locating and preventing damage to utilities. If damage occurs, repair utility at no additional expense to the Government.

D. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Government or others unless permitted under the following conditions:

1. Notify Contracting Officer not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Contracting Officer's written permission.

E. Nonsmoking Building: Smoking is not permitted within buildings or within 25 feet of entrances, operable windows, or outdoor air intakes.

1.8 SPECIAL CONSTRUCTION REQUIREMENTS

A. Exotic Vegetation and Noxious Weeds

1. Cleaning of Equipment
a. The Contractor shall ensure that prior to moving on to the project area, all equipment is free of soil, seeds, vegetative matter, or other debris that could contain or hold seeds. Equipment shall be considered free of soil, seeds and other such debris when a visual inspection does not disclose such material. Disassembly of equipment components or specialized inspection tools is not required.

b. Contractor shall notify the Contracting Officer at least 2 days prior to moving any equipment onto the project area. Notification will include identifying the location of the equipment's most recent operations. The Contractor shall arrange for the Contracting Officer to inspect each piece of equipment prior to it being placed in service.

B. Avoid Soil Compaction

1. Avoid compaction from heavy equipment to surrounding area by keeping equipment inside the limits of work.
2. Compacted soils must be ripped or decompacted post construction to enable vegetation.
3. All disturbances must be returned to grade and any tracks from equipment must be raked out.

1.9 REFERENCES

A. Industry Standards.

1. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
2. Publication Dates: Comply with standards in effect as of the date of the Contract Documents unless otherwise indicated.

1.10 ADDITIONAL REPORTS

A. Previous construction drawings for the WTP are available upon request:
1. MEVE 307 41057C – Original WTP Record Drawings, 1993.
2. MEVE 307 80175 – Pall Microfiltration System Addition, 2005.
3. MEVE 307 108840A – GAC Addition, 2010.
4. MEVE 307 129606 – Charlotte Pressure Tank Addition, 2015.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011100

SECTION 012700 – DEFINITION OF CONTRACT LINE ITEMS

PART 1 - GENERAL

1.1 SUMMARY

A. The intent of this section is to explain, in general, what is and what is not included in a contract line item, and the limits or cut-off points where one item ends, and another begins.

B. If no contract line item exists for a portion of the work, include the costs in a related item.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF CONTRACT LINE ITEMS

A. Contract Line Item No. 1 – New Compressors

1. This item consists of furnishing new compressors.
2. Payment will be made at the contract unit price for each compressor.

B. Contract Line Item No. 2 – Install compressors and relocate existing disconnect

1. This item consists of all labor, equipment, and materials necessary to install two new compressors, controls, piping, conduit, conductors, disconnects, and relocating all existing components necessary to install a fully functional system as indicated, in accordance with all other requirements stated or otherwise implied in the contract documents, drawings and specifications.
2. Payment will be made at the contract lump sum price.

C. Contract Line Item No. 3– Compressor control panel

1. This item consists of all labor, equipment, and materials necessary to install the compressor control panel, conduit, conductors, disconnects, and relocating all existing components necessary to install a fully functional system as indicated, in accordance with all other requirements stated or otherwise implied in the contract documents, drawings and specifications.
2. Payment will be made at the contract unit price.

D. Contract Line Item No. – 4 Demo/ remove existing compressor

1. This item consists of all labor, equipment, and materials necessary to demolition and remove the existing compressor system, piping, conduits, wiring, brackets, etc.
2. Payment will be made at the contract unit price for each compressor.

E. Contract Line Item No. 5 – Valve & Actuator
   1. This item consists of the cost to furnish a new valve and actuator in accordance with all other requirements stated or otherwise implied in the contract documents, drawings and specifications.
   2. Payment will be made at the unit price for each valve and actuator.

F. Contract Line Item No. 6 – Remove existing valves/ install new
   1. This item consists of all labor, equipment, and materials necessary to remove, dispose of, and replace the existing valves and actuators in accordance with all other requirements stated or otherwise implied in the contract documents, drawings and specifications.
   2. Measurement for payment will be on a lump sum basis as a single item of work.
   3. Payment will be made at the unit price for each valve and actuator.

G. Contract Line Item No. 7 – 60 HP Soft Starts

   1. This item consists of all labor, equipment, and materials necessary to install new soft starts on three new pumps, conduit, connectors, and all components necessary to install a fully functional system as indicated, in accordance with all other requirements stated or otherwise implied in the contract documents, drawings and specifications.
   2. Payment will be made at the unit price for each soft start.

H. Contract Line Item No. 8 – Power Supply

   1. This item consists of all labor, equipment, and materials necessary to install a power supply for the soft starts, conduits, conductors, and all other components necessary to install a fully functional system, in accordance with all other requirements stated or otherwise implied in the contract documents, drawings and specifications.
   2. Payment will be made at the unit price for each power supply.

I. Contract Line Item No. 9 – Start up and Training for new soft starts
   1. This item consists of all labor, equipment, and materials necessary to commission, troubleshoot, and train water plant personnel in the operation and maintenance for the new soft starts.
   2. Payment will be made at the contract lump sum price.

J. Contract Line Item No. 10 – Replacement Pumps

   1. This item consists of the cost to furnish the specified water pumps.
   2. Payment will be made at the contract unit price for each pump.

K. Contract Line Item No. 11 – Demo/ remove existing pumps

   1. This item consists of all labor, equipment, and materials necessary to remove the three existing high service pumps, and appurtenances.
   2. Payment will be made at the contract unit price for each pump.

L. Contract Line Item No. 12 – Install new pumps

1. This item consists of all labor, equipment, and materials necessary to install three new pumps and base plate, conduits, conductors, and all other components necessary to install a fully functional system, in accordance with all other requirements stated or otherwise implied in the contract documents, drawings and specifications.
2. Payment will be made at the contract unit price for each pump.

M. Contract Line Item No. 13 – Start up and training for new pumps.

1. 1. This item consists of all labor, equipment, and materials necessary to commission, troubleshoot, and train water plant personnel in the operation and maintenance for the new the new pumps.
2. Payment will be made at the contract lump sum price.

END OF SECTION 012700

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

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

1. Construction Coordination.
2. Division 01 Submittals.
3. Requests for Information (RFIs).
4. Project meetings.

1.2 CONSTRUCTION COORDINATION

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

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other Contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

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

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Permit requirements.
7. Pre-installation conferences.
8. Project closeout activities.
9. Commissioning activities.

1.3 SUBMITTALS

A. Division 01 documents: The following items shall be submitted a minimum of one week prior to the Preconstruction Conference. Contracting Officer will notify Contractor of tentative date for the Pre-Construction Conference.

1. Letter designating Project Superintendent.
2. Construction Schedule.
3. A comprehensive breakdown of the 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. Satisfactory evidence of liability insurance coverage and workman's compensation for the Contactor and all subcontractors.
8. Waste Management Plan.
9. Quality Control Plan.
10. Indoor Air Quality (IAQ) Management Plan.
11. Contractors Commissioning Plan.

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

1.4 REQUESTS FOR INFORMATION (RFIs)

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

1. Contracting Officer will return RFIs submitted by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner to avoid delays in the work.

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

1. RFI number, numbered sequentially.
2. Project name.
3. Contract number.
4. Date.
5. Name of Contractor.
6. RFI subject.
7. Specification Section number and title and related paragraphs, as appropriate.
8. Drawing number and detail references, as appropriate.
9. Field dimensions and conditions, as appropriate.
10. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
11. Contractor's signature.

12. Requested date for response.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

C. RFI Forms: Utilize the RFI form at the end of this section.

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

1. The following Contractor-generated RFIs will be returned without action:
   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for approval of Contractor's means and methods.
   d. Requests for coordination information already indicated in the Contract Documents.
   e. Requests for adjustments in the Contract Time or the Contract Sum.
   f. Requests for interpretation of Contracting Officer's actions on submittals.
   g. Incomplete RFIs or inaccurately prepared RFIs.
2. Contracting Officer's action may include a request for additional information, in which case time for response will date from time of receipt of additional information.
3. Contracting Officer's action on RFIs may result in the need for a change to the Contract Time or the Contract Sum. All contract changes will be processed following the terms and conditions of the contract.

1.5 PROJECT MEETINGS

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

1. Roles & Responsibilities/ Lines of Authority.
2. Park rules and regulations.
3. Resolution of comments on required Division 01 documents.
4. Coordination of Subcontractors.
5. Labor law application.
6. Modifications.
7. Payments to Contractor.
8. Payroll reports.
9. Contract time.
10. Liquidated damages.
11. Display of Hotline posters.
12. Notice to proceed.
13. Correspondence procedures.
14. Acceptance/rejection of work.
15. Progress meetings.
16. Submittal procedures.
17. NPS Final Accessibility Inspection.
18. Environmental requirements.
19. Project safety.

20. Permit requirements.
21. As-constructed drawings/operation and maintenance (O&M) manuals.
22. Saturday, Sunday, holiday and night work.
23. Reference materials.
24. Value engineering.

B. Progress Meetings: The Contracting Officer will schedule weekly meetings with the 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 at these meetings. All participants at the meeting shall be familiar with the 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. The meeting agenda will include the following:
    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.
    h. Construction Schedule update (provide updated CPM).
    i. Status of Project Record Drawings and O&M manuals.
    j. Other business relating to work.
    k. Permit requirements.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Contracting Officer of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. Possible conflicts.
    i. Time schedules.
    j. Weather limitations.
    k. Compatibility of materials.

l. Temporary facilities and controls.
m. Space and access limitations.
n. Regulations of authorities having jurisdiction.
o. Testing and inspecting requirements.
p. Installation procedures.
q. Coordination with other work.
r. Protection of adjacent work.
s. Protection of construction and personnel.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

REQUEST FOR INFORMATION

Project: MEVE 305703 / 259082 – Replace WTP Pumps and Air Compressor

Contract No.: **Date:**

To:

cc:

From:

Subject:

Please provide the following information or clarification:

Response required by

Date:

To:

From:

Subject: Response to RFI No___

SECTION 013216 – CONSTRUCTION SCHEDULE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section consists of Construction Schedule requirements including but not limited to the following:

1. Schedule of Values
2. Construction Schedule Requirements.
3. Construction Schedule Updates.

B. Purpose: The purpose of the Construction Schedule is to ensure adequate planning, coordination, scheduling, and reporting during execution of the work by the Contractor. The Construction Schedule will assist the Contractor and Contracting Officer in monitoring the progress of the work, evaluating proposed changes, and processing the Contractor's monthly progress payment.

1.2 DEFINITIONS

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

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

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

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

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

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

1.3 SUBMITTALS

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

B. Construction Baseline Schedule: After contract award and before the Pre-Construction conference, submit PDF copies of baseline schedule, large enough to show entire schedule for entire construction period.

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

D. Construction Schedule Revisions: For each Construction Schedule revision submit PDF copies demonstrating how the Contractor proposes to incorporate a modification, change, delay, or Contractor request.

1.4 COORDINATION

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

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

1. In developing the Construction Baseline Schedule, ensure that the Subcontractor's work at all tiers, as well as the prime Contractor's work, is included and coordinated.
2. Secure time commitments for performing critical elements of the Work from parties involved.
3. Coordinate each construction activity in the network with other activities and schedule them 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. The work activities broken out within the schedule of values shall be integrated into and made a logical part of the construction baseline schedule submitted under this specification. The total costs for the component work activities shall equal the contract price for that lump-sum item. The 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. The total cost of all items shall equal the contract price. The Schedule of Values will form the basis for progress payments.

D. An acceptable Schedule of Values shall be agreed upon by the Contractor and Contracting Officer before the first progress payment is processed.

2.2 CONSTRUCTION SCHEDULE REQUIREMENTS

A. Construction Baseline Schedule: Prepare Construction Baseline Schedule using a computerized, time-scaled CPM 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 all work within applicable completion dates, regardless of Governments acceptance of the 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. Identify probable critical paths.

1. Activities: Indicate the 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 CPM schedule within the limitations of the Contract Time.
4. The Construction Baseline Schedule as developed shall show the sequence and interdependence of activities required for complete performance of the work. Ensure all work sequences are logical and the Construction Baseline Schedule shows a coordinated plan of the work.
5. Consider seasonal weather conditions in planning and scheduling all work influenced by high and low ambient temperatures, wind, or precipitation to ensure completion of all work within the contract time.
6. Time Frame: Proposed duration assigned to each activity shall be the Contractor's best estimate of time required to complete the activity considering the scope and resources planned for the activity.

    a. An early finish date may be shown but the late finish date must be the same date as the last day of the contract period.
    b. Contract completion date shall not be changed by submission of a schedule that shows an early completion date.
    c. The Contractor shall limit use of lead or lag duration’s between schedule activities.

d. Activity Duration: Define activities so no activity is longer than 15 days, except for non-construction activities including mobilization, shop drawings and submittals, fabrication and delivery of materials and equipment.

e. Procurement Activities: Include procurement process activities for pumps, compressors, VFDs, long lead items and major items, requiring a cycle of more than 60 calendar days, as separate activities in the schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

1) Vertical Turbine Pumps

2) Variable Frequency Drives

3) Air Compressors

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

g. Startup and Testing Time: Include not less than 10 days for startup, testing and commissioning activities.

h. Substantial Completion: Allow time for Government administrative procedures necessary for certification of Substantial Completion as specified in Division 01 Specification 017700 Closeout Procedures.

C. Joint Review, Revision, and Acceptance:

1. Within fifteen calendar days of receipt of the Contractor's proposed Construction Baseline Schedule, the Contracting Officer and Contractor shall meet for joint review, correction, or adjustment of the initial Construction Baseline Schedule. Any areas which, in the opinion of the Contracting Officer, conflict with timely completion of the project shall be subject to revision by the Contractor.

2. Within seven calendar days after the joint review between the Contractor and Contracting Officer, the Contractor shall revise and resubmit the Construction Baseline Schedule in accordance with agreements reached during the joint 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 the Contractor or Contracting Officer, shall be corrected by the Contractor within seven calendar days and shall not affect the contract period.

4. Upon acceptance of the Construction Baseline Schedule by the Contracting Officer, save the schedule as a baseline and update on a monthly basis. The construction schedule update will be used to evaluate the Contractor's monthly applications for payment based upon information developed at the monthly Construction Schedule update meeting.

PART 3 - EXECUTION

3.1 CONSTRUCTION SCHEDULE UPDATES

A. Progress Meeting Updates: Provide updated schedule information before each weekly progress meeting.

1. Issue updated schedule concurrently with the report of each such meeting. Incorporate construction progress into the currently accepted schedule in a timely manner.

B. Monthly Schedule Updates:

1. General: Update the Construction Schedule on a monthly basis to reflect actual construction progress and activities throughout the 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. Progress Payments: The monthly updating of the currently accepted Construction Schedule shall be an integral part of the process upon which progress payments will be made under this contract. If the Contractor fails to provide schedule updates or revisions, then a portion of the monthly payment may be retained until such corrections have been made.

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

1. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

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 the actual prosecution and progress of the work, the Contracting Officer will request, and the Contractor shall submit, a revision to the Construction Schedule. The Contractor may also request reasonable revisions to the currently accepted Construction Schedule in the event the Contractor's planning for the work is revised. If the Contractor desires to make changes, the Contractor shall notify the Contracting Officer in writing, stating the reason for the proposed revision. Accepted revisions will be incorporated into the currently accepted Construction Schedule for the next monthly schedule update.

END OF SECTION 013216

SECTION 013323 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This 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. 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. Types of submittals are indicated in individual specific sections.

1. Contracting Officer reserves the 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 them for legibility, accuracy, completeness, and compliance with Contract Documents.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Contracting Officer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittal List: A submittal list has been attached to the end of this specification section. The intent is to provide an overall summary of submittal requirements and not a comprehensive list. The requirements of the individual specification sections, terms and conditions of the Contract still apply regardless of what is shown on the submittal list.

D. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Contracting Officer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including re-submittals.

1. Action Submittals

    a. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required.
    b. Re-submittal Review: Allow 15 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 the installation of an approved item and make all changes required in other elements of the work because of the substitution.
    e. Waives all 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. CM-16 Transmittal Form: All material submittals shall be transmitted using National Park Service form CM-16. (This form can be downloaded from https://www.nps.gov/dscw/con_subreview21.htm. No action will be taken on a material submittal item unless accompanied by the transmittal form.
    a. Contractor to complete all sections, unless otherwise noted, on form CM-16.
    b. Provide a certified digital signature on form CM-16 where indicated.
    c. Attach all related documents in PDF format.
2. Name file with submittal number or other unique identifier, including revision identifier.

G. Hardcopy Submittals:
    a. No hardcopy submittals will be accepted unless approved by the CO.

H. 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 an alphabetic suffix after another decimal point (e.g., .001.A).

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

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

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

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

1.4 CONTRACTOR'S USE OF CAD FILES

A. General: At Contractor's written request, copies of CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:

    1. Files will be provided ‘as is’; no format or other changes to files or changes to the 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. Include the following information, as applicable:

        a. Manufacturer's catalog cuts: Submit only pertinent pages; mark each page of standard printed data to identify specific products proposed for use.
        b. Manufacturer's product specifications.
        c. 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.

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 file format or hardcopy.

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.

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

a. Dimensions.
b. Identification of products.
c. Fabrication and installation drawings.
d. Roughing-in and setting diagrams.
e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
f. Shopwork manufacturing instructions.
g. Templates and patterns.
h. Schedules.
i. Notation of coordination requirements.
j. Notation of dimensions established by field measurement.
k. Relationship to adjoining construction clearly indicated.
l. Seal and signature of professional engineer if specified.
m. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Submit shop drawings in PDF file format or hardcopy.

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

2.2 INFORMATIONAL SUBMITTALS

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

1. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
2. Informational submittals that do not comply with the requirements specified in the Contract Documents will be rejected and one copy will be returned.

B. Coordination Drawings: Comply with requirements specified in Section 013100 "Project Management and Coordination."

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

D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

G. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

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

K. 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 the Contract Documents.

L. 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.

M. 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 the Contract Documents.

N. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

O. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

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

Q. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Statement on condition of substrates and their acceptability for installation of product.
2. Summary of installation procedures being followed, whether they comply 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 requirements.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

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

3.2 CONTRACTING OFFICER’S ACTION

A. General: Submittals will be disapproved without technical review if identification information is missing; an incorrect format of submittals is provided; the 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 the Contractor's own risk.

B. Action Submittals: Contracting Officer will review each submittal, generate comments on corrections or modifications required, and indicate the appropriate action on the CM-16E Transmittal Form. The submittal will be marked in one of three ways as defined below:

1. APPROVED: Acceptable with no corrections.
2. APPROVED WITH NOTATIONS: Minor corrections or clarifications required. All comments are clear and no further review is required. The Contractor shall address all 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. The Contracting Officer will identify the

reasons for disapproval. The 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 013323

SECTION 013523 - SAFETY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes establishing an effective accident prevention program and providing a safe environment for all personnel and visitors.

1.2 SUBMITTALS

A. Accident Prevention Plan: After contract award and before the Pre-Construction conference, submit for review, an Accident Prevention 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.

1.3 QUALITY ASSURANCE

A. Comply with contract clauses entitled "Accident Prevention" and "Permits and Responsibilities". In case of conflicts between Federal, State, and local safety and health requirements, the most stringent shall apply. Equipment or tools not meeting OSHA requirements will not be allowed on the project sites. Failure to comply with the requirements of this section and related sections may result in suspension of work.

B. Qualifications of Employees:

1. All employees must be physically qualified and able to perform their assigned duties in a safe manner.
2. Do not allow employees to perform work 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.
3. Operators of vehicles, hoisting equipment, and hazardous plant equipment shall be able to understand signs, signals, and operating instructions, and be fully capable of operating such equipment. Provide operating instructions for all equipment. Newly hired operators shall be individually tested by an experienced operator or supervisor to determine if they are capable of safely operating equipment.

1.4 ACCIDENT REPORTING

A. Reportable Accidents: A project reportable accident is defined as death, occupational disease, traumatic injury to employees or the public, fires, and property damage by accident in excess of $100. Notify Contracting Officer immediately in the event of a reportable accident. Within 7 days of a reportable accident, fill out and forward to Contracting Officer an Accident/Property Damage Report (Form CM-22). Form may be obtained from the Contracting Officer.

PART 2 - PRODUCTS

2.1 ACCIDENT PREVENTION PLAN

A. The Plan shall be written to comply with OSHA and project requirements (a generic plan is not acceptable) including but not limited to the following:

1. Name of responsible supervisor to carry out the program.
2. Weekly and monthly safety meetings.
3. First aid procedures.
4. Outline of each phase of the work, the hazards associated with each major phase, and the methods proposed to provide for property protection and safety of the public, National Park Service personnel, and Contractor's employees. Identify the work included under each phase.
5. Training, both initial and continuing.
6. Planning for possible emergency situations, such as floods, fires, cave-ins, slides, explosions, power outages, and wind storms. Such planning shall take into consideration the nature of construction, site conditions, and degree of exposure of persons and property.

2.2 FIRST AID FACILITIES

A. Provide adequate facilities for the number of employees and the hazards associated with the types of ongoing construction work at the site.

2.3 PERSONNEL PROTECTIVE EQUIPMENT

A. Meet requirements of applicable ANSI standards.

PART 3 - EXECUTION

3.1 EMERGENCY INSTRUCTIONS

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

3.2 FIRE AND LIFE SAFETY

A. Comply with the requirements of NFPA 241 (Standard for Safeguarding Construction, Alteration, and Demolition Operations).

B. Store hazardous materials in accordance with manufacturer’s and OSHA recommendations. Maintain readily available, on site, MSDS for each chemical.

1. Immediately report all spills of hazardous materials to the park.
2. Maintain a spill emergency response kit.

3.3 PROTECTIVE EQUIPMENT

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

B. Inspect and maintain other protective equipment and devices before use and on a periodic basis to ensure safe operation.

3.4 SAFETY MEETINGS

A. As a minimum, conduct weekly 15-minute "toolbox" safety meetings. These meetings shall be conducted by a foreman or supervisor and attended by all construction personnel at the worksite.

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

3.5 HARD HATS AND PROTECTIVE EQUIPMENT AREAS

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

B. It is the Contractor's responsibility to require all those working on or visiting the site to wear hard hats and other necessary personal protective equipment at all times. As a minimum, provide two hard hats for use by visitors.

3.6 TRAINING

A. First Aid: Provide adequate training to an adequate number of 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. Hazardous materials are defined as explosive, flammable, poisonous, corrosive, oxidizing, irritating, or otherwise harmful substances that could cause death or injury.

END OF SECTION 013523

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

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

C. See Divisions 02 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 that actual products incorporated into the work and completed construction comply with requirements.

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

D. Product Testing: Tests and inspections that are 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 that are performed at the source, i.e., plant, mill, factory, or shop.

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

G. Testing Agency or Laboratory: An 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 that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as “carpenter.” It also does not imply that requirements specified apply exclusively to trades people of the corresponding generic name.

1.3 CONFLICTING REQUIREMENTS

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

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

1.4 SUBMITTALS

A. Quality Control Plan:

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

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

C. Contractor's Quality Control Daily Reports: Submit showing all inspections and tests on the first workday following the date covered by the report. Quality Control Supervisor shall utilize the forms attached at the end of this Section or Contractor supplied forms with the same information.

D. Test Reports

1. Test reports shall be completed by the person performing the test.
2. Use the Daily Test Report Information Sheet form attached at the end of this Section or Contractor supplied form with the same information.

3. Submit Daily Test Information Sheets with Quality Control Daily Reports.
4. Submit failing test results and proposed remedial actions within four hours of noted deficiency.
5. Submit three copies of complete test results no later than one calendar day after the test was performed.

E. Accessibility Inspection Report:

1. Fill out the applicable sections of the Accessibility Inspection Report and attach to the Quality Control Daily Report.
2. Utilize the attached Accessibility Inspection form to document compliance with the Architectural Barriers Act Accessibility Standards (ABAAS).
3. Inspect at various stages of construction as needed to insure the finished product meets the standards.
4. Submit report not later than one calendar day after the inspection was performed.

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

G. If the CQC plan and Quality Control Daily Reports are not submitted as specified, the Contracting Officer may retain all payments until such time a plan is accepted and implemented, or may retain payments for work completed on days there are no Quality Control Daily Reports.

H. Permits, Licenses, and Certificates: For 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 the work.

1.5 QUALITY ASSURANCE

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

B. Contractors Quality Control Staff:

1. The Contractor's Quality Control Supervisor may also perform other duties.
2. The Contractor's designated Quality Control Supervisor shall be on the project site whenever contract work is in progress.
3. The Contractor's job supervisory staff may be used to assist the Quality Control Supervisor supplemented, as necessary, by additional certified testing technicians.

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

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

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

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

G. Testing Agency Qualifications: An independent agency with the experience, qualifications and capability to conduct testing and inspecting indicated; and with additional qualifications specified in individual Sections; and where required by Contract, is acceptable to the Contracting Officer.

1. All measuring devices, laboratory equipment, and instruments shall be calibrated at established intervals against certified standards. Upon request, measuring and testing devices shall be made available for use by the Government for verification tests.

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

1.6 QUALITY CONTROL

A. The Contractor is responsible for all testing and inspections. Inspect and test work as needed to ensure that the 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 a qualified testing agency to perform these quality-control services.
2. Submit the appropriate report, for each quality-control service.
3. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
4. The Contracting Officer may designate test locations.

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

C. Re-testing/Re-inspecting: Provide quality-control services for re-testing and re-inspecting for construction that replaced work that failed to comply with the 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 the work during performance of its services.

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

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 the following:

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

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

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

PART 2 - PRODUCTS

2.1 QUALITY CONTROL PLAN

A. The Quality Control Plan shall include:

1. A list of personnel responsible for quality control and assigned duties. Include each person's qualifications.
2. A copy of a letter of direction to the Contractor's Quality Control Supervisor outlining assigned duties.
3. Names, qualifications, and descriptions of laboratories to perform sampling and testing, and samples of proposed report forms.
4. Methods of performing, documenting, and enforcing quality control of all work.
5. Methods of monitoring and controlling environmental pollution and contamination as required by regulations and laws.

PART 3 - EXECUTION

3.1 OFF-SITE CONTROL

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

3.2 ON-SITE CONTROL

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

B. Initial Phase:

1. As soon as work begins, inspect and test a representative portion of a particular feature of work for quality of workmanship.
2. Review control testing procedures to ensure compliance with contract requirements.
3. Document all initial phase activities and discussions on the Contractor's Quality Control Daily Report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.

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

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

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

3.3 DOCUMENTATION

A. Maintain Quality Control Daily Reports, Daily Test Report Information Sheets, and Accessibility Inspection Reports (attached) of quality control activities and tests.

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

3.4 ENFORCEMENT

A. The Contractor shall stop work on any item or feature pending satisfactory correction of any deficiency noted by the quality control staff or the 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 that are as invisible as possible.
2. Comply with the Contract Document requirements for Division 01 Section “Cutting and Patching.”

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

C. Repair and protection are Contractor's responsibility.

END OF SECTION 014000

CONTRACTOR'S QUALITY CONTROL DAILY REPORT

REPORT NO. _____ SHEET 1 OF _____

PROJECT				CONTRACT NO.	DATE
PARK				CONTRACTOR'S REPRESENTATIVE ON THE JOB	
WEATHER (Rain, Snow, Cloudy, Windy, etc.)	RAINFALL Inches	TEMPERATURE MAX.	MIN.	GROUND CONDITIONS (Dry, Damp, Wet, Frozen, etc.)	

1. PRIME CONTRACTOR

NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	Comments

WORK PERFORMED BY PRIME CONTRACTOR:

MATERIALS DELIVERED	OFFICIAL VISITORS TO SITE

2A. SUBCONTRACTOR, _____: (If more than one subcontractor use copies of following page.)

NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	Comments

WORK PERFORMED BY SUBCONTRACTOR:

3. SPECIFIC INSPECTIONS: (Inspections performed, results, and corrective actions)

4. TESTING: ☐1 Check if any testing was performed today. (Complete and attach Test Report Information Sheets.)
Type and Location of Testing: _____

5. VERBAL INSTRUCTION RECEIVED FROM GOVERNMENT ON CONSTRUCTION DEFICIENCIES OR RE-TESTING REQUIRED:

6. REMARKS:

7. CERTIFICATION:

I certify that the above report is complete and correct and that I, or my authorized representative, have inspected all work performed this day by the prime contractor and each subcontractor and determined that all materials, equipment, and workmanship are in strict compliance with the plans and specifications except as may be noted above.

_____
Contractor's Quality Control Representative

SUBCONTRACTOR WORK CONTINUED:	CONTRACT NO.	REPORT NO. _______ SHEET ____ OF ____

2 SUBCONTRACTOR,						
NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	Comments
WORK PERFORMED BY SUBCONTRACTOR:						
2 SUBCONTRACTOR,						
NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	Comments
WORK PERFORMED BY SUBCONTRACTOR:						
2 SUBCONTRACTOR,						
NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	Comments
WORK PERFORMED BY SUBCONTRACTOR:						
2 SUBCONTRACTOR,						
NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	COMMENTS
WORK PERFORMED BY SUBCONTRACTOR:						

DAILY TEST REPORT INFORMATION SHEET

CONTRACT NO._____ REPORT NO. _____

SHEET _____ OF _____

1. Individual Making Inspection or Test:	
2. Testing Laboratory; Name:	Phone #:
Address:	
3. Description of Work and Test Method:	
4. Location of Samples and Tests or Inspections:	
5. Specification Section:	
6. Inspection or Test Data:	
7. Test Results and Interpretations of Test Results:	
8. Comments or Professional Opinion About Compliance of Inspected Work or Tested Work with contract Document Requirements:	
9. Recommendations:	
10. Corrective Actions Taken:	

CERTIFICATION:

I certify that the above testing report is complete and correct and that all testing performed this day for this contract is in strict compliance with the plans and specifications except as noted above.

_____

Signature of Inspector

CQC ACCESSIBILITY INSPECTION REPORT

Updated 5/18/11

CONTRACT NO._____ REPORT NO. _____

Note: This report covers only the most common accessibility requirements. This form can be expanded as needed for elements not shown. Inspect for compliance with all requirements of the ABAAS. Use applicable sections for each inspection.

CQC Inspector:	Date:

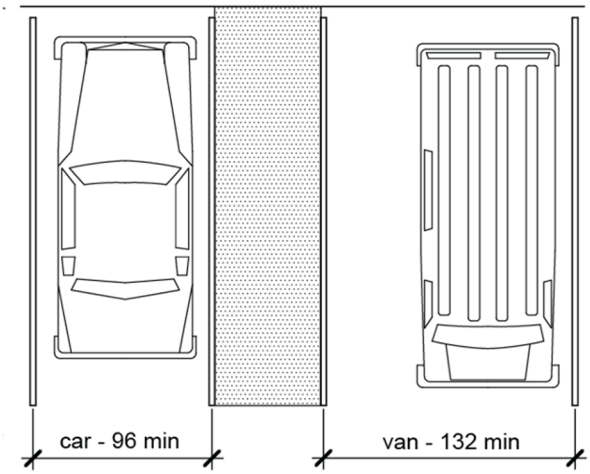
1. Parking and Passenger Loading Zones: Attach a copy of the grading plan with each accessible parking space running and cross slope readings noted. All slopes shall be measured with a 24" electronic level.

Location/Notes:

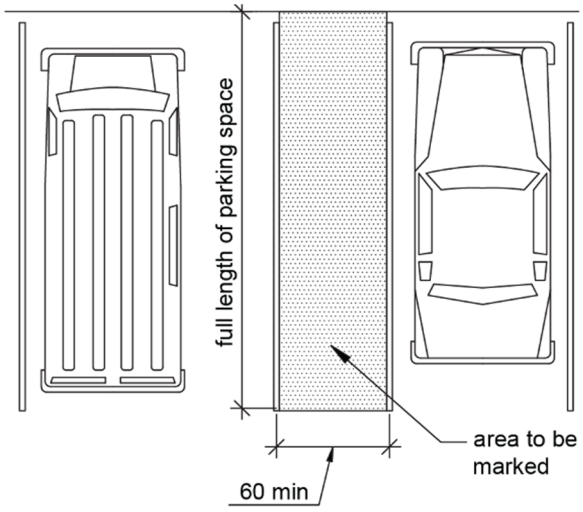
	Yes	No	N/A	
a)	☐	☐	☐	Accessible spaces and access aisles running slope and cross slope is 1:48 (2%) or less. Measure at 3' intervals.
b)	☐	☐	☐	Car spaces are at least 96 inches wide and van spaces 132 inches wide measured to striping centerline or face of curb.
c)	☐	☐	☐	Access aisles are 60 inches wide min. measured to striping centerline and adjoin an accessible route.
d)	☐	☐	☐	Curb ramp running slope is 1:12 (8.33%) or less, and cross slope is 1:48 (2%) or less. Measure at 3' intervals.
e)	☐	☐	☐	Curb ramp has a 36 inch minimum landing length at top, running slope and cross slope is 1:48 (2%) or less
f)	☐	☐	☐	Curb ramp flared side slopes are 1:10 (10%) or less.
g)	☐	☐	☐	Passenger loading zone (drop-off area) running slope and cross slope is 1:48 (2%) or less. Area has flush curb.

Inspection Results: _____

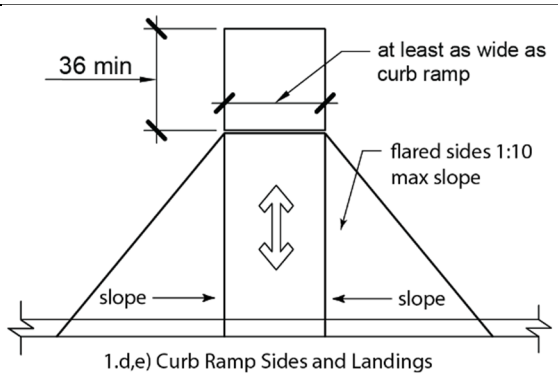
Corrective Actions Needed/Taken: _____



1.b) Parking Space Widths



1.c) Access Aisle



1.d,e) Curb Ramp Sides and Landings

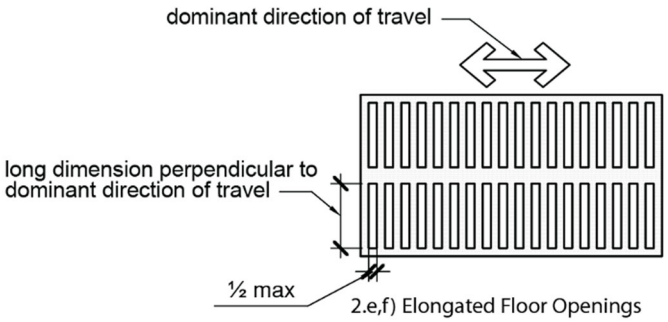
2. Walking surfaces and Accessible Route: The accessible route is defined as the pedestrian route from the accessible parking and passenger loading zones to all accessible facilities and features. Attach accessible route plan and/or grading plan with accessible route highlighted and running and cross slope readings noted. All slopes shall be measured with a 24" electronic level.

	Yes	No	N/A	
a)	☐	☐	☐	Floor and ground surfaces are stable, firm, and slip resistant as defined by ADAABAAG Advisory 302.1.
b)	☐	☐	☐	Running slope of all walking surfaces on the accessible route is 1:20 (5%) or less. Measure at 3-foot intervals.
c)	☐	☐	☐	Cross slope of walking surfaces is 1:48 (2%) or less. Measure at 3-foot intervals.
d)	☐	☐	☐	Clear widths of walking surfaces are 36 inches minimum.
e)	☐	☐	☐	Elongated openings in floor or ground surfaces are 1/2 inch wide or less.
f)	☐	☐	☐	Elongated openings are perpendicular to direction of travel.
g)	☐	☐	☐	Accessible route surface changes are 1/2 inch or less with 1/4 inch maximum vertical change.
h)	☐	☐	☐	Floor drains and grates on accessible route meet all above requirements.

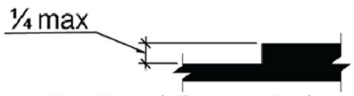
Inspection Results: _____

Corrective Actions Needed/Taken: _____

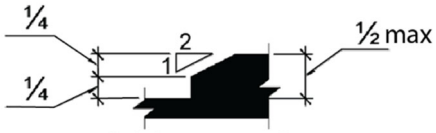
_____



2.e,f) Elongated Floor Openings



2.g) Vertical Change in Grade



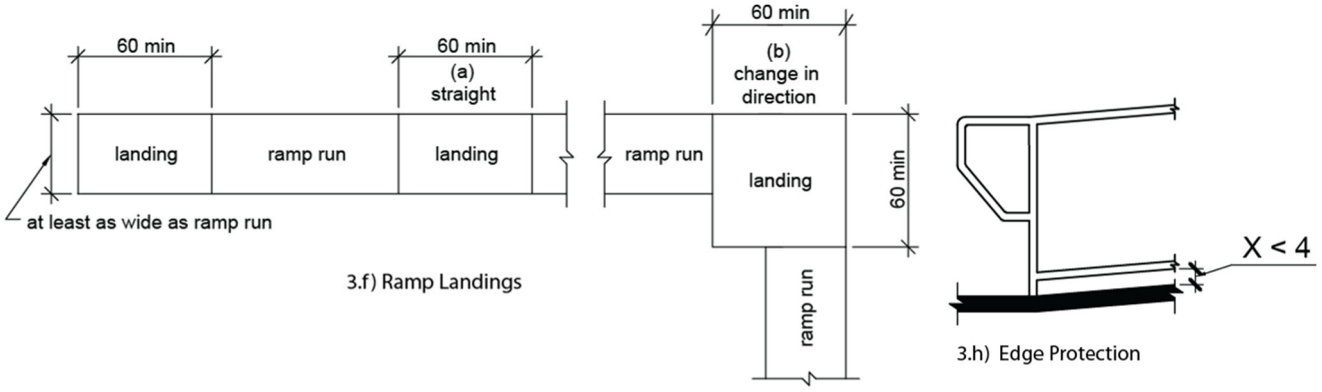
Beveled Change in Grade

3. Ramps: Ramps are defined as walking surfaces on the accessible route that are steeper than 1:20 (5%) but less than 1:12 (8.33%). Attach grading plan with running and cross slope readings noted. All slopes shall be measured with a 24" electronic level.

	Yes	No	N/A	
a)	☐	☐	☐	Running slope is 1:12 (8.33%) or less. Measured at 3-foot intervals.
b)	☐	☐	☐	Cross slope is 1:48 (2%) or less. Measured at 3-foot intervals.
c)	☐	☐	☐	Clear width is 36 inches minimum, clear width between handrails is 36 inches minimum.
d)	☐	☐	☐	Rise for any ramp run is 30 inches maximum.
e)	☐	☐	☐	Ramps have landings at the top and the bottom of each ramp run.
f)	☐	☐	☐	Landing clear length is 60 inches minimum, running slope and cross slope of landing is 1:48 (2%) or less.
g)	☐	☐	☐	Ramps with a rise greater than 6 inches have handrails.
h)	☐	☐	☐	Ramps and landings have edge protection on both sides that prevents passage of a 4 inch diameter sphere.

Inspection Results: _____

Corrective Actions Needed/Taken: _____



3.f) Ramp Landings

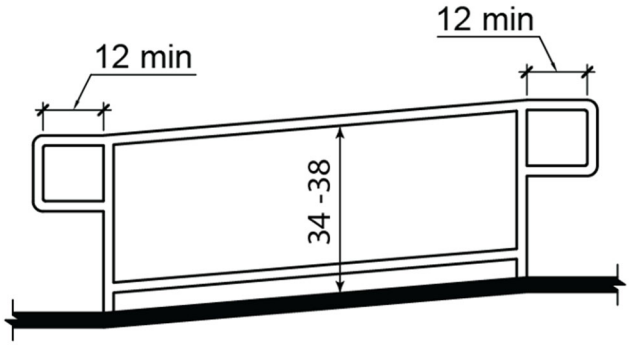
3.h) Edge Protection

4. Handrails: Verify each handrail.

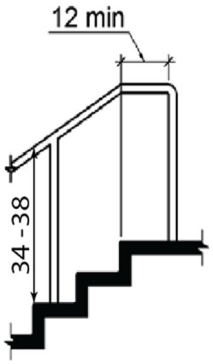
	Yes	No	N/A	
a)	☐	☐	☐	Top of handrail is 34 inches minimum and 38 inches maximum vertically above walking surfaces.
b)	☐	☐	☐	Handrails extend 12 inches minimum beyond the top and bottom of ramp runs.
c)	☐	☐	☐	Free standing handrails have edge protection that prevents passage of a 4 inch diameter sphere.
d)	☐	☐	☐	Handrails extend horizontally 12 inches minimum at top of stairs.
e)	☐	☐	☐	Handrails extend at slope of the stair flight at bottom of stairs minimum one tread depth beyond last riser.
f)	☐	☐	☐	Handrail clearance is 1 ½ inches clear minimum to walls and above horizontal attachments.

Inspection Results: _____

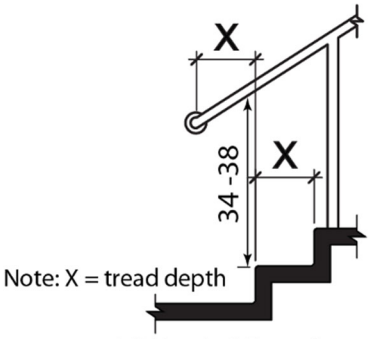
Corrective Actions Needed/Taken: _____



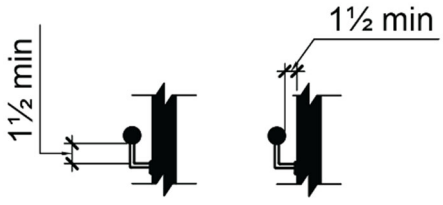
4.a,b) Handrail Extension at Top and Bottom of Ramp



4.c) Handrail Extension at Top of Stair



4.d) Handrail Extension at Bottom of Stair



4.e) Handrail Clearance

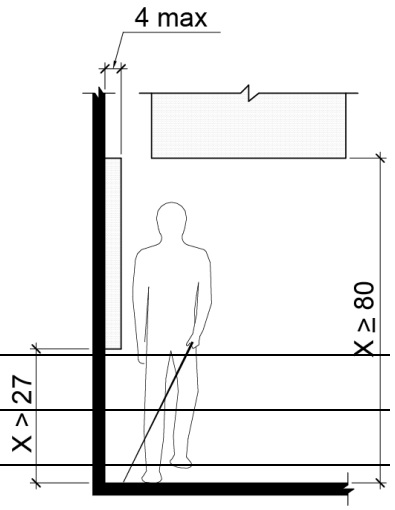
5. Drinking fountains (Two spout heights required for each drinking fountain). Verify fountains do not create a protruding object:

Location/Notes:

	Yes	No	N/A	
a)	☐	☐	☐	Spout outlet is 36 inches maximum above the finish floor or ground for wheelchair accessible spout.
b)	☐	☐	☐	Spout outlet for standing persons is 38 inches minimum and 43 inches maximum above the finish floor.
c)	☐	☐	☐	Drinking fountain is recessed or has 27 inches maximum space from floor to bottom of fountain.

Inspection Results: _____

Corrective Actions Needed/Taken: _____



5.c) Limits of Protruding Objects

6. Toilet Compartments: Attach floor plan and elevations with as-constructed dimensions noted.

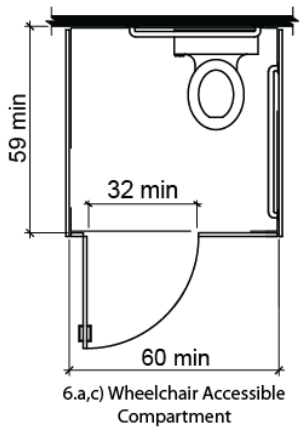
Location/Notes:

	Yes	No	N/A	
a)	☐	☐	☐	Wheelchair accessible compartment is 60 inches wide min., and 59 inches deep minimum.
b)	☐	☐	☐	Ambulatory stall is 60 inches deep min. width of 35 inches min. and 37 inches max, toilet is centered in stall.
c)	☐	☐	☐	Accessible compartment has 32 inch wide door opening minimum with door opening outward, or adequate clear space for door opening inward.
d)	☐	☐	☐	Seat height is 17 inches minimum and 19 inches maximum measured to the top of the seat.
e)	☐	☐	☐	Urinal rim is 17 inches maximum above the finish floor and 13 1/2 inches deep minimum.
f)	☐	☐	☐	Urinal has a clear floor space of 30 inches wide by 48 inches long minimum.
g)	☐	☐	☐	Side wall grab bar is 42 inches long minimum, located 12 inches maximum from the rear wall.
h)	☐	☐	☐	Rear wall grab bar is 36" long min. extends from toilet centerline 12" min. one side, 24" min. other side.
i)	☐	☐	☐	Grab bar height is 33 inches minimum and 36 inches maximum.
j)	☐	☐	☐	Toilet paper dispensers are 7 inches min. and 9 inches max. in front of the toilet to centerline of the dispenser.
k)	☐	☐	☐	Toilet paper dispenser outlet is 15 inches minimum and 48 inches maximum above the finish floor.
l)	☐	☐	☐	Centerline of the wheelchair stall toilet is 16 inches min. to 18 inches max. from the side wall.
m)	☐	☐	☐	Sinks and counters are 34" max. above floor with 27" min. knee space. Drain pipes are insulated or concealed.
n)	☐	☐	☐	Space between grab bar and projecting objects below is 1 1/2 inches minimum; space above is 12 inches minimum.
o)	☐	☐	☐	Wheelchair accessible compartment and Ambulatory stall have door pulls on both sides of the door near the latch.

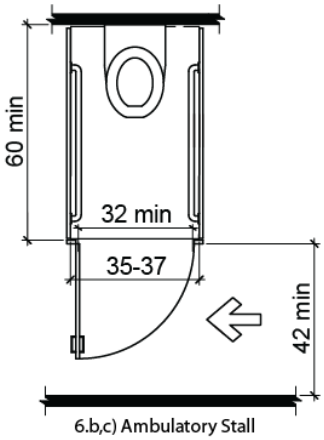
Inspection Results: _____

Corrective Actions Needed/Taken: _____

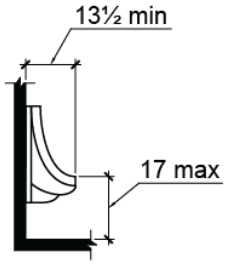
_____



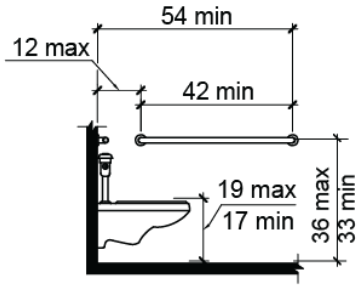
6.a,c) Wheelchair Accessible Compartment



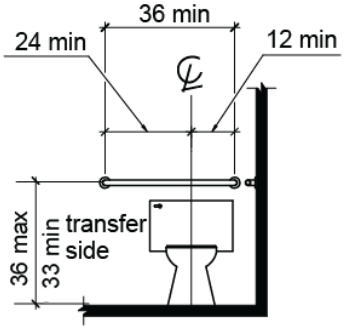
6.b,c) Ambulatory Stall



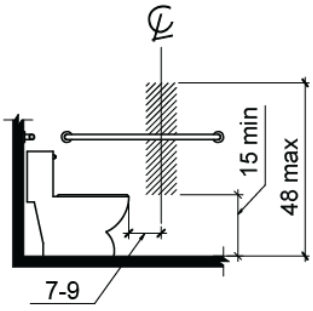
6.e) Urinal Rim Location



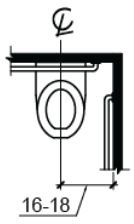
6.d,g,i) Side Wall Grab Bar Loca-



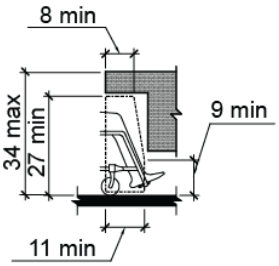
6.h,i) Rear Wall Grab Bar Location



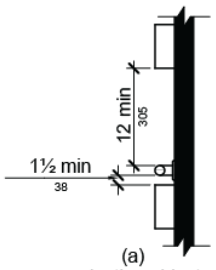
6.j,k,n) Toilet Paper Dispenser Outlet Location



6.l) Toilet Location



6.m) Lavatory Height and Knee Space



6.n) Grab Bar Clearance for Protruding Dispensers

7. Service Counters, Dining and Work Surfaces: (Service counters are parallel or forward approach)

Location/Notes:

	Yes	No	N/A

	Yes	No	N/A	
a)	☐	☐	☐	Parallel Approach. Counter is 36 inches long min. and 36 inches high max.
b)	☐	☐	☐	Forward Approach. Counter surface is 30 inches long min. and 36 inches high max, knee space under counter.
c)	☐	☐	☐	Tops of dining and work surfaces are 28 inches minimum and 34 inches maximum above the finish floor.

Inspection Results: _____

Corrective Actions Needed/Taken: _____

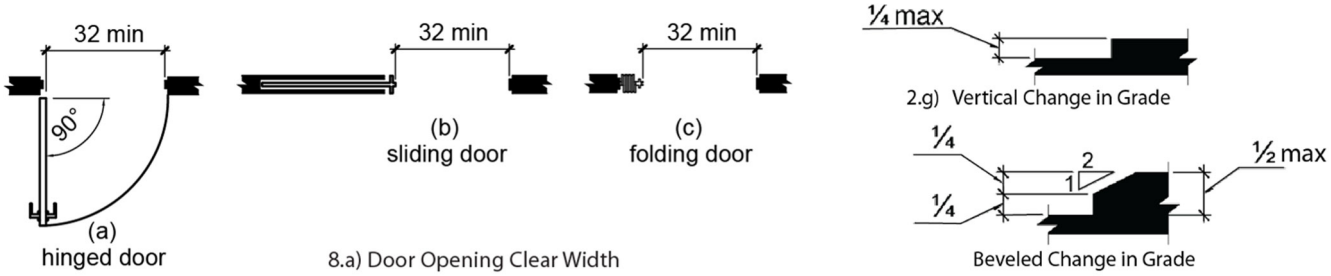
8. Doors: Attach accessible route plan with accessible door dimensions and threshold heights.

Location/Notes:

	Yes	No	N/A	
a)	☐	☐	☐	Door openings on accessible routes provide a clear width of 32 inches minimum.
b)	☐	☐	☐	Door closers move door from open position of 90 degrees to 12 degrees from the latch is 5 seconds min.
c)	☐	☐	☐	Spring hinge doors close from open position of 70 degrees to closed position in 1.5 seconds minimum.
d)	☐	☐	☐	Fire doors have the minimum opening force allowable by the appropriate administrative authority.
e)	☐	☐	☐	Interior hinged doors have an opening force of 5 pounds maximum.
f)	☐	☐	☐	Thresholds at doors on accessible route are 1/2 inch or less with 1/4 inch maximum vertical change.

Inspection Results: _____

Corrective Actions Needed/Taken: _____



8.a) Door Opening Clear Width

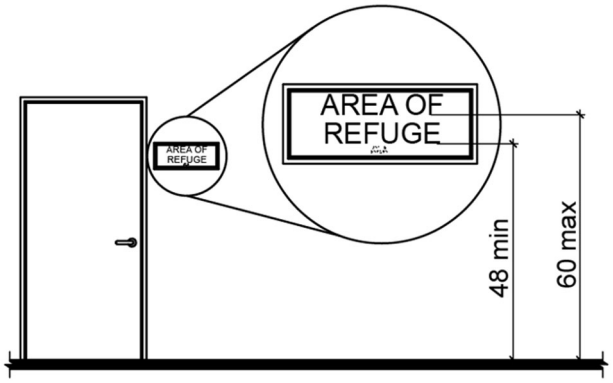
9. Signs:

Location/Notes:

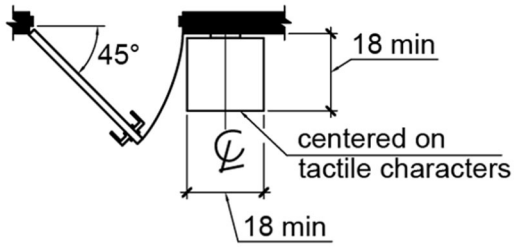
	Yes	No	N/A	
a)	☐	☐	☐	Parking space signs are 60 inches minimum above finish ground surface measured to the bottom of the sign.
b)	☐	☐	☐	Van parking space sign includes the designation "van accessible".
c)	☐	☐	☐	Tactile characters on signs are 48 inches minimum and 60 inches maximum above the finish floor.
d)	☐	☐	☐	Sign is located alongside the door at the latch side.
e)	☐	☐	☐	Sign is located with a clear floor space of 18 inches by 18 inches minimum.

Inspection Results: _____

Corrective Actions Needed/Taken: _____



9.c) Tactile Sign Location



9.d,e) Tactile Sign Location

CERTIFICATION:
I certify that the above inspection report is complete and correct and that this inspection is in compliance with the contract documents.

Signature of Inspector

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 USE CHARGES

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

B. Water Service: Water from existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service: Electric power from existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 QUALITY ASSURANCE

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

B. Environmental Protection: Provide environmental protection as required by authorities having jurisdiction and as indicated in the Contract Documents. Coordinate with requirements of the following:

1. Regulatory Requirements.
2. Indoor Air Quality (IAQ) Management.
3. Noise & Acoustics Management.
4. Environmental Management.
5. Construction Waste Management.

1.4 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 the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

B. 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.

2.3 EQUIPMENT

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

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

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.

B. Non-potable water for construction is not available within the park boundaries. The Contractor shall furnish non-potable water from a source outside the park boundary.

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

D. 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.

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

F. Electric Power Service: Use of existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to the NPS.

1. When temporary connections are removed, restore existing utility services to their original condition.

G. Telephone Service: No telephone service is available on site for Contractor's use. Cellular service from companies are typically adequate for voice and text messages outside the WTP building, but typically not inside the WTP building. Data connections may not be sufficient for effective use.

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. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Contracting Officer.

B. Parking: Use designated areas of existing parking areas for construction personnel.

C. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.

D. Lifts and Hoists: Use of existing rail hoist for removal and setting of pumps will be permitted as long as hoist is maintained in a condition acceptable to Contracting Officer. At Substantial Completion, restore existing hoist to condition existing before initial use.

E. Existing Stair Usage: Use of existing stairs will be permitted, as long as stairs are cleaned and maintained in a condition acceptable to Contracting Officer. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If, despite such protection, stairs become damaged, restore damaged areas so no evidence remains of correction work.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

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

B. Pest Control: Follow NPS requirements and practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

C. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by NPS from fumes and noise.

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

1. Responsible Person: A capable and qualified person shall be placed in charge of fire protection. The responsibilities shall include locating and maintaining fire protective equipment and establishing and maintaining safe torch cutting and welding procedures.
2. Smoking: Smoking within buildings or temporary storage sheds is prohibited.
3. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of NPS. Check with park; many require “burn permits” for welding.
4. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site.. Instruct personnel in methods and procedures.
5. Hazard Control: Take all necessary precautions to prevent fire during construction. Do not store flammable or combustible liquids in existing buildings. Provide adequate ventilation during use of volatile or noxious substances.
6. Spark Arresters: Equip all gasoline or diesel powered equipment used during periods of potential fire hazards or in potential forest and grass fire locations with spark arresters approved by the USDA Forest Service.

a. Written determinations of periods and areas of potential fire hazard will be issued by Contracting Officer.

7. Buildings: Furnish a minimum of one extinguisher for each 1,500 square feet of area or major fraction thereof.
   a. Travel distance from any work station to the nearest extinguisher shall not exceed 75 feet.
8. Vehicles and Equipment: Provide one extinguisher on each vehicle or piece of equipment.

3.5 OPERATION, TERMINATION, AND REMOVAL

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

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

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

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor.
2. At Substantial Completion, clean and renovate permanent facilities used during construction period.

END OF SECTION 015000

SECTION 016700 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This 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 the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

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

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

D. 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: The amount of biobased carbon in the material or product as a percentage of weight (mass) of the total organic carbon in the material or product.

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

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 for more information http://www.epa.gov/epp/guidance/finalguidancetoc.htm.

G. Stewardship: Responsible use and management of resources in support of sustainability.

H. Sustainability: The maintenance of ecosystem components and functions for future generations.

1. 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 with ISO 140001 Standard for the Use of Environmental Marketing Claims.
2. Rapidly Renewable Material: Material made from plants that are typically harvested within a ten-year cycle.
3. Regional Materials: Materials that are manufactured and extracted, harvested, or recovered within a radius of 500 miles from the Project location.

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 will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Contractor is encouraged to obtain materials in biodegradable or recyclable/reusable packaging which uses the minimum amount of packaging possible.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weather tight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.

1.5 PACKAGING

A. Where Contractor has the option to provide one of the 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.

1.6 ENVIRONMENTALLY PREFERABLE PRODUCTS

A. Provide environmentally preferable products to the greatest extent possible.

1. To the greatest extent possible, provide products and materials that have 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 the use of ozone depleting compounds during and after construction where alternative environmentally preferable products are available, consistent with either the Montreal Protocol and Title VI or the 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 the total value of the materials in the project.

1.7 PRODUCT WARRANTIES

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

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

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

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to Divisions 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.

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

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

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

1. Provide products complete with accessories, trim, finish, fasteners, anchors, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Government reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements or approved equal.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements or approved equal.
3. Products: Where Specifications include a 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 a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements or approved equal.
5. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product, system, or approved equal.
6. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers, or approved equal. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named.

2.2 COMPARABLE PRODUCTS

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

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION

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 016700

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes procedural requirements for cutting and patching on buildings that do not contain Historic Fabric.

1.2 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

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

PART 2 - PRODUCTS

2.1 MATERIALS

A. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and/or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
5. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329

SECTION 017340 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. Field engineering and surveying.
   3. General installation of products.
   4. Progress cleaning.
   5. Starting and adjusting.
   6. Protection of installed construction.
   7. Correction of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions, Utilities and Site Improvements: The existence and location of site improvements, underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

   1. Before construction, verify the existence and location and elevations of existing construction including mechanical and electrical systems and services, sanitary sewer, storm sewer, and water-service piping.
   2. Before construction, verify the location and points of connection of utility services.
   3. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

   1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
   2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
   3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
   4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

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

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 the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to the Contracting Officer in accordance with Section 013100 “Project Management and Coordination”.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the existing benchmarks. If discrepancies are discovered, notify Contracting Officer promptly.

B. General:

1. Establish benchmarks and control points to set lines of construction and elsewhere as needed to locate each element of Project.
2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check the location, level and plumb, of every major element as the Work progresses.
5. Notify the Contracting Officer when deviations from required lines and levels exceed allowable tolerances.

C. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

D. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by NPS.

3.4 FIELD ENGINEERING

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

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

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

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

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

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

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by the Contracting Officer.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 PROGRESS CLEANING

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

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
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 the level of cleanliness necessary for proper execution of the Work.

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

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

1. Utilize non-toxic cleaning materials and methods.

a. Comply with GS 37 for general purpose cleaning and bathroom cleaning.
b. Use natural cleaning materials where feasible. Natural cleaning materials include:

1) Abrasive cleaners: substitute 1/2 lemon dipped in borax.
2) Ammonia: substitute vinegar, salt and water mixture, or baking soda and water.
3) Disinfectants: substitute 1/2 cup borax in gallon water.
4) Drain cleaners: substitute 1/4 cup baking soda and 1/4 cup vinegar in boiling water.
5) Upholstery cleaners: substitute dry cornstarch.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces : Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

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

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

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

1. Provide final cleaning in accordance with ASTM E1971.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.8 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. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

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

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

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017340

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction 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 the construction, demolition, or renovation of a structure which exceeds 2.5 inch (60 mm) 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 the 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: The presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances; or degrade the utility of the environment for aesthetic, cultural, or historical purposes.

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

H. Hazardous Materials: Any material that is regulated as a hazardous material in accordance with 49 CFR 173, 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 the potential to meet the definition of a 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 GOALS

A. General: As a goal, this project shall minimize the creation of construction, deconstruction, and demolition waste to protect and restore natural habitat and resources. Factors that contribute to waste such as over packaging, improper storage, ordering error, poor planning, breakage, mishandling, and contamination shall be minimized. A Waste Management Plan shall be developed to ensure that to the extent practical, existing site and building materials are reused, salvaged, or recycled. Waste disposal in landfills shall be minimized.

B. Salvage /Recycle Goals: To extent practical, develop waste management plan that results in end-of-Project rates for salvage/recycling of 50 percent by weight of total waste generated by the Work. The following waste categories, at a minimum, shall be diverted from a landfill:
1. Clean dimensional wood, palettes
2. Plywood, OSB, and particle board
3. Cardboard, paper, packaging, newsprint
4. Metals (from banding, stud trim, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze)
5. Non-hazardous paint and paint cans
6. Beverage containers: Aluminum, glass, and plastic containers
7. Insulation
8. Wiring
9. Other mixed construction and demolition waste as appropriate

C. If any waste materials encountered during the deconstruction/demolition or construction phase are found to contain lead, asbestos, 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 the contract and prior to the scheduled Pre-Construction Conference, the Contractor shall submit a draft Waste Management Plan to the Contracting Officer for approval. Submit one PDF copy of plan. Revise and resubmit Plan as required by the Contracting Officer. Approval of the Contractor’s Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations.

B. Landfill and Incinerator Disposal Records: For hazardous materials only indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Waste Management Meeting: Conduct separate meeting or cover in the Pre-Construction Conference and comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
2. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
3. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
4. Review waste management requirements for each trade.

PART 2 - PRODUCTS

2.1 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification and waste reduction work plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition, and construction waste generated by the Work.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator.

1. Salvaged Materials for Reuse: List materials that will be salvaged and reused in this Project.
2. Recycled Materials: List materials that will be recycled in this Project.
3. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste.

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

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

B. Waste Management Coordinator: Identify a waste management coordinator to be 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. The Contractor shall establish contacts with local recycling and reuse companies to set up the lines of responsibility. Contractor shall be responsible for coordinating with these companies 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. The Contractor shall designate and the Contracting Officer shall approve a specific area or areas to facilitate separation of materials for potential reuse, salvage, recycling, and return.
2. Waste and recycling bins are to be placed near each other, and close to the point of waste generation but out of the traffic pattern.
3. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid co-mingling of materials.
4. Bins shall be protected during non-working hours from off-site contamination.
5. The garbage dumpsters should be checked periodically to monitor recyclables being thrown away or if there are undocumented materials that could be recycled.

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

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
   a. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile materials away from construction area. Do not store within drip line of existing trees.
3. Store components off the ground and protect from the weather.
4. Remove recyclable waste off Governments property and transport to recycling receiver or processor.

3.3 RECYCLING DEMOLITION WASTE

A. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

B. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

C. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

D. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

E. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

F. Conduit: Reduce conduit to straight lengths and store by type and size.

G. Electronic Products: Ensure that all non-usable electronic products are reused, donated, sold, or recycled using environmentally sound management practices at end of life.

3.4 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

3.5 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Government’s property and legally dispose of them.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Project Record Drawings.
2. Closeout Submittals.
3. Substantial Completion and Final Inspection.
4. Final Acceptance of the Work.
5. 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 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 the Contracting Officer for inspection at the time of monthly progress payment requests. If project record drawings are not current, the Contracting Officer may retain an appropriate amount of the progress payment.

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

1.3 CLOSEOUT SUBMITTALS

A. The intent is to provide an overall summary of requirements and not a comprehensive list. The terms and conditions of the contract require meeting the requirements of the individual specification sections regardless of what is included on the list. Submit the following before requesting final inspection:

1. Submit specific warranties, guarantees, workmanship bonds, final certifications, and similar documents.
2. Submit Project Record Documents and operation and maintenance manuals and similar final record information.
3. Posted Operating Instructions: As specified in the 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 the manufacturer.

4. 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.
5. Submit approved pre-functional checklists and functional performance testing reports from the commissioning documentation.
    a. Equipment start-up requires coordination with the commissioning process. Refer to Sections 221519 and 432139. Equipment shall not be “temporarily” started for commissioning.
6. Submit test and balance report.
7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
8. Complete final cleaning requirements, including touchup painting.
9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
10. Instruct NPS personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videos.

1.4 SUBSTANTIAL COMPLETION AND FINAL INSPECTION

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

B. If, following final inspection, the work is determined to be substantially complete, Contracting Officer will prepare a Punch List to be corrected before final acceptance and issue a Letter of Substantial Completion. Contractor shall complete the work described on the Punch List within 30 calendar days, as weather permits. If the Contractor fails to complete the work within this time frame, the Contracting Officer may either replace or correct the work with an appropriate reduction in the contract price or charge for re-inspection costs in accordance with the Inspection of Construction clause of the contract.

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

1.5 FINAL ACCEPTANCE OF THE WORK

A. Prior to requesting inspection for verification of completion of all outstanding items:

1. Complete commissioning requirements of Sections 221519 and 432139 unless approved in writing by the Contracting Officer. Exceptions to this are required seasonal and approved deferred testing.

B. After all deficiencies have been corrected, a Letter of Final Acceptance will be issued.

1.6 WARRANTIES

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

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

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

PART 2 - PRODUCTS

2.1 MATERIALS

A. See Section 017340 “Execution” for information on cleaning agents.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Remove tools, construction equipment, machinery, and surplus material from Project site.
    d. Sweep concrete floors broom clean in unoccupied spaces.
    e. Remove labels that are not permanent.
    f. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
        1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

g. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
h. Replace parts subject to unusual operating conditions.
i. Leave Project clean and ready for occupancy.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

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

1. Manuals, General.
2. Operation and maintenance information for systems, subsystems, and equipment, products, materials and finishes.

B. See Divisions 02 through 49 Sections for additional operation and maintenance manual requirements for the Work in those Sections.

1.2 SUBMITTALS

A. Draft Manual: Submit in draft form at least 15 days before final inspection. Contracting Officer will return copy with comments within 15 days of receipt.

1. Format: Submit operations and maintenance manuals in PDF electronic file format or in hardcopy format.
   a. PDF electronic file. Assemble each manual into a composite electronic file. Submit on digital media acceptable to Contracting Officer.
   b. Hardcopy, submit two copies.

B. Final Manual: Correct or modify each manual to comply with Contracting Officer's comments and submit final corrected manual within 15 days of receipt of Contracting Officers comments.

1. Format: hardcopy required, PDF electronic file format is optional.
   a. PDF electronic file. Assemble each manual into a composite electronic file. Submit on digital media acceptable to Contracting Officer.
   b. Hardcopy, submit four copies.

PART 2 - PRODUCTS

2.1 MANUALS, GENERAL

A. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Project Title.
2. Location.
3. Park.
4. Contract Number.
5. Prime Contractors Name and Address.

6. All subcontractors' names and addresses including portions of project completed by each subcontractor.
7. Date of Substantial Completion.

B. Manual Contents:

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 paper; with clear plastic window sleeve on front and spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
   a. Cover Sheet: Identify each binder on front and spine, with the project title, location, park, contract number, prime contractor's name and address, and date of substantial completion. 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," and Project title or name.
   b. Data: Fill binders to no more than 75 percent of capacity. Punch holes shall not obscure any data.
   c. Manufacturers' Data: Provide originals for color or copyrighted data. Black and white data may be originals or clean, good quality reproductions. Copies produced by facsimile transmission and sheets with stamps will not be acceptable. Include only sheets that apply to items installed.
   d. Vendor Furnished As-Built Drawings: Maximum 24-inch by 36-inch sheets with minimum character or lettering size of 1/8 inch. Reduced-size reproductions may be provided instead of full-size drawings if the reproductions are clear and legible. If reduced-size drawings are used, identify as "REDUCED SIZE" and provide graphic scales, if applicable.
   e. Custom Data: Data supplemented by drawings and schematics necessary to describe systems adequately.
   f. Schedules: Schedules reflecting final, as-installed conditions.
   g. Data that is poorly reproduced or in any way illegible will be rejected.
2. Drawings:
   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.

2.2 OPERATION AND MAINTENANCE INFORMATION FOR SYSTEMS AND EQUIPMENT

A. Operation Requirements

1. Content: In addition to requirements in this 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 the following:
   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 the sequence of operation, and diagram controls as installed.
5. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

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, as described below.
2. Source Information: 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: Include test and inspection instructions, troubleshooting guide, disassembly instructions, and adjusting instructions, that detail essential maintenance and environmental procedures.
5. 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.
6. 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.
7. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 GENERAL

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

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

3.2 MANUAL PREPARATION

A. Manual Contents: Including but not limited to:

1. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents.
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.
    a. Provide a written description of pump startup including:
        1) VFD ramp procedure
        2) Control valve opening sequence.
            a) Describe how VFD and control valve work together to mitigate transient pressure surges in the discharge line upon pump start up.
            b) Provide similar description for pump shut off.
        3) Second pump call to run procedure
            a) Describe how both VFDs and control valves work together to mitigate transient pressure surges in the discharge line when one pump is already running and a second pump is also called to run.
            b) Provide similar description for second pump shut off, when the first pump will continue to run.
3. Vendor Furnished As-Built Drawings: Provide for each electrical and each mechanical control system.
    a. For each control system, provide control circuit schematic drawings. Identify each wire and terminal block number. Show terminal numbers on all control devices. Show control wires and devices remote from the control panel.
    b. For each control panel, provide a general arrangement drawing showing location of each control component and terminal block on the panel front and interior. Include a materials list of all panel-mounted control components as well as field-installed control components remote from the panel, identifying components, manufacturer, model number, and initial set points or sensing ranges of devices where applicable.
    c. For packaged equipment systems, provide general arrangement drawings showing interrelationships of the various items of equipment and components.
    d. In addition to the control wiring schematic, provide a power wiring schematic drawing showing the power flow to each motor. Identify each power conductor. Show all over-current protection and motor starting devices.

B. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for instructing NPS personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment, including environmental considerations.
3. Demonstration and training video.

B. See Divisions 02 through 49 Sections for specific requirements for demonstration and training for products in those Sections.

1.2 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project.

B. Instructor Qualifications: A factory-authorized service representative experienced in operation and maintenance procedures and training.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not schedule training program until operation and maintenance data has been reviewed and approved by Contracting Officer.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

1. Vertical Turbine Pumps

2. Air Compressors and controls

B. Training Modules: For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include system and equipment descriptions, operating standards, regulatory requirements, equipment function, operating characteristics, limiting conditions, and performance curves.
2. Documentation: Review emergency, operations, and maintenance manuals; Project Record Documents; identification systems; warranties and bonds; and maintenance service agreements.
3. Emergencies: Include instructions on stopping; shutdown instructions; operating instructions for conditions outside normal operating limits; instructions on meaning of warnings, trouble indications, and error messages; and required sequences for electric or electronic systems.
4. Operations: Include startup, break-in, control, and safety procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; operating procedures for emergencies and equipment failure; and required sequences for electric or electronic systems.
5. Adjustments: Include alignments and checking, noise, vibration, economy, and efficiency adjustments.
6. Troubleshooting: Include diagnostic instructions and test and inspection procedures.
7. Maintenance: Include inspection procedures, types of cleaning agents, methods of cleaning, procedures for preventive and routine maintenance, and instruction on use of special tools.
8. Repairs: Include diagnosis, repair, and disassembly instructions; instructions for identifying parts; and review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 INSTRUCTION

A. Engage qualified instructors to instruct NPS personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

B. Scheduling: Provide instruction at mutually agreed on times.

1. Schedule training with NPS through the Contracting Officer with at least seven days advance notice.
2. Conduct training sessions after the equipment or system has been accepted and turned over to the Government. Coordinate with commissioning requirements.
3. Individual sections specify the duration of training required. If no duration is listed, provide training of sufficient duration to adequately cover the subjects.

END OF SECTION 017900

SECTION 221519 - GENERAL-SERVICE PACKAGED AIR COMPRESSORS AND RECEIVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Oil-free, rotary-screw air compressors.
   2. Refrigerant compressed-air dryers.

B. This work is replacing one existing Atlas Copco GX2 FF air compressor including refrigerant dryer, horizontal receiver (~50 gal), filters, oil separator, etc. with two new compressors (one redundant) of the same size. The new system shall provide the same quality air as the existing system. The existing 200-gal vertical receiver shall remain in use with the new system. The new system shall include controls capable of alternating new compressors to maintain equal run time. Operating both compressors at the same time is not required. Provide all equipment, controls, disconnects, piping, etc. necessary to provide a fully functional system.

1.3 DEFINITIONS

A. Actual Air: Air delivered from air compressors. Flow rate is delivered compressed air measured in acfm.

B. Standard Air: Free air at 68 deg F and 1 atmosphere before compression or expansion and measured in scfm.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

   1. Include diagrams for power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

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

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Air-Compressor, Inlet-Air-Filter Elements: One of each type for each compressor.

2. Belts: One of each type for each belt-driven compressor.

3. Outlet-Air-Filter Elements: One of each type for each compressor.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

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

B. ASME Compliance: Fabricate and label receivers to comply with ASME Boiler and Pressure Vessel Code.

2.2 GENERAL REQUIREMENTS FOR PACKAGED AIR COMPRESSORS AND RECEIVERS

A. General Description: Factory-assembled, -wired, -piped, and -tested; electric-motor-driven; air-cooled; continuous-duty air compressors and receivers that deliver air of quality equal to intake air.

B. Control Panels: Automatic control station with load control and protection functions. Comply with NEMA ICS 2 and UL 508.

1. Enclosure: NEMA ICS 6, Type 12 control panel unless otherwise indicated.
2. Motor Controllers: Full-voltage, combination magnetic type with undervoltage release feature and motor-circuit-protector-type disconnecting means and short-circuit protective device.
3. Control Voltage: 120-V ac or less, using integral control power transformer.
4. Motor Overload Protection: Overload relay in each phase.
5. Starting Devices: Hand-off-automatic selector switch in cover of control panel, plus pilot device for automatic control.
6. Automatic control switches to alternate air compressors.
7. Instrumentation: Include discharge-air pressure gage, air-filter maintenance indicator, hour meter, compressor discharge-air and coolant temperature gages, and control transformer.

8. Alarm Signal Device: For connection to alarm system to indicate when backup air compressor is operating.

C. Receivers: Steel tank constructed according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

1. Pressure Rating: At least as high as highest discharge pressure of connected compressors, and bearing appropriate code symbols.
2. Interior Finish: Corrosion-resistant coating.
3. Accessories: Include safety valve, pressure gage, drain, and pressure-reducing valve.

2.3 OIL-FREE, ROTARY-SCREW AIR COMPRESSORS

A. Manufacturers:
1. Atlas Copco
2. Or Approved Equal.

B. Compressor(s): Oil-free, rotary-screw type with nonlubricated helical screws and lubricated gear box, and of construction that prohibits oil from entering compression chamber.

1. Coupling: Nonlubricated, flexible type.
2. Cooling/Lubrication System: Unit-mounted, air-cooled exchanger package pre-piped to unit; with air pressure circulation system with coolant stop valve, full-flow coolant filter, and thermal bypass valve.
3. Air Filter: Match existing filter(s) as necessary to provide identical air quality for downstream air uses.
    a. Dry type, with maintenance indicator and cleanable, replaceable filter element.
4. Air/Coolant Receiver and Separation System: Match existing system as necessary to provide identical air quality for downstream air uses.
    a. 150-psig rated steel tank with ASME safety valve, coolant-level gage, multistage air-coolant separator element, minimum pressure valve, blowdown valve, discharge check valve, coolant stop valve, full-flow coolant filter, and thermal bypass valve.
5. Capacity Control: Capacity modulation between zero and 100 percent air delivery, with operating pressures between 50 and 125 psig. Include necessary control to hold constant pressure. When air demand is zero, unload compressor by using pressure switch and blowdown valve.

C. Capacities and Characteristics:

1. Air Compressor(s): Two; single stage.
2. Actual-Air Capacity of Each Air Compressor: 10.5 acfm delivered.
3. Discharge-Air Pressure: 115 psig.
4. Motor (Each Air Compressor):
    a. Horsepower: 3 max.
    b. Speed: 1750 rpm.
5. Electrical Characteristics:

a. Volts: 460.
b. Phase(s): Three.
c. Hertz: 60.

6. Receiver: ASME construction steel tank.

a. Arrangement: Horizontal.
b. Capacity: 50 gal.
c. Interior Finish: Epoxy coating.
d. Pressure Rating: 150 psig minimum.
e. Drain: Automatic valve.

7. Enclosure: Steel with sound-attenuating material lining.

2.4 REFRIGERANT COMPRESSED-AIR DRYERS

A. Manufacturers:
1. Atlas Copco
2. Or Approved Equal.

B. Description: Noncycling, air-cooled, electric-motor-driven unit with steel enclosure and capability to deliver 35 deg F, 100-psig air at dew point. Include automatic ejection of condensate from airstream, step-down transformers, disconnect switches, inlet and outlet pressure gages, thermometers, automatic controls, and filters.

C. Capacities and Characteristics:

1. Standard-Air Capacity of Each Compressed-Air Dryer: 10.5 acfm free air.
2. Pressure: 115 psig.
3. Entering-Air Temperature: 104 deg F (40 deg C) Max.
4. Ambient-Air Temperature: 104 deg F (40 deg C) Max.
5. Inlet Filter: Match existing.
6. Outlet Filter: Match existing.
7. Motor Horsepower: 0.5 Hp.
8. Electrical Characteristics:

a. Volts: 115.
b. Phase(s): Single.
c. Hertz: 60.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Install compressed-air equipment anchored to existing concrete floor.

B. Arrange equipment so controls and devices are accessible for servicing.

C. Maintain manufacturer's recommended clearances for service and maintenance.

D. Install the following devices on compressed-air equipment:

1. Thermometer, Pressure Gage, and Safety Valve: Install on each compressed-air receiver.
2. Pressure Regulators: Install downstream from air compressors and dryers.
3. Automatic Drain Valves: Install on aftercoolers, receivers, and dryers. Discharge condensate over nearest floor drain.

3.2 CONNECTIONS

A. Where installing piping adjacent to machine, allow space for service and maintenance.

B. Connect to existing 200-gallon receiver.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Check for lubricating oil in lubricated-type equipment.
3. Check belt drives for proper tension.
4. Verify that air-compressor inlet filters and piping are clear.
5. Check for equipment vibration-control supports and flexible pipe connectors, and verify that equipment is properly attached to substrate.
6. Check safety valves for correct settings. Ensure that settings are higher than air-compressor discharge pressure, but not higher than rating of system components.
7. Drain receiver tanks.
8. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
9. Test and adjust controls and safeties.

3.4 DEMONSTRATION

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

END OF SECTION 221519

SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Applicable codes include the following:
1. International Building Code 2021
2. National Electric Code 2020
3. NPS Building Standards

1.2 SUMMARY

A. Section Includes:

1. Electrical equipment coordination and installation.
2. Common electrical installation requirements.

1.3 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. To connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items, except as otherwise indicated in drawings.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

F. Exposed raceways/conduit: Where conduit or raceway is routed in an exposed location, the conduit and raceway shall be painted to match adjacent finishes. Coordinate required finishes with Contracting Officer.

END OF SECTION 26 05 00

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

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

1. Alcan Products Corporation; Alcan Cable Division.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN

2.2 CONNECTORS AND SPLICES

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

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

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

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper feeders, solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

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

C. Minimum wire size shall be #12AWG.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Type THHN-THWN, single conductors in raceway, Armored cable, Type AC, Metal-clad cable, Type MC, or Nonmetallic-sheathed cable, Type NM.

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway, Armored cable, Type AC, Metal-clad cable, Type MC, or Nonmetallic-sheathed cable, Type NM].

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway..

D. Class 1 Control Circuits: Type THHN-THWN, in raceway.

E. Class 2 Control Circuits: Type THHN-THWN, in raceway

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

F. Feeders have been sized to limit voltage drop to 2%. The contractor shall increase branch circuit conductors, as required, to limit voltage drop in each branch circuit to 3%.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test feeder conductors for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

C. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.3 SUBMITTALS

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

1.4 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

D. RNC: Rigid non-metallic conduit.

1.5 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. GS Metals Corp.
e. Thomas & Betts Corporation.
f. Unistrut; Tyco International, Ltd.
g. Wesanco, Inc.

2. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
3. Channel Dimensions: Selected for applicable load criteria.

B. Raceway Supports: As described in NECA 1 and NECA 101.

C. Conduit Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti Inc.
4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, RMC and RNC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways to these supports with single-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

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

END OF SECTION 260529

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. EPDM: Ethylene-propylene-diene terpolymer rubber.

D. FMC: Flexible metal conduit.

E. IMC: Intermediate metal conduit.

F. LFMC: Liquidtight flexible metal conduit.

G. LFNC: Liquidtight flexible nonmetallic conduit.

H. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.

1. Custom enclosures and cabinets.

C. Source quality-control test reports.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

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

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. Electri-Flex Co.
6. Manhattan/CDT/Cole-Flex.
7. Maverick Tube Corporation.
8. O-Z Gedney; a unit of General Signal.
9. Wheatland Tube Company.

B. Rigid Steel Conduit: ANSI C80.1.

C. Aluminum Rigid Conduit: ANSI C80.5.

D. IMC: ANSI C80.6.

E. PVC-Coated Steel Conduit: PVC-coated.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

F. EMT: ANSI C80.3.

G. FMC: Zinc-coated steel

H. LFMC: Flexible steel conduit with PVC jacket.

I. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
1. Fittings for EMT: Set-screw for conduits less than 2-inches. Compression type for conduits 2-inches or larger.
2. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

J. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

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

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.; Pipe & Plastics Group.
6. Condux International, Inc.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; a Hubbell Company.
12. Thomas & Betts Corporation.

B. ENT: NEMA TC 13.

C. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

D. LFNC: UL 1660.

E. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

F. Fittings for LFNC: UL 514B.

2.3 METAL WIREWAYS

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

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, 12, or 3R, unless otherwise indicated.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type.

E. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS

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

1. Hoffman.
2. Lamson & Sessions; Carlon Electrical Products.

B. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.

C. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.

D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.5 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Thomas & Betts Corporation.
b. Walker Systems, Inc.; Wiremold Company (The).
c. Wiremold Company (The); Electrical Sales Division.

B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by owner from manufacturer's standard colors.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Butler Manufacturing Company; Walker Division.
b. Enduro Systems, Inc.; Composite Products Division.
c. Hubbell Incorporated; Wiring Device-Kellems Division.
d. Lamson & Sessions; Carlon Electrical Products.
e. Panduit Corp.
f. Walker Systems, Inc.; Wiremold Company (The).
g. Wiremold Company (The); Electrical Sales Division.

2.6 BOXES, ENCLOSURES, AND CABINETS

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

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman.
5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
6. O-Z/Gedney; a unit of General Signal.
7. RACO; a Hubbell Company.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet Division.
10. Spring City Electrical Manufacturing Company.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy oraluminum, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum, orgalvanized, cast iron with gasketed cover.

G. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic.

H. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT**.**
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:
   a. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT, or RNC, Type EPC-40-PVC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: Rigid steel conduit.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

B. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

C. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

D. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

E. Do not install aluminum conduits in contact with concrete.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Complete raceway installation before starting conductor installation.

C. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

D. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

E. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

F. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

G. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

H. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

I. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

J. Contractor shall not install conductors or cables in a building that is not completely waterproofed, unless the conductors or cable is rated for wet location installations.

K. Route circuit homeruns down corridors, above accessible ceilings.

L. Minimum burial depth for underground conduit shall be 24”.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Identification for raceway and metal-clad cable.
2. Identification for conductors and communication and control cable.
3. Warning labels and signs.
4. Instruction signs.
5. Equipment identification labels.
6. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and ANSI C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.145.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Color for Printed Legend:

1. Power Circuits: Black letters on an orange field.
2. Legend: Indicate system or service and voltage, if applicable.

C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

2.2 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

C. Aluminum Wraparound Marker Labels: Cut from 0.014-inch- (0.35-mm-) thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.

D. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking nylon tie fastener.

E. Write-On Tags: Polyester tag, **0.015 inch (0.38 mm)** thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.3 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 10 by 14 inches (250 by 360 mm).

E. Warning label and sign shall include, but are not limited to, the following legends:
1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.4 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. in. (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved legend with black letters on white face
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.5 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

E. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength: 50 lb (22.6 kg), minimum.
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black, except where used for color-coding.

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 APPLICATION

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A: Identify with orange self-adhesive vinyl tape applied in bands.

B. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, self-adhesive vinyl tape applied in bands**:**
1. Mechanical and Electrical Supervisory System: Green and blue.
2. Control Wiring: Green and red.

C. Power-Circuit Conductor Identification: For primary and secondary conductors No. 1/0 AWG and larger in pull and junction boxes, and handholes use color-coding conductor tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

D. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.

E. Auxiliary Electrical Systems Conductor Identification: Identify control, signal, sound, intercommunications, voice, and data connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.

F. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

G. Instruction Signs:

1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

H. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

a. Indoor Equipment: Adhesive film label, Adhesive film label with clear protective overlay, Self-adhesive, engraved, laminated acrylic or melamine label, and Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where 2 lines of text are required, use labels 2 inches (50 mm) high.
b. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
c. Disconnect Means for Equipment: Indicate the equipment being served and the panelboard and circuit numbers that are being utilized.

2. Equipment to Be Labeled:

a. Panelboards, electrical cabinets, and enclosures.
b. Access doors and panels for concealed electrical items.
c. Motor-control centers.
d. Disconnect switches.
e. Enclosed circuit breakers.
f. Motor starters.
g. Monitoring and control equipment.

3.2 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

G. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.

1. Color shall be factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.
2. Colors for 208/120-V Circuits:

    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.

3. Colors for 480/277-V Circuits:

    a. Phase A: Brown.
    b. Phase B: Orange.
    c. Phase C: Yellow.

4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

END OF SECTION 260553

SECTION 262913.06 - SOFT-START MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes soft-start motor controllers that are designed for reduced-voltage start and full-voltage run duty.

1. Combination soft-start controllers.
2. Enclosures.
3. Identification.

1.3 DEFINITIONS

A. CPT: Control power transformer.

B. FLA: Full-load current.

C. MCCB: Molded-case circuit breaker.

D. MCP: Motor circuit protector.

E. NC: Normally closed.

F. NO: Normally open.

G. OCPD: Overcurrent protective device.

H. SCCR: Short-circuit current rating.

I. SCPD: Short-circuit protective device.

J. SCR: Silicon-controlled rectifier.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For each type of controller.

1. Include plans, elevations, sections, and mounting details.
2. Indicate dimensions, weights, required clearances, and location and size of each field connection.
3. Wire Termination Diagrams and Schedules: Include diagrams for signal and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features. Differentiate between manufacturer-installed and field-installed wiring.
4. Include features, characteristics, ratings, and factory settings of individual OCPD and auxiliary components.

C. Product Schedule: For each enclosed controller.

1. Each installed soft-start controller type.
2. NRTL listing.
3. Factory-installed accessories.
4. Nameplate legends.
5. SCCR of integrated unit.

a. For each combination soft-start controller, include features, characteristics, ratings, and factory setting of the SCPD and OCPD.

1) Listing document proving Type 2 coordination.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For soft-start controllers to include in operation and maintenance manuals.

1. Include the following:

a. Routine maintenance requirements for soft-start controllers and installed components.
b. Manufacturer's written instructions for testing and adjusting circuit-breaker and MCP trip settings.
c. Manufacturer's written instructions for testing, adjusting, and reprogramming reduced-voltage soft-start controllers.
d. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed and arrange to demonstrate that switch settings for motor running overload protection suit actual motors to be protected.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store soft-start controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect soft-start controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

B. If stored in areas subject to weather, cover soft-start controllers to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than 32 deg F (0 deg C) and not exceeding 104 deg F (40 deg C), humidity noncondensing.
2. Altitude: Not exceeding 8500 feet (1000 m).

PART 2 - PRODUCTS

2.1 COMBINATION SOFT-START MOTOR CONTROLLERS

A. Description: Factory-assembled, combination, reduced-voltage soft-start controller with a disconnecting means, SCPD and OCPD, in a single enclosure. The reduced-voltage soft-start controller shall consist of an integrated unit with power SCRs, heat sink, microprocessor logic board, door-mounted digital display and user interface module, run-bypass contactor, and overload relay(s); suitable for use with NEMA MG 1, Design B, polyphase, medium induction motors.

1. Run-Bypass Contactor: Magnetic contactor in parallel with the SCR of the soft-start controller, bypassing the SCR when full voltage is achieved.

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or from available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.

2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

C. Standard: Comply with NEMA ICS 2, general purpose, Class A.

D. Configuration: Standard duty

1. At least two SCRs per phase to control the starting and stopping of the motor.
2. Microprocessor control shall continuously monitor current and proper operation of the SCRs.
3. Bypass Contactor: Operates automatically when full voltage is applied to motor, and bypasses the SCRs. Soft-start controller protective features and deceleration controls shall remain active when this contactor is in the bypass mode.
4. Power Electronics Disconnect Contactor. Where indicated, installed ahead of the power electronics equipment, and shall open automatically when the motor is stopped, or a controller fault is detected, or when an SCR shorts.
5. Logic Board: Identical for all ampere ratings and voltage classes, with environmental protective coating.
6. Surge Protection: Comply with NEMA ICS 2 requirements for surge suppression.

E. Control Power:

1. For on-board control power, obtain from line circuit or from integral CPT. The CPT shall have capacity to operate integral devices and remotely located pilot, indicating, and control devices.

F. Controller Diagnostics and Protection:

1. Microprocessor-based thermal-protection system for monitoring SCR and motor thermal characteristics, and providing controller overtemperature and motor-overload alarm and trip; settings selectable via the keypad.
2. Protection from line-side reverse phasing; line-side and motor-side phase loss; motor jam, stall, and under-load conditions; and line frequency over or under normal.
3. Input isolation contactor that opens when the controller diagnostics detect a faulted soft-start component or when the motor is stopped.

G. Cover mounted-controller status panel with LED lights or alphanumeric display to show the following:

1. Starter Status: "Ready," "starting," "stopping," or "run."
2. Motor current in amperes.
3. Faults:

    a. Motor overcurrent trip.
    b. Motor thermal overload.
    c. Starter thermal fault.
    d. Low line voltage.
    e. Loss of a phase.
    f. Phases reversed.
    g. Maximum stating time exceeded.

h. Serial communications error.

H. Interface Panel: Mounted on controller door

1. Guarded adjustable set points, not readily accessible.

a. Motor FLA, adjustable from 40 to 110 percent of the controller's rating.
b. Current limitation on starting, adjustable from 200 to 500 percent of FLA, typically set at 300 percent.
c. NEMA ICS 2 overload class. Selections shall include the following tripping classes: Class 5, Class 10, Class 15, Class 20, and Class 30.

2. Adjustable set points, readily accessible

a. Linear acceleration, adjustable from 1 to 60 s
b. Maximum start time, adjustable from 1 to 250 s
c. Selector switch; select coast to stop or soft stop.
d. Linear deceleration, adjustable from 1 to 60 s

I. Fusible Disconnecting Means:

1. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate Class J fuses.
2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
3. Auxiliary Contacts: NO or NC, arranged to activate before switch blades open.

J. MCP Disconnecting Means:

1. UL 489 and NEMA AB 3 (with interrupting capacity to comply with available fault currents) instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
3. Auxiliary contacts "a" and "b" arranged to activate with MCP handle.

K. MCCB Disconnecting Means:

1. UL 489 and NEMA AB 3, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.

L. Molded-Case Switch Disconnecting Means:

1. UL 489 and NEMA AB 3, with in-line fuse block for Class J or Class L power fuses (depending on ampere rating), providing an interrupting capacity to comply with available fault currents; MCCB with fixed, high-set instantaneous trip only.
2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.

2.2 ENCLOSURES

A. Comply with NEMA 250, Type designations as indicated on Drawings, to comply with environmental conditions at installed location.

B. Construction of the enclosures shall comply with NEMA ICS 6.

2.3 IDENTIFICATION

A. Controller Nameplates: Baked-enamel, Metal-backed, butyrate, Laminated acrylic or melamine plastic signs, as described in Section 260553 "Identification for Electrical Systems," for each compartment, mounted with corrosion-resistant screws.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and space conditions for compliance with requirements for motor controllers, their relationship with the motors, and other conditions affecting performance of the Work.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Freestanding Controllers: Bolt to existing slotted support systems.

C. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.

D. Control Wiring: Separate control wiring from power wiring. Where unavoidable, use twisted pair cabling or shielded cables for control wiring.

E. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

F. Setting of Overload Relays: Select and set overloads on the basis of FLA rating as shown on motor nameplate. Adjust setting value for special motors as required by NFPA 70 for high-torque, high-efficiency, and so on motors.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections. Retain test requirements below with any combination of paragraphs above. The following tests and inspections are derived from the NETA ATS.

B. Tests and Inspections:

1. Comply with provisions of NFPA 70B, Chapter "Testing and Test Methods."
2. Visual and Mechanical Inspection:

a. Compare equipment nameplate data with Drawings and the Specifications.
b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, and grounding.
d. Verify that the unit is clean.
e. Ensure that vent path openings are free from debris and that heat-transfer surfaces are clean.
f. Verify correct connections of circuit boards, wiring, disconnects, and ribbon cables.
g. Inspect Contactors:

1) Verify mechanical operation.
2) Verify that contact gap, wipe, alignment, and pressure are according to manufacturer's published data.

h. Motor-Running Protection:

1) Verify that motor FLA is at, or under, the controller current rating.
2) Verify that overload element setting is correct for its application.
3) Apply minimum- and maximum-speed set points. Verify that set points are within limitations of the load coupled to the motor.
4) If motor-running protection is provided by fuses, verify correct fuse rating.

i. Inspect bolted electrical connections for high resistance using one of the following two methods:

1) Use a low-resistance ohmmeter. Compare bolted-connection-resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels shall be according to manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.

j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

3. Electrical Tests:
a. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.

b. Test motor protection devices according to manufacturer's published data.
c. Test circuit breakers as follows:

1) Operate the circuit breaker to ensure smooth operation.
2) For adjustable circuit breakers, adjust protective device settings according to the coordination study. Comply with coordination study recommendations.

d. Test the electronic motor overload relay elements by injecting primary current through the overload circuit and monitoring trip time of the overload element.
e. Test the following parameters according to NETA relay calibration procedures, or as recommended by manufacturer:

1) ANSI No. 49R, Overtemperature Protection:

a) Determine time delay at 300 percent of setting.
b) Determine a second point on the operating curve.

2) ANSI No. 47, Input Phase Loss and Reversed Phases Protection:

a) Determine positive sequence voltage to close the NO contact.
b) Determine positive sequence voltage to open the NC contact (undervoltage trip).
c) Verify negative sequence trip.
d) Determine time delay to close the NO contact with sudden application of 120 percent of pickup.
e) Determine time delay to close the NC contact on removal of voltage when previously set to rated system voltage.

3) ANSI No. 81, Overfrequency Protection:

a) Verify frequency set points.
b) Determine time delay.
c) Determine undervoltage cutoff.

C. Motor controllers will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 SYSTEM FUNCTION TESTS

A. System function tests shall prove the correct interaction of sensing, processing, and action devices. Perform system function tests after field quality-control tests have been completed and all components have passed specified tests.

1. Develop test parameters and perform tests for the purpose of evaluating performance of integral components and their functioning as a complete unit within design requirements and manufacturer's published data.
2. Verify the correct operation of interlock safety devices for fail-safe functions in addition to design function.
3. Verify the correct operation of sensing devices, alarms, and indicating devices.

B. Motor controllers will be considered defective if they do not pass the system function tests and inspections.

C. Prepare test and inspection reports.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain motor controllers.

END OF SECTION 262913.06

SECTION 430520 - COMMON WORK RESULTS FOR LIQUID HANDLING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Lubrication.
2. Pump piping, fittings, and valves.
3. Piping connections.
4. Shaft coupling guards.
5. Accessories.

1.2 REFERENCE STANDARDS

A. American Society of Mechanical Engineers:

1. ASME B1.20.1 - Pipe Threads, General Purpose (Inch).
2. ASME B1.20.2M - Pipe Threads, 60 deg. General Purpose (Metric).
3. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
4. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard.

B. NSF International:

1. NSF 61 - Drinking Water System Components - Health Effects.
2. NSF 372 - Drinking Water System Components - Lead Content.

C. Occupational Safety and Health Administration (OSHA):

1. 29 CFR 1910 - Occupational Safety and Health Standards.

1.3 COORDINATION

A. Coordinate Work of this Section with new and existing locations and placement of utilities and piping.

1.4 PREINSTALLATION MEETINGS

A. Convene minimum one week prior to commencing Work of this Section.

1.5 SUBMITTALS

A. Product Data:

1. Submit manufacturer information for the following:

    a. Drive assemblies, pumps, panels, and other major components.
    b. Schematics, diagrams, panel layouts, ladder diagrams, and sequence of operation.
    c. Electric motors and soft starters.

B. Shop Drawings:

1. Indicate assembly, foundation, and installation with location including critical dimensions, sizes, and support locations.
2. Characteristic Pump Curves: Plot against flow rate and indicate total dynamic head, pump efficiency, brake horsepower, and overall efficiency.
3. For multi-speed service, indicate characteristic curves for maximum and minimum speeds specified and at least two points in between.
4. Submit pump name, identification tag number, and Specification Section number.
5. Submit elevation of local control panel, indicating panel-mounted devices, power single-line diagram, and input/output list.
6. Submit electrical schematic diagram and wiring diagram of field connections.

C. Manufacturer's Certificate:

1. Certify that pumping systems meet or exceed specified requirements.
2. Pumping Systems Rated Greater than 5 hp

    a. Certify that pumping system has been installed satisfactorily and is ready for operation.
    b. Indicate date of field tests and furnish test data.

D. Test and Evaluation Reports:

1. Performance Data Curves:

    a. Indicate head, flow rate, power demand, net positive suction head (NPSH) required, and pump efficiency over entire operating range of pump.
    b. Indicate head, power demand, overall efficiency at design, and maximum and minimum flow rates.
    c. For variable-frequency-driven pumps, indicate performance at intervals of 100 rpm from minimum to maximum speed.

2. NPSH:

    a. Indicate test results of NPSH required, as required by specific pump Section.
    b. Otherwise, submit manufacturer's NPSH calculation.

E. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

F. Qualifications Statements:

1. Submit qualifications for manufacturer.
2. Submit manufacturer's approval of installer.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Section 017000 - Execution and Closeout Requirements: Requirements for maintenance materials.

B. Spare Parts:

1. Furnish two sets of manufacturer's recommended spare parts.

C. Tools: Furnish special wrenches and other devices required for Owner to install, remove, and maintain pumping systems.

1.7 QUALITY ASSURANCE

A. Materials in Contact with Potable Water: Certified to NSF Standards 61 and 372.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years documented experience.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.10 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

A. Provide pumping systems designed and constructed for continuous service within specified range of operation, without overheating, cavitation, or excessive vibration.

2.2 LUBRICATION

A. Water-Lubricated Pumps: Provide flow meter and differential pressure switch to de-energize pumping unit in low-water-flow conditions.

B. Ball Bearings and Roller Bearing: Lubricate materials as recommended by pump manufacturer.

C. Lubrication Equipment: Provide pumps, piping, tankage, and filters as required to supply lubrication to pumping units.

2.3 PUMP PIPING, FITTINGS, AND VALVES

A. For piping, fittings, and valves furnished with pumps, comply with relevant Section referenced in this Section under "Related Requirements" Paragraph.

2.4 PIPING CONNECTIONS

A. Flanges:

1. Comply with ASME B16.5.

2.5 ACCESSORIES

A. Nameplates:
1. Identify individual pumps with a stainless-steel nameplate, indicating assigned equipment number, serial number, rated head and flow rate, impeller size, speed, and manufacturer's name and model number.

2.6 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Drive Units:
1. Furnish test results to pump manufacturer prior to pump testing.

C. Hydrostatic Testing:

1. Hydrostatically test each pump.
2. Provide Contracting Officer minimum two weeks' notification prior to testing.

3. Perform hydrostatic and performance tests on pumps where specified and on pumping systems rated at 50 hp or greater.
4. Test Pressure:

    a. Vertical Turbine Pumps: Minimum 150 percent of shutoff head.

D. Performance Testing:

1. Test over entire operating range of pump; obtain measurements of head, flow rate, power demand, NPSH required, and pump efficiency.
2. Obtain measurements of head, maximum and minimum flow rates, power demand, and overall efficiency at design.
3. For variable-frequency-driven pumps, test pumps at intervals of 100 rpm from minimum to maximum speed.
4. Demonstrate that pump is free from overheating, cavitation, and excessive vibration over flow rate range.

E. Drive Units:
1. For pumps with motors rated less than 100 hp, manufacturer's certified test motor is acceptable.

F. Do not ship equipment until test data have been accepted by Contracting Officer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that designated areas, clearances, structural requirements, piping, utility connections, and electronic signals are ready to receive equipment.

3.2 PREPARATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Disconnect electrical systems scheduled for removal.

C. Provide temporary wiring and connections to maintain existing systems in service during construction.

D. Remove, relocate, and extend existing installations as necessary to accommodate new construction.

3.3 INSTALLATION

A. According to manufacturer instructions.

B. Ensure that equipment is secure in position.

C. Equipment Bases and Supports:

1. Provide, modify, or replace as necessary, concrete housekeeping pads, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment.
2. Install anchor bolts and accessories for mounting and anchoring equipment.

D. Gauges:

1. Provide pressure gauges at pump discharge piping.
2. If subject to shock or vibrations, wall-mount gauges or attach gauges to galvanized channel floor stands and connect with flexible connectors.

E. Lubricants: Provide necessary oil and grease for initial operation.

3.4 FIELD QUALITY CONTROL

A. Section 017000 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

B. Testing:

1. Test for proper alignment and freedom from binding, scraping, shaft runout, or other defects.
2. Where specified by individual Specification Section, field test equipment to demonstrate operation without undue noise, vibration, or overheating.
3. Contracting Officer will witness field testing.
4. Start control system by energizing system equipment and testing operation of hardware and process control logic under supervision of manufacturer's representative and in presence of Contracting Officer.
5. Field-test each pump system after installation in order to demonstrate:

    a. Satisfactory operation without excessive noise and vibration over flow rate range; if pump driven by variable-frequency drive, test at 100-rpm increments.
    b. Required head, flow rate, and efficiency at design point.

6. Certify in writing that pump system has been satisfactorily tested.

C. Manufacturer Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than 3 days on Site for installation, inspection, startup, field testing, and instructing Owner's personnel in maintenance of equipment.

D. Equipment Acceptance:

1. Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.
2. Make final adjustments to equipment under direction of manufacturer's representative.

E. Furnish installation certificate from equipment manufacturer's representative attesting that equipment has been properly installed and is ready for startup and testing.

3.5 DEMONSTRATION

A. Demonstrate equipment startup, shutdown, routine maintenance, alarm condition responses, and emergency repair procedures to Contracting Officer or their designated representative.

END OF SECTION 430520

SECTION 432139 – VERTICAL TURBINE PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes vertical turbine, multistage, centrifugal water pumps with open line shafts, above surface discharge for:
   1. Mesa Verde Water Treatment Plant
      a. Finished Water Pumps
         1) The finished water pumps will be replacing existing finished water pumps in the existing WTP building and add soft starts to each pump. Depending on the pump supplied, additional labor and/or materials may be required to install the pumps. Contractor shall evaluate each pump and the required additional effort prior to selecting a manufacturer. The operating conditions of the finished water pumps are not changing.

B. Related Requirements:
   1. Section 430520 - Common Work Results for Liquid Handling Equipment: Pump components, appurtenances, and identification requirements common to liquid-handling systems.

1.2 REFERENCE STANDARDS

A. American Bearing Manufacturers Association:

   1. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
   2. ABMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

B. ASME International:

   1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.

C. ASTM International:

   1. ASTM A29/A29M - Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought.
   2. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
   3. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes.
   4. ASTM A536 - Standard Specification for Ductile Iron Castings.
   5. ASTM B91 - Standard Specification for Magnesium-Alloy? Forgings.

D. NSF International:

   1. NSF 61 - Drinking Water System Components - Health Effects.
   2. NSF 372 - Drinking Water System Components - Lead Content.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer information, including installation instructions, accessories, performance curves with specified operating point plotted, capacities and pressure differentials, power, rpm, sound power levels for both inlet and outlet at rated capacity, electrical characteristics, and connection requirements.
   1. Performance Curves
      a. Standard performance curves for each pump furnished. Curves shall cover range from shutoff to 150% of design flow rate and for the following parameters as a function of capacity at design temperature.
      b. Provide variable speed curves covering the full range of flow and head conditions specified.
      c. Curves shall at a minimum include the following for each speed.
         1) Total developed head.
         2) Required net positive suction head (NPSH).
         3) Efficiency.
         4) Required brake horsepower.
   2. Minimum recommended submergence.
   3. Perform variable speed pump performance tests in compliance with all applicable Hydraulic Institute Standards.
   4. Submit layout, dimensional, and cross-section drawings, including mechanical details of impellers, bearings, couplings, and seals.
   5. Materials of construction.
   6. Motor performance data and results of shop test.
   7. Type, number and size of anchor bolts.
   8. Coating system data.
   9. Nameplate data to include:
      a. Pumps:
         1) Name of manufacturer
         2) Type and model.
         3) Design rotative speed
         4) Number of stages.
         5) Type of line shaft bearing.
         6) Type and construction of pump seals.
         7) Type and size of shafting.
         8) Size and length of pump column.
         9) O.D. of pump bowls.
         10) Shop painting data.
      b. Motors:
         1) Name of manufacturer.
         2) Type and model.
         3) Rated size (hp)
         4) Type of bearings.
         5) Full load current.
         6) Motor performance data and results of shop test.
   10. Equipment instruction books.
   11. Maximum height required for disassembling each pump.
   12. Manufacturer’s field report covering all inspection items, including recommendations where applicable.

C. Shop Drawings:

1. Furnish diagrams showing complete layout of system, including equipment, piping, valves, wiring and ladder diagrams, controls, and control sequences.
2. Indicate size and configuration of assembly, mountings, weights, and accessory connections.
3. Indicate manufacturer's specified displacement tolerances for vibration at operational speed as specified for pumps.

D. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures, anchoring, and layout.

1.4 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Operation and Maintenance Manual in accordance with SECTION 017823.

1.5 QUALITY ASSURANCE

A. Materials in Contact with Potable Water: Certified according to NSF 61 and NSF 372.

B. Factory Tests and Reports.
1. Include all manufacturer's standard factory tests on Equipment and Material at the manufacturer’s testing facility.
2. Conform to Hydraulic Institute Standards except as otherwise specified.
3. Perform tests for capacity, power requirements, and efficiency at specified rated head, operating head extremes, and at three other points.
4. Test all impellers for dynamic and static balance.
5. Assemble all pumps completely in the shop including motors, couplings, and related items to ensure component fit-up.
6. Conduct "running test," "hydrostatic test of discharge head," and "hydrostatic test of bowl assembly" for each pump as outlined in AWWA E101: SECTION A6 - "Factory Inspection and Tests."
7. Submit shop test reports and graphic representation(s) of test results as a Compliance Submittal.

PART 2 - PRODUCTS

2.1 VERTICAL TURBINE PUMPS

A. Manufacturers:

1. Floway Pumps
2. Pentair / Fairbanks Nijhuis
3. Flowserve Corporation.

4. Or approved equal.

B. High Service Pump Station Operating Conditions:
1. Each pumping unit shall be capable of continuous flow.
2. Design to conform to the following:

a.	Number required	3
b.	Primary Design Flow (gpm)	120
c.	Primary Total Dynamic Head (feet)	1,200
d.	Minimum Pump Efficiency at Primary Design Flow (%)	60
e.	Maximum Motor Size (BMP)	60
f.	Maximum Nominal Pump Operating Speed (rpm)	3,500
g.	Maximum Shutoff Head (feet)	1,750
h.	Discharge Connection Size (inches)	4”
i.	Liquid Pumped	Potable Water
j.	Liquid Temperature (degrees Fahrenheit)	35-75
k.	NPSH Available (ft)	26.5
l.	Elevations (feet-inches)	
1)	Centerline Discharge Connection	6976.5
2)	Pump Room Floor	6975.0
3)	Wet Well Floor	6963.0
4)	High Water Level	6973.0

3. Existing Conditions
   a. The holes for the columns of all three pumps are 12” in diameter
   b. If pump manufacturer requires modifications to the existing conditions for pump installation, submit proposed changes with pump proposal and compliance submittal.
4. Head-capacity curves shall be constantly falling from shutoff head.
5. Brake horsepower of motors furnished shall not be exceeded at any point on the head-capacity performance curves.
6. Provide pump curves with efficiencies at corresponding speeds for each design point indicated.

C. General:
1. Open line shaft type vertical turbine pumps.
2. Above surface discharge heads.
3. Multiple stages, as required.
4. Easily accessible adjusting assembly shall be provided for vertical adjustment of pump shaft to properly position impellers.
5. Hydraulically stable both axially and radially at all outputs.
6. Capable of preventing damage to the pump or driver created by reverse rotation due to water receding in the discharge column or an upthrust condition (motor must include a non-reversing ratchet).
7. Provide locking plates or lock-tite on all bolts in the pump bowls or other portions of the pumps where the bolts can enter the pump suction if they become loose.
8. Accurately and carefully finish all pump surfaces in contact with the fluid.
9. Provide pumps with lifting lugs or eyebolts to lift the entire pump assembly.
10. Provide pumps and motors capable of operating with motor soft starts without any additional modifications.

D. Discharge Head:
1. Fabricated steel type.

2. Aboveground discharge head with shaft couplings above the stuffing box and machined bottom surface.
3. Provide flange discharge connections of 150-pound class, flat faced, as required, conforming to ANSI B16.5 for fabricated steel heads.
4. Adequate openings to permit easy access to the stuffing box and shaft coupling.
5. Include all necessary openings:
    a. For venting, drainage, water or oil lubrication, and other purposes.
    b. Tapped for standard pipe openings.
    c. Tap in flange for pressure gauge connection.
6. Design and construct the discharge head to carry the complete pump column, bowl and motor weight and completely cover the openings in the base plate.

E. Base Plate:
1. Cast-iron or fabricated steel type.
2. Designed to give rigid support to the total weight of the pump, motor, column, discharge head, and fittings.
3. Provided with an opening to permit removal of pump without requiring removal of base plate after grouting.
4. With machined surfaces of contact between discharge head and base plate.
5. Supplied with dowels, shims, bolts and all other devices required for proper installation, alignment and anchoring of units.

F. Mechanical Seal for Open Line Shaft:
1. A drive shaft of the same material as the line shaft shall extend through the sealing assembly of the discharge head and be connected using a shaft coupling above the stuffing box to permit easy field removal of the mechanical seal.
2. The shaft sealing assembly shall consist of a cast iron stuffing box, cast iron stuffing gland, bronze stuffing box bushing, and stainless steel stuffing gland, nut, bolts and mechanical seal.
    a. Stuffing box shall be suitable for installation of packing glands in the future.
    b. Stuffing box shall be rated for 1.5 times the maximum discharge pressure of the pump.
3. Discharge head openings shall be fitted with guards to prevent access to the rotating shaft and/or coupling.
4. Single cartridge type, rotary/stationary seal.
5. Hydraulically balanced, non-clog design.
6. Self-aligning stationary shell.
7. Statically pressure tested to 150% of the operating pressure.
8. Fitted for product lubrication.
9. Seal gland of one piece stainless steel, with 1/4-inch , vent, quench, and drain connections.
10. Seal springs shall be stainless steel.
11. Seal face materials:
    a. Primary Seal - Stationary face: Ceramic.
    b. Primary Seal - Rotating face: Carbon.

G. Bowl Assembly:
1. Constructed of cast iron with minimum tensile strength of 30,000 psi.
2. The bowls shall conform to ASTM A48 CL30.
3. Provide flanged bowl connections with bolted stage connections.

4. Enclose bronze or stainless steel impellers smoothly finished throughout, secured to a stainless steel impeller shaft using keys, tapered collets, or threaded-type lock collets to prevent loosening in the event of reverse rotation or thermal expansion.
5. With replaceable bronze or stainless steel bowl wear rings.
6. Impellers shall be statically and dynamically balanced to eliminate vibration.
7. Bronze or stainless steel bearings lubricated by liquid pumped.

H. Suction Bell:
1. Cast iron or ductile iron.
2. Design and size the suction bells to assure proper hydraulic performance under all operating conditions.
3. Provide flanges for connection of suction bell to the pump bowl.
4. Suction case bearings shall be bronze with permanently lubricated water-resistant grease
5. Provide suction bearing with sand collar.

I. Suction Strainer:
1. Provide pump with a basket type suction strainer of stainless steel.
2. The net open area of the strainer shall be not more than 75% of the minimum opening of the water passage through the bowl or impeller.
3. The length of strainer shall not prevent minimum submergence of the pump from being obtained.

J. Line Shaft:
1. Design and construct the pump line shaft to run without whip or vibration under all operating conditions.
2. Provide screwed shaft couplings of the same or better material as the line shaft.
3. Provide the line shafts with easily replaceable shaft sleeves at the lineshaft bearings.
4. Interchangeable sections having lengths not exceeding 10 feet. Provide bearings on a maximum of 5-foot centers.
5. Provide line shaft bearings of bronze, cut-less rubber, or Contracting Officer approved equal.

K. Discharge Column:
1. Discharge column pipe shall be steel with flanged connections.
2. Interchangeable sections having length not exceeding 10 feet.

2.2 Pump Motors

A. Shall be vertical solid-shaft motor.

B. Provide with non-reversing ratchet to prevent pump and motor damage during surge or reverse flow conditions.

C. All pump motors shall be inverter duty type and rated for use with variable frequency drives.

2.3 MATERIALS:

A. The materials specified below indicate a standard of quality. Substitutions may be made or recommended by manufacturer upon approval of Design-Builder and Owner, if deemed

necessary due to the quality of the fluid being pumped, start-up system flushing chemical additives, or other reasons.

1. Base plate: Carbon steel structural plate.
2. Discharge Head: Fabricated carbon steel.
3. Motor Stand: Fabricated carbon steel.
4. Discharge Column: ASTM A53 carbon steel pipe.
5. Bowl: ASTM A48 cast iron.
6. Wear Rings: Bronze or stainless steel.
7. Impellers: ASTM B584 bronze or stainless steel.
8. Suction Bell: ASTM A48 cast iron.
9. Line Shaft and Coupling: ASTM A276 Type 410 or 416 stainless steel.
10. Shaft Sleeves: ASTM A276, Type 416 with 350 minimum BHN, or Type 304 or Type 316.
11. Line Shaft Bearings: Cutless rubber.
12. Bowl Bearings: Bronze.
13. Suction Bell Bearing: Bronze.
14. Bolting: ASTM A276 Type 316 stainless steel.

2.4 PROTECTIVE COATINGS:

A. Shop Painting:
   1. Prepare surfaces to SSPC-SP10 standards.
   2. Prime and finish paint all iron and steel surfaces with a minimum of two (2) 5-mil DFT coats of Tnemec Pota-Pox Plus, Series N140 or approved equal.
   3. Coordinate coating colors with existing piping.
   4. All stainless steel or bronze surfaces shall not be painted.

B. Field Painting:
   1. Pump manufacturer shall supply an adequate quantity of touch-up paint.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Manufacturer's field representative shall submit guidelines for installation of pumps.

B. Manufacturer's field representative shall inspect Equipment after the Equipment has been installed and prior to start-up. A written report of the inspection shall be submitted to Contracting Officer within 7 days.

3.2 FIELD QUALITY CONTROL

A. As specified in DIVISION 1.

B. Conduct all site testing in the presence of Contracting Officer.

C. Manufacturer Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than 1 day on Site for installation, inspection, startup, field testing, and instructing Owner's personnel in operation and maintenance of equipment.

D. Equipment Tests:
   1. Check performance of all components as a functioning unit.
   2. Verify factory tests as well as possible with facilities available at the Site of installation.
   3. Check Vibration: Equipment vibration velocity shall be less than allowed by ANSI/HI 9.6. No exceptions shall be allowed.
      a. Test locations for vibration shall be in accordance with Hydraulic Institute Standards.
      b. If vibration exceeds the specified requirements, manufacturer shall adjust equipmentuntil vibration meets the specifications.
      c. Conduct all tests in the presence of authorized representatives of Owner and Design-Builder and submit written report to Owner and Design-Builder regarding tests performed and test results.

E. Operational Tests:
   1. Conduct such operational tests as necessary to determine that the performance of Equipment and controls is as specified.
   2. Tests will generally consist of placing Equipment in operation under varying conditions and observing performance.
   3. Check from proper vibration isolation, high bearing temperature, and temperature on seal.
   4. Check for motor overload, coordinate overload headers and MCP breaker settings.
   5. Measure flow, motor energy consumption, and discharge pressure and provide data to Contracting Officer in a field report.

F. Make all necessary Equipment adjustments and corrective work indicated by tests.

G. Submit a written test report to Contracting Officer showing operations performed and results obtained for each unit within 7 days of completion of all units tested.

3.3 INSPECTION:

A. Recheck all units for alignment after Equipment has been placed in operation forapproximately 30 days.

END OF SECTION 432139