Section 00 00 01 - Specifications

GENERAL SPECIFICATIONS

Sherando Lake Recreation Area Water System Replacement

1.1 SCOPE OF CONTRACT

A. This project consists of the construction of the water distribution system at Sherando Lake Recreation Area.

B. The work includes demolition of existing site features, installation of a new well pump, water storage tank rehabilitation, and installation of new water system distribution system as shown on the drawings.

1.2 PROJECT LOCATION

A. The project is located on George Washington and Jefferson National Forest in Augusta County, Virginia (37.919784, -79.006626). From I-64, take exit 96 just east of Stuarts Draft. Turn south onto State Route (SR) 624 and continue. At Lyndhurst Road, it changes to SR 664 but there is no distinct turn. Continue South on SR 664 for approximately 8 miles to the entrance to Sherando Recreation Area on the right.

1.3 SITE INFORMATION AND LIMITATIONS

A. The following site conditions are considered incidental to the contract, and the contractor will not be paid directly for any of the following items:

1. The gate to the recreation area will be closed to the public from November 1, 2026, to May 21, 2027. The public will still have access to the Lower Lake Angler Access Parking Area therefore the public may still be around on foot. Contractor will be responsible for signing and limiting public access to all work areas (e.g., demolition, construction, equipment and material storage, etc.). The contractor will be provided with a combination code to access the recreation area. It shall be the responsibility of the Contractor to keep this gate closed and locked to prevent the public from entering the recreation area by vehicle. It shall be the responsibility of the Contractor to ensure no public personal vehicles remain in the recreation area before leaving and locking the gate at the end of every workday.
2. Contractor shall provide warning signs at all trailheads leading into the area from the Lower Dam that will warn pedestrians of ongoing work.
3. Contractor will provide all materials and labor necessary to protect streams, wet or dry, during construction activities. The Contractor will be required to submit an erosion control plan and receive approval from the COR, in writing, prior to the beginning of construction.
4. All construction equipment shall be pressure washed before entering National Forest System lands. The removal of mud and debris from treads, tracks and undercarriage, with emphasis on axles, frame, cross-members, motor mounts, and underneath steps,

running boards, and front bumper/brush guard assemblies will be required. The purpose is to reduce or eliminate the transportation of noxious weeds, which is required by Federal and State regulations.

5. The Contractor shall locate all existing utilities at the site prior to any ground disturbing activities.
6. Contractor shall provide and maintain portable toilets for the use of their employees, any subcontractors, the C.O.R., Forest Service employees, and any visiting authorities/officials throughout the duration of the project.
7. The Contractor can access the 50 electric pedestals available in B/C loops and all host sites throughout the campground for work related to the project. All buildings will be locked during construction. The Contractor will need to work with the COR to ensure the electric pedestals are powered prior to use.

1.4 TRAFFIC CONTROL AND CONSTRUCTION SIGNING

A. No work that endangers, interferes, or conflicts with traffic or access to work sites shall be performed until a plan for satisfactory warning and handling of traffic has been submitted by the contractor and approved by the COR. Construction signing for traffic control shall conform to the Manual of Uniform Traffic Control Devices (MUTCD). All traffic control signs will be placed in areas adequate for a truck pulling a fifth wheel trailer to be turned around. Contractor shall not be paid directly for this item, rather it will be considered incidental to other items of work listed in the Schedule of Items.

1. The gate will be closed during construction preventing public vehicular use throughout the project site.

1.5 WORK CAMPS, STAGING AND STORAGE AREAS

A. Areas for staging operations and storage of materials shall be approved by the COR. The Contractor must request in writing for approval from the COR to stage materials or trailers (work **or housing**) on site a minimum of three (3) weeks prior to when the area is needed by the Contractor.

1.6 INSPECTION OF WORKSITE

A. The contractor acknowledges they have taken the necessary steps to ascertain the nature and location of work and have investigated and satisfied themselves as to the general and local conditions that can affect the work or its cost. Any failure of the contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from the responsibility of estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expenses to the government.

1.7 SPECIFICATIONS

A. The following specifications are attached. Some sections in the schedule of items refer to other sections not listed and are subsidiary to, or are included in payment for other pay

items in this contract. These items are considered incidental and no additional compensation will be made.

Section 010250 - Construction Staking
Section 011250 - Measurement And Payment
Section 011900 - Mobilization
Section 013300 - Submittal Procedures
Section 014100 - Quality Control
Section 023701 - Sediment And Erosion Control Measures
Section 024100 – Waste Material Disposal
Section 024102 – Removal and Disposal of Structures and Obstructions
Section 033000 - Cast-In-Place Concrete
Section 033020 - Concrete From Packaged Dry Mix For Minor Structures
Section 099013 – Interior Coating – Water Storage Tank
Section 099014 – Exterior Coating – Water Storage Tank
Section 099100 – Internal Ladder – Water Storage Tank
Section 133402 – Utility Vaults
Section 221100 - Water Distribution Systems
Section 221102 - Curb Valves And Boxes
Section 221103 – Plumbing Appurtenances
Section 221105 - Water Hydrants
Section 221220 – Submersible Well Pump
Section 260500 – Common Work Results for Electrical
Section 260519 – Low Voltage Electrical Power Conductors and CablesSection 260523 – Pump Controls and Control Voltage Electrical Power Cables
Section 260526 – Grounding and Bonding for Electrical Systems
Section 260533 – Raceways and Boxes for Electrical Systems
Section 260553 – Identification for Electrical Systems
Section 311000 - Clearing And Grubbing
Section 312000 - Earthwork
Section 321200 – Hot Mix Asphalt Paving
Section 321204 – Crushed Aggregate Base or Surface Course
Section 321216 – Asphalt Concrete Pavement Patching
Section 322705 – Pavement Sawing
Section 329206 – Seeding
Section 330523 – Utility Horizontal Directional Drilling

END OF SECTION C

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 010250 - CONSTRUCTION STAKING

PART 1 - GENERAL

1.1 SUMMARY

A. This work shall consist of the construction staking of utilities in accordance with the Drawings and Specifications. The work includes the furnishing of all labor, equipment, instruments, materials, transportation and other incidentals necessary to complete the construction staking in accordance with these specifications and acceptable engineering practice.

1.2 QUALITY CONTROL

A. Construction staking shall be accomplished under the direction of a Civil Engineer, Engineering Technician, or Land Surveyor closely associated and familiar with construction staking; periodic visits to the project site are required.

1.3 MEASUREMENT AND PAYMENT

A. Measurement shall be lump sum for surveying and staking the project through all phases of construction.

PART 2 - PRODUCTS

2.1 GOVERNMENT-FURNISHED SURVEY CONTROL SHEETS

A. The Government will provide the contractor with a set of survey control sheets showing horizontal and vertical control for site to be staked. The Government will provide the Contractor with layout information that will include:

1. Control Points - Northing, Easting, Existing Elevations.
2. Proposed Utility Lines - Northing, Easting, and Existing Ground Elevations for centerline of utilities (Water Line, Sewer Line, Electrical Lines) including but not limited to pipe ends, hydrants, and changes in direction.

2.2 STAKES

A. Identification stakes and hubs shall be of sufficient length and width to provide and set solid in the ground and to provide space for marking above ground when applicable. Other dimensions and materials may be used, such as steel reinforcing bars, wire flagging and markers, and metal pins, if approved in writing by the Contracting Officer's Representative (COR). The top 2 inches of all slope, guard, reference, clearing, and structure stakes shall be painted or marked with plastic flagging. Colors used on stakes or for flagging shall be as follows:

1. Waterlines, utilities, and culverts -Blue

2.3 SURVEY NOTE PAPER AND BOOKS

A. Paper for survey notes shall be moisture-resistant paper. Notes shall be contained in books with covers that will protect the contents and retain the pages in numerical sequence during field use. Field notebooks or note paper shall be furnished by the contractor by project closeout.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall be required to provide all necessary staking and control for all phases of construction. The contractor shall use the data and information shown on the project drawings to establish the location of all facilities and utilities to be constructed under this contract. The Contractor may choose any method of establishing horizontal and vertical controls provided the following minimum precision and accuracy requirements are met.

B. Accuracy requirements:

1. Minimum position close; 1/1000 of a foot
2. Vertical closure: 0.05 ft (vertical)/station (100 feet horizontal)
3. Cross section and slope stake precision:

a. Allowable deviation of cross section line projection from a true perpendicular to tangents, a true bisector of angle points, or a true radius of curves: +/-3 degrees.
b. Cross section topography measurements shall be taken so that variations in ground form a straight line connecting the cross-section points will not exceed: 1.0 ft.
c. Horizontal and vertical accuracy for slope stake, slope stake references, and clearing limits. In feet or percentage of horizontal distance measured form centerline or reference stake, whichever is greater. Slope reference stakes and slope stakes: 0.15 ft or 0.6%. Clearing limits: 1.0 ft.

3.2 ESTABLISHING AND REFERENCING IMPROVEMENT LOCATIONS

A. Waterline, Sewerline, & other Utilities

1. Waterline, Sewerline, & other Utilities shall be staked at the locations shown on the drawings with the specified minimum burial depth. Waterline and sewerline elevations shall be accurately staked to provide for drainage as indicated on the drawings. Grade stakes shall be established as necessary to provide the control for the construction work.

3.3 DISCREPANCIES

A. The contractor shall compare the staked centerline horizontal and vertical alignment with the design data. Differences between previously recorded and observed elevations of bench marks, including piping alignment points provided on Sheet CU-19 of the Contract Drawings shall be referred to the Contracting Officer's Representative. Differences in centerline profile elevations exceeding 1 foot at any two or more consecutive points shall be reported to the Contracting Officer's Representative for evaluation and possible revision. Staking of these areas shall be deferred until the Contacting Officer's Representative resolves these differences.

3.4 VERTICAL CONTROL

A. Vertical control for construction shall be as referenced on the Drawings.

3.5 MARKING STAKES

A. All stakes shall be legibly marked, in the format agreed upon with the Contracting Officer, with a stake pencil that leaves an imprinted or with waterproof ink. Marking shall conform to the nomenclature below;

RP	Reference point
P	P-line (preliminary location line)
L	L-line (final location line)
BM	Bench mark
TBM	Temporary bench mark
C	Cut
F	Fill
L	Centerline
W	Width

3.6 SURVEY NOTES

A. All survey data shall be neatly recorded in survey books. All survey notes shall become the property of the Forest Service. Errors shall be deleted by lining out. Date, crew names and positions, instrumentation, and weather shall be recorded in the notes at the beginning of each day's work. The party chief shall sign or initial each page of the notes immediately after the last entry for each day's work.

B. Electronically recorded survey notes shall be consecutively numbered and headed to identify the contents. The notes shall be supported and accompanied by a bound book that records the project name and for each day identifies date, crew names and positions, instrumentation, weather, type of survey, stationing of sections between which survey was performed, and survey data or sketched that cannot be electronically recorded. The party chief shall sign or initial the electronically recorded notes and Day Book immediately after the last entry for each day's work.

END OF SECTION 010250

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 011250 - MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Measurement and payment for contract work will be made only for and under those pay items included in the Schedule of Items. All other work, labor, materials, equipment, and incidentals necessary to successfully complete the project will be considered as included in the payment for items shown. This section defines the method of measurements and basis of payment for work items listed in the Schedule of Items.

B. When more than one class, size, type, thickness, etc. is specified in the Schedule of Items for any pay item, suffixes will be added to the item number to differentiate between the pay items.

1.2 DETERMINATION OF QUANTITIES

A. The following measurements and calculations shall be used to determine contract quantities for payment.

1. For individual construction items, longitudinal and lateral measurements for area computations shall be made horizontally or corrected to horizontal measurement unless otherwise specified. Measurements for geotextiles and erosion control blankets shall be along slope lines.
2. For excavation or embankment volumes, the average end area method shall be used to compute volumes. However, if in the judgment of the Contracting Officer’s Representative (COR), the average end area method is impractical, measurement shall be made by volume in hauling vehicles or by other three-dimensional methods.
3. For Structures, they shall be measured according to neat lines shown on the drawings or as altered by the COR, in writing, to fit field conditions.
4. For items that are measured by the linear foot, such as pipe culverts, fencing, guardrail, piping, utilities, and underdrains, measurements shall be made parallel to the base or foundation upon which the structures are placed.
5. For aggregates weighed for payment, the tonnage shall not be adjusted for moisture content, unless otherwise provided for.
6. For standard manufactured items (such as fence, wire, plates, rolled shapes, pipe conduits) identified by gauge, weight, section dimensions, and so forth, such identifications shall be considered the nominal weights or dimensions. Unless controlled by tolerances in cited specifications, manufacturer's tolerances shall be accepted.
7. For bituminous material, volumes will be measured at 60°F or will be corrected to the volume at 60°F by using ASTM D1250 for asphalts. Emulsified asphalt will be measured at 60°F, or measured by converting the gallonage at another temperature to gallonage at 60°F by means of the following formula:

$$\text{Gallons at } 60°F = \frac{\text{Gallons at } A°F}{1+0.00025\ (A°F - 60°F)}$$

* A°F is the temperature of the material at the time the gallonage is measured.

a. For vehicular shipments, net certified scale weights or weights based on certified volumes will be used as a basis of measurement. Measurements will be adjusted when bituminous material has been lost from the vehicle or the distributor, has been wasted, or has otherwise not been incorporated into this work. Determining true weights of hauling vehicles shall be made by weighing the empty vehicles at least once a day at the times the COR directs. Each vehicle shall bear a plainly legible identification mark.
b. When bituminous materials are shipped, net certified weights, or volume corrected for loss of foaming, can be used for computing quantities.

B. Earthwork Tolerances - Adjustments of horizontal or vertical alignment, within the tolerances specified in this contract, or shifts of balance points up to 100 feet shall be made by the contractor as necessary to produce the designed sections and to balance earthwork. Such adjustments shall not be considered as "Changes."

1.3 UNITS OF MEASUREMENT

A. Payment shall be by units defined and determined according to U.S. Standard measure and by the following:

1. Acre: Make longitudinal and transverse measurements for area computations horizontally.
2. Cubic Yard (CY): A measurement computed by one of the following methods:

   a. Excavation, Embankment, or Borrow. The measurement computed by the average end area method from measurements made longitudinally along a centerline or reference line.
   b. Material in Place or Stockpile. The measurement computed using the dimensions of the in-place material.
   c. Material in the Delivery Vehicle. The measurement computed using measurements of material in the hauling vehicles at the point of delivery. Vehicles shall be loaded to at least their water level capacity. Leveling of the loads may be required when vehicles arrive at the delivery point.

3. Each (EA): One complete unit, which may consist of one or more parts.
4. Hour (HR): Measurement will be for the actual number of hours (or fraction thereof) ordered by the Contracting Officer's Representative and performed by the Contractor.
5. Linear Foot (LF): Measurement of work along its length from point-to-point; parallel to the base or foundation. Do not measure overlaps.
6. Lump Sum (LS): One complete unit.
7. Square Foot (SF): Measured on a plane parallel to the surface being measured.

1.4 METHOD OF MEASUREMENT

A. One of the following methods of measurement for determining final payment is designated on the Schedule of Items for each pay item:

1. ACTUAL QUANTITIES (AQ) - These quantities are determined from actual measurements of completed work.
2. DESIGNED QUANTITIES (DQ) - These quantities denote the final number of units to be paid for under the terms of the contract. They are based upon the original design data available prior to advertising the project. Original design data include the preliminary survey information, design assumptions, calculations, drawings, and the presentation in the contract. Changes in the number of units shown in the Schedule of Items may be authorized under any of the following conditions:

    a. As a result of changes in the work authorized by the COR.
    b. As a result of the COR determining that errors exist in the original design that cause a pay item quantity to change by 15 percent or more.
    c. As a result of the Contractor submitting to the COR a written request showing evidence of errors in the original design that cause a pay item quantity to change by 15 percent or more. The evidence must be verifiable and consist of calculations, drawings, or other data that show how the designed quantity is believed to be in error.

3. LUMP SUM QUANTITIES (LSQ) - These quantities denote one complete unit of work as required by or described in the contract, including necessary materials, equipment, and labor to complete the job. They shall not be measured.

1.5 PRICE ADJUSTMENT (for Out-of-Specification Bituminous Materials)

A. Bituminous materials are defined as all types and grades of asphalt cement, liquid asphalt, emulsified asphalt, and dust oil.

B. If bituminous material fails one or more test requirements, and the Contracting Officer's Representative determines it is in the public interest to accept the material at a reduced price, the price reduction shall be based on the test results giving the largest percent price adjustment. The contractor may remove and replace the defective material or accept the adjustment.

C. The price reduction shall apply to all pay items affected.

D. Price adjustment will be based on samples taken in duplicate in accordance with AASHTO T40 under the supervision of the Contracting Officer's Representative. Samples shall be sent to an authorized laboratory. The laboratory shall test one of each duplicate sample and retain the other. When any test result is not within the specification limits, the laboratory shall immediately notify the Contractor, the supplier, and the Contracting Officer's Representative. The Contractor, after notifying the Contracting Officer's Representative, may check test the retained sample.

E. If the retained sample tests satisfactorily, the material will be accepted. If the retained sample also fails, the following schedule of price adjustments shall apply. The average of test values for the two samples will determine the basis for price adjustment, except when test results on the samples differ by more than the applicable AASHTO or ASTM

Repeatability Unit; then, the test result numerically nearest the specification requirement will be used. (A repeatability unit is defined as D2S or D2S% limit for single operator precision described in ASTM C670.)

F. The schedule of price adjustments shall not apply to the following tests:

Test	AASHTO Test Method
Spot Test	T102
Particle Charge	T59
Ductility	T51

G. Bituminous materials failing to meet specifications for these tests shall be removed and replaced.

H. See Table 011250-1 for the schedule of price adjustments for bituminous materials that do not meet specifications.

Table 011250-1

Schedule of Price Adjustments for Out-of-Specification Bituminous Materials.

Application	Deviation from Specification Limit Measured in Reproducibility Units*.			
	Less than 1	1 but less than 2	2 but less than 3	3 or more
Price reduction applicable to bituminous base course and pavement mixture or to seal coat and bituminous material paid for as a separate item.	0%	5%	25%	Remove & Replace
Price reduction applicable to bituminous material paid for as a separate item.	0%	10%	25%	Remove & Replace

* A reproducibility unit is defined as D2S or D2S% limit for multi-laboratory precision described in ASTM recommended practice C670.

The Sieve Test (AASHTO T59) results may be exempt from the Schedule of Price Adjustments provided the contractor's quality assurance program includes checking the uniformity of bituminous spread rates in increments no greater than 1 foot over the width of the spray bar and variation between increments is no greater than 5 percent.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 011250

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 011900 - MOBILIZATION

PART 1 - GENERAL

1.1 SUMMARY

A. This item is intended to compensate the Contractor for operations including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; for payment of premiums for bonds and insurance for the project; and for any other work and operations which must be performed or costs that must be incurred incident to the initiation of meaningful work at the site and for which payment is not otherwise provided for under the contract.

1.2 MEASUREMENT AND PAYMENT

A. The measurement shall be lump sum for mobilization. Payment shall be as follows:

1. Bond premiums will be reimbursed after receipt of the evidence of payment.
2. 50% of the lump sum, not to exceed 5% of the original contract amount, will be paid following completion of 5% of the original contract amount not including mobilization and bond premiums.
3. Payment of the remaining portion of the lump sum, up to 10% of the original contract amount, will be paid following completion of 10% of the original contract amount not including mobilization and bond premiums.
4. Any portion of the lump sum in excess of 10% of the original contract amount will be paid after final acceptance.
5. Progress payments for mobilization and preparatory work shall be subject to retainage.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 011900

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 013300 - 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 miscellaneous submittals. See Table 013300-1 for a summary of required submittals.

B. See other specification sections within this package for additional requirements on submittals.

1.2 SUBMITTAL PROCEDURES

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

1. 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. The Contracting Officer’s Representative (COR) reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. The Contractor shall utilize a project management information system (PMIS) for management of submittals in accordance with the Specifications for the Sherando Recreation Area Rehabilitation project.

C. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on COR 's receipt of submittal.

1. Initial Review: Allow 15 calendar days for initial review of each submittal. Allow additional time if processing must be delayed to enable coordination with subsequent submittals. COR will advise Contractor when a submittal being processed must be delayed for coordination.
2. If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Allow 15 days for processing each re-submittal.
4. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.

D. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space on label or beside title block to record Contractor's review and approval markings and action taken by COR .
3. Include the following information on label for processing and recording action taken:

a. Project name.
b. Date.
c. Name and address of Contractor.
d. Name of manufacturer.
e. Unique numeric or alpha-numeric identifier, including revision number.
f. Number and title of appropriate Specification Section.
g. Drawing number and detail references, as appropriate.
h. If more than one item is shown on submittal sheet, identify item.

E. Deviations: Highlight, encircle, and individually list any deviations from the Contract Documents on submittals.

F. Additional Copies: Unless additional copies are required for final submittal, and unless COR observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.

G. Use for Construction: Use only final submittals with mark indicating action taken by COR in connection with construction.

1.3 MEASUREMENT AND PAYMENT

A. No separate measurement and/or payment will be made for this section. Payment shall be included with work shown in the schedule of items.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS – (Submittals requiring COR approval)

A. General: Prepare and submit Action Submittals required by this Section or other individual Specification Sections.

1. Contractor shall provide all returned submittals in a single digital collection at project close-out.

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

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Manufacturer's written recommendations.
b. Manufacturer's product specifications.
c. Manufacturer's installation instructions.
d. Manufacturer's catalog cuts.
e. Wiring diagrams showing factory-installed wiring.
f. Compliance with recognized trade association standards.
g. Compliance with recognized testing agency standards.

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

1. Preparation: Include the following information, as applicable:

a. Dimensions.
b. Identification of products.
c. Fabrication and installation drawings.
d. Roughing-in and setting diagrams.
e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
f. Notation of dimensions established by field measurement.

2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

D. Contractor's Construction Schedule: The contractor shall submit a Construction Schedule, for approval by COR, in accordance with the contract provisions at least three calendar weeks prior to the commencement of work.

E. Samples: Prepare physical units of materials or products, including the following:

1. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

2.2 INFORMATIONAL SUBMITTALS – (Submittals NOT requiring COR approval)

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

1. Contractor shall provide all returned submittals in a single digital collection at project close-out.
2. Certificates and Certifications: Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
3. Test and Inspection Reports: Comply with requirements in Section 014100 "Quality Control."

B. 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.

C. 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.

D. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment and assemble an Operation and Maintenance Manual for the water system.

E. 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.

PART 3 - EXECUTION

3.1 GENERAL

A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with Contractor's approval stamp before submitting to COR.

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

C. COR will not review submittals that do not bear Contractor's approval stamp.

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

E. Substitutions – Whenever materials, products, and equipment are listed by name or brand in the specifications and/or on the drawings, it is used as a measure of quality, utility, or standard. If the Contractor prefers to use any other brand or manufacturer of same quality, appearance and utility to that specified, he shall request substitution as provided below, not less than 30 days before the planned installation of the item. The Contracting Officer's Representative will approve or disapprove the request for substitution.

F. Requests for substitutions will only be considered if contractor submits the following:

1. Complete technical data including drawings, complete performance specifications, test data, samples and performance tests of the article proposed for substitution. Submit additional information if required by Contracting Officer's Representative. All items of the above information shall be circled, tagged, or marked in some way to indicate all deviations or differences between the proposed item and the originally specified item.
2. Similar data as above for item originally specified. All items shall be marked to identify where/how the proposed substitution will differ.
3. A statement by the Contractor that the proposed substitution is in full compliance with the contract documents, applicable codes, and laws.
4. The Contractor shall be responsible for any effect upon related work in the project for any substitution and shall pay any additional costs generated by any substitutions.

3.2 SUBMITTAL SCHEDULE – Submittals shall be made as required by and called for in the drawings and specifications. The following table is a summary of the required submittals for the project - the table is to assist the Contractor and may not be all inclusive – additional submittals may be required by other specific specification sections.

TABLE 013000-1

Spec. Section	Section Title	Subsection	Required Submittal
013300	Submittal Procedures	2.1D	Construction Schedule
014100	Quality Control	1.3 A	Contractor Quality Control Plan
014100	Quality Control	1.3 B	Permits, Licenses, and Certificates
014100	Quality Control	1.3 C	Test and Inspection Reports
014100	Quality Control	1.3 D	As-Built Drawings
023701	Sediment & Erosion Control Measures	1.2A	Sediment & Erosion Control Plan Stormwater Pollution Prevention Plan Construction General Permit Coverage Letter
033000	Cast-in-Place Concrete	1.3A	Product Data
033000	Cast-in-Place Concrete	1.3B	Design Mix
033000	Cast-in-Place Concrete	1.3C	Shop Drawings
033000	Cast-in-Place Concrete	1.3D	Field Quality-Control Test Reports and Cylinder Break Results
133402	Utility Boxes	1.3A	Concrete Box and Lid Data, Insulation Data
133402	Utility Boxes	1.3B	Box and Lid Shop Drawings
133402	Utility Boxes	1.3C	Product Certificates
221100	Water Distribution Systems	1.4A	Product Data for all supply and distribution system components
221100	Water Distribution Systems	1.4B	Water Disposal Plan
221100	Water Distribution Systems	1.4C	Operation and Maintenance Data for each component
221100	Water Distribution Systems	1.4D	Operation and Maintenance Manual for entire system
221102	Curb Valves and Boxes	1.4A	Product Data for curb valves and boxes
221102	Curb Valves and Boxes	1.4B	Operation and Maintenance Data for curb valves and boxes
221103	Plumbing Appurtenances	1.2A	Product Data for all plumbing components
221103	Plumbing Appurtenances	1.2B	Operation and Maintenance Data for all plumbing components
221105	Water Hydrants	1.3A	Product data for yard hydrants, vacuum breakers, hose bibs, and water fill towers
221105	Water Hydrants	1.3B	Washed Rock Certification
221105	Water Hydrants	1.3C	Maintenance Data
221120	Submersible Well Pumps	1.2A	Product Data
260500	Common Work Results for Electrical	1.2A	Product Data

Specifications - Water Distribution System 2(b)

Spec. Section	Section Title	Subsection	Required Submittal
260519	Low-Voltage Electrical Power Conductors and Cables	1.3A	Product Data
260519	Low-Voltage Electrical Power Conductors and Cables	1.3B	Field Quality Control Reports
260523	Pump Controls and Control-Voltage Electrical Power Cables	1.2A	Field Quality Control Reports
260523	Pumps Controls and Control-Voltage Electrical Power Cables	1.2B	Product Data and Description of Control Logic
260523	Pump Controls and Control-Voltage Electrical Power Cables	1.2C	Pressure Transducer Product Data
312000	Earthwork	1.3A	Pipe Zone Material and Backfill Certifications
312000	Earthwork	1.3A	Sieve Analysis
312000	Earthwork	1.3B	De-watering plan
321200	Hot Mix Asphalt Paving	1.3A	Product Data
321200	Hot Mix Asphalt Paving	1.3B	Job Mix Design
321200	Hot Mix Asphalt Paving	1.3C	Material Certificate
321204	Crushed Aggregate Base or Surface Course	1.2A	Aggregate Base – Source, Gradation, Material Properties
321204	Crushed Aggregate Base or Surface Course	1.2B	Compaction Test Results and Proctor
330523	Utility Horizontal Directional Drilling	1.4A	Drilling Plan
330523	Utility Horizontal Directional Drilling	1.4B	Drilling Log

END OF SECTION 013300

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 014100 - QUALITY CONTROL

PART 1 - GENERAL

1.1 This work shall consist of providing quality control in conformance with the inspection, testing, and product certification requirements of this contract to ensure compliance with the drawings and specifications. The Contractor shall provide all personnel, equipment, tests, and reports necessary to meet the requirements of the contract.

1.2 QUALITY CONTROL

A. The Contractor shall provide and maintain a quality control system that will ensure all services, supplies, and construction work required under this contract conforms to the contract requirements. The Contractor shall perform, or cause to be performed, the sampling, inspection, and testing required to substantiate that all services, supplies, and construction conform to the contract requirements.

B. Special Tests and Inspections: Contractor will engage a testing agency to conduct required special tests and inspections. The Contractor shall authorize the testing agency to perform the required testing and inspections on the work completed. The authority shall include:

1. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
2. Testing agency will re-test and re-inspect corrected work.

C. Retesting/Reinspecting: Contractor shall provide quality-control services for retesting and reinspection for replaced construction work or for work that failed to comply with the requirements under the contract.

1.3 SUBMITTALS

A. Contractor Quality Control Plan

B. Permits, Licenses, and Certificates

C. Test and Inspection Reports

D. As-Built Drawings

1.4 MEASUREMENT AND PAYMENT

A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 QUALITY CONTROL SYSTEM

A. General: Perform required testing, inspections, sampling, and similar services per direction specified in the contract drawings and specifications and in accordance with established industry standards.

3.2 CONTRACTOR QUALITY CONTROL PLAN

A. At the time of the preconstruction conference, the Contractor shall submit for approval a written Contractor Quality Control Plan.

1. If the plan requires any revisions or corrections, the Contractor shall resubmit the plan within 10 days.
2. The Government reserves the right to require changes in the plan during the contract period as necessary.
3. No change in the approved plan may be made without written concurrence by the Contracting Officer’s Representative.
4. At a minimum, the plan shall include the following:

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

3.3 TEST AND INSPECTION REPORTS

A. Submit three copies of complete test results no later than three calendar days after the test was performed.

B. Submit failing test results and proposed remedial actions within four hours of noted deficiency.

C. Testing and Inspection Reports shall include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples, tests, or inspections.
5. Names of individuals performing tests and inspections.
6. Reference Specification Section(s).
7. Complete test or inspection data.

8. Test and inspection results and an interpretation of test results.
9. Ambient conditions at time sample was taken, tested, or inspected.
10. Comments or professional opinion on whether tested or inspected work complies with the Contract Document requirements.
11. Name and signature of laboratory inspector.
12. Recommendations on retesting and reinspecting.

3.4 PERMITS, LICENSES, AND CERTIFICATES

A. For Contracting Officer's Representative's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations relevant to the performance of the work.

3.5 AS-BUILT DRAWINGS

A. The Contractor shall maintain a set of the contract drawings depicting as-built conditions. These drawings shall be maintained in a current condition and shall be available for review. All variations from the original contract drawings shall be indicated in red on the drawings. Upon completion of the contract work, as-built drawings shall be submitted to the Contracting Officer's Representative in both hard copy and digital copy.

3.6 SAMPLING, TESTING, AND CERTIFICATION REQUIREMENTS

A. Sampling, testing, and Certification requirements and frequency for specific items shall be as specified in the drawings and specification. The following table is a summary of the required sampling, testing, and certification for the project - the table is to assist the Contractor, but may not be all inclusive – additional submittals may be required by specific specification section:

B.

TABLE 014100-1

Item	Subsection	Certification or Test Required	Frequency
033000	2.13	Mixing and Delivery	Each Truck
033000	3.13	Concrete – Slump, Air, Temperature	1 composite per truck load delivered
033000	3.13	Concrete - Compression Test Specimens	at 7 days and 28 days (see spec)
221100	3.2O	HDPE Pipe - Bent Strap Test	Once Daily
221100	3.7A	Hydrostatic Testing of Water System	See Spec.
221100	3.7B	Pressure and Leakage Test – Water Line	See Spec.
221100	3.8A	Bacteriological Examination	After disinfection, before use

TABLE 014100-1			
Item	Subsection	Certification or Test Required	Frequency
260523	3.6A	Verify Working Operations	After completion of control system
312000	3.13C	Compaction Test – at Pipe Zone	One per 600 Feet of Trench
312000	3.13C	Compaction Test – at Pipe Zone	One test – at each road crossing
312000	3.13D	Compaction Test – above Pipe Zone	One per 600 Feet of Trench
312000	3.13D	Compaction Test – above Pipe Zone	One test every other lift – at each road crossing
312000	3.13I	Tracer Wire Conductivity Test	Until Passing
312000	3.16A	Compaction Test – Backfill/Fills	One per Tank, Utility Building or Utility Box
312000	3.19B	Compaction Test – Exterior Concrete Slabs	1 per slab
321200	3.10B	Gradation and Asphalt Content	One per 700 tons or Min. of 1 per Project
321200	3.10C	Field Density Tests – Asphalt	One test for every 300 sq. yd. of pavement
321204	3.4A	Compaction Tests – Road Base and Surface Course	One test for every 300 sq. yd. of aggregate
321204	3.4A	Compaction Tests – Aggregate Base for Concrete Slabs	One test for each hydrant pad

END OF SECTION 014100

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 023701 - SEDIMENT AND EROSION CONTROL MEASURES

PART 1 - GENERAL

1.1 The work under this section consists of furnishing all necessary labor, equipment, materials, and performing all operations in connection with construction sediment and erosion control design, permitting, implementation, and removal .

A. General

1. All erosion and sediment control shall be in accordance with the GENERAL VPDES PERMIT FOR DISCHARGES OF STORMWATER FROM CONSTRUCTION ACTIVITIES ("VPDES Permit") and all the associated site-specific supporting documents. Coverage under the VPDES Permit shall be obtained from the Virginia Department of Environmental Quality (VDEQ) by the Contractor.
2. The Contractor shall be solely responsible for ensuring that erosion and sediment control measures are implemented, maintained, and ultimately removed at the site.
3. Soil disturbing activities include but are not limited to: Clearing and grubbing, excavation for utilities and foundations, construction or modification of site drainage, grading, and preparation for final seeding.

1.2 SUBMITTALS

A. The Contractor shall be required to submit a sediment and erosion control plan that has been approved by VDEQ as part of the VPDES Permit to the Contracting Officer's Representative 2 weeks prior to start of work.

B. Product data:

1. Submit product data for approval for all erosion or sediment control products.
2. Any product found installed without an approved submittal will be removed immediately and replaced with acceptable measures at the Contractor's expense.

1.3 PERMITS

A. The Contractor shall obtain and pay all associated costs for coverage under the GENERAL VPDES PERMIT FOR DISCHARGES OF STORMWATER FROM CONSTRUCTION ACTIVITIES.

1.4 MEASUREMENT AND PAYMENT

A. Payment will be lump sum for development, submittal, approval, implementation, and ultimate removal of the erosion and sediment control plan and VPDES permit.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

A. Netting of any kind is strictly prohibited on this project unless *specifically required in writing* by VDEQ during the VPDES Permit review process. If VDEQ specifically requires in writing the use of netting, netting shall be loose-woven with moveable joints (i.e., joints shall not be knotted or otherwise fixed) such as leno or gauze weave. Openings in netting shall be elongated (e.g., rectangular) instead of square.

B. The use of erosion or sediment control products that incorporate plastic, synthetic, or metal wire materials is strictly prohibited. Only 100% biodegradable, natural fibers are permitted on this project.

C. Use seed and mulch techniques instead of erosion control mats or blankets, unless mats or blankets are specifically required in writing by VDEQ, Where a mat or blanket is required, the top, bottom, and sides shall be trenched at least 6 inches deep into the soil and backfilled. Mats/blankets must be securely pinned to the ground along edges and periodically in the field (middle area) using wood or other biodegradable anchor pins; no plastic or metal pins may be used.

PART 3 - EXECUTION

3.1 CONSTRUCTION

A. Maintain and remove all erosion controls as specified.

B. Temporary seeding shall be placed on exposed surfaces that will not be brought to final grading or permanent cover treatment within 30 days of the exposure to reduce erosion and sedimentation by stabilizing exposed soils. Seeded areas shall be checked regularly for bare spots, washouts, and healthy growth to assure that a good stand of grass is being maintained. Reseed areas that fail to establish vegetation cover as soon as such areas are identified.

C. Contractor shall remove temporary erosion/sediment controls as soon as possible upon establishment of acceptable vegetative cover in accordance with the VPDES Permit.

3.2 MAINTENANCE

A. Inspection shall be frequent, and repair or replacement shall be made promptly as needed.

END OF SECTION 023701

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 024100 - WASTE MATERIAL DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the loading, handling, hauling, and placing of excess excavation material, unsuitable excavation material, clearing and grubbing debris, and construction and demolition debris.

1.2 MEASUREMENT AND PAYMENT

A. Payment will be made in CY for material that is hauled off site and described in Section 3.1, below. No payment will be made for Section 3.2, below, with this pay item. See Section 024102 for payment associated with items in 3.2.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION

3.1 WASTE MATERIAL TO BE HAULED TO A DISPOSAL AREA

A. All excavated material not used in the construction of embankments or backfilling of trenches, or other excess material resulting from the excavation and embankment operation shall be hauled to a disposal area that is located -off Federal Lands, in accordance with all applicable regulations. Materials removed from the project site become the property of the Contractor at the time of removal.

B. The COR will have the first right of refusal for salvaging boulders 2’x2’x2’ and larger. If the COR decides the boulder shall be salvaged, the Contractor shall deliver boulder to a single predetermined on-site location. All unsuitable excavated material, and any boulders that are rejected by the COR, shall be transported and disposed of in accordance with Section 3.1.A, above.

C. The Government is not responsible for removed materials upon its departure from the project site.

3.2 WASTE MATERIAL TO BE HAULED TO A LANDFILL

A. All demolition materials, garbage, and other refuse generated shall be removed from the project site and legally disposed off Government property in an approved landfill.

B. The contractor is responsible for all costs and permits associated with landfill disposal.

C. The Government is not responsible for waste material upon its departure from the project site.

END OF SECTION 024100

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 024102 - REMOVAL AND DISPOSAL OF STRUCTURES AND OBSTRUCTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes removal, disposal, and backfilling of existing water lines and appurtenances, valves, vaults, pavement, concrete, walkways, hydrants, and all other items related to the existing water distribution system unless otherwise shown on the Drawings. This item also includes scarifying and regrading the area around features and structures removed. Items shall only be removed when they conflict with the proposed construction unless otherwise noted on the Drawings.

B. Related Sections Include the Following:

1. Section 024100 “Waste Material Disposal.”
2. Section 312000 “Earthwork”
3. Section 329206 “Seeding.”

1.2 MEASUREMENT AND PAYMENT

A. Payment will be lump sum for removal and disposal of structures and obstructions, including demolition, excavation, backfill, removal, hauling and all incidentals and work required to complete this item.

PART 2 - PRODUCTS

2.1 SELECT BACKFILL

A. Select backfill shall be native or imported soil, sand, or granular soil free of stones larger than 6 inches in greatest dimension.

PART 3 - EXECUTION

3.1 SALVAGE

A. Items to be salvaged include:

1. Any items to be salvaged will be removed by the Forest Service prior to construction work beginning.

3.2 GENERAL

A. Topsoil stripping and storage, if required, shall comply with the applicable specification.

B. The Contractor may use any means to remove the structures or items shown on the Drawings to be removed, as long as the safety of the public is provided and all surrounding site, structures, and utilities are protected.

C. All of a substructure shall be demolished to a depth of 1 foot below the present ground level at the structure. All materials to be removed shall be disposed of off-site in accordance with all regulations. All other structures shall be backfilled and the surrounding ground restored to as near surrounding grade and conditions as practicable in accordance with these specifications. In locations where the ABAAS is applicable, all finished grades and transitions shall be in compliance with the ABAAS.

D. Any existing water system appurtenance shall be removed prior to perforating the bottom of the existing vault, and filling with open-graded, self-compacting aggregate (such as #57 stone) up to 1' below surface, and then match the surrounding surface and grade in a manner that will promote proper drainage and will not allow the accumulation of standing water.

E. Backfill for removed items may be excess material from other excavation or borrow from an approved source.

1. Backfill shall be brought up in 12-inch compacted layers.
2. Compaction shall be by mechanical tampers, with at least three passes over the entire surface.
3. Maximum size of rock in backfill shall be 6 inches.
4. Backfill shall be compacted and rounded 6 inches above the natural ground.
5. If the backfill is not in an existing roadway or parking area, and at least 20 feet away from any proposed structure, the backfill shall be as specified above, except backfill shall be graded to blend with the natural ground and each layer compacted to **85 percent** of the optimum dry density determined by AASHTO T-99, Method C.
6. In areas where backfill is in graveled or paved surface roadways, or within 20 feet of a proposed structure, the backfill shall be as specified above, except it shall be terminated at the grade shown on the drawings and each layer compacted to **95 percent** of the optimum dry density determined by AASHTO T-99, Method C. Completion of backfill shall be in accordance with the applicable surfacing specifications.
7. When topsoil replacement is required, backfill and compaction shall be as specified above, except the backfill shall terminate 6 inches below the natural ground. Placement of topsoil, when required, shall comply with the applicable specification.

F. Excessive settlement or other evidence of improper backfill shall be corrected by reopening the excavation to the depth required for proper refilling and compaction.

3.3 DISPOSAL

A. Disposal of all materials shall comply with Section 024100 “Waste Material Disposal.”

3.4 FINISHING AND CLEANUP

A. After the area has been backfilled, the disturbed area shall be finish graded to present a natural appearance and cleaned up by removing all debris and materials left from the removal of items in this Section.

3.5 SEEDING

A. Seeding, if required, shall comply with Section 329206 “Seeding.” Seeding shall be required in any area where grass existed prior to construction disturbance.

END OF SECTION 024102

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground/granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.3 SUBMITTALS

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

B. Design Mixtures: For each concrete mixture. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings when project design requires special consideration.

D. Field quality-control test reports.

1.4 MEASUREMENT AND PAYMENT

A. There will be no separate measurement or payment for work in this section. Payment will be included at the contract unit price for items shown on the Schedule of Items.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

    a. Structural 1, B-B or better; mill oiled and edge sealed.
    b. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
2. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Plain-Steel Wire: ASTM A 82, as drawn.

C. Deformed-Steel Wire: ASTM A 496.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type II.

B. Normal-Weight Aggregates: ASTM C 33, graded, from a single source.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

D. Fly ash, ground iron blast-furnace slag, or silica fume may partially replace cement in any mix as follows:

1. Fly Ash:

   a. Class F – Not more than 20 percent of the minimum mass of portland cement may be replaced with class F fly ash.
   b. Class C – Not more than 25 percent of the minimum mass of portland cement may be replaced with class C fly ash.

2. Ground Iron Blast-Furnace Slag: Not more than 25 percent of the minimum mass of portland cement may be replaced with ground iron blast-furnace slag.
3. Silica Fume (microsilica): Not more than 10 percent of the minimum mass of portland cement may be replaced with silica fume.
4. Additionally, fly ash, slag, and silica fume will constitute no more than 50 percent of the total replacement weight.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Retarding Admixture: ASTM C 494/C 494M, Type B.

C. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.

1. Color: As selected by Contracting Officer’s Representative from manufacturer's full range.

D. Synthetic Fiber: Monofilament or fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches long.

2.6 VAPOR RETARDERS

A. Plastic Vapor Retarder: ASTM E 1745, Class C, or polyethylene sheet, ASTM D 4397, not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch

sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.7 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating or nondissipating. Liquid Membrane-Forming Compounds. Material shall be certified by curing compound manufacturer to not interfere with bonding of floor covering.

2.8 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.9 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than **4100 psi** at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than **5000 psi** at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

D. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3500 psi at 28 days.
2. Minimum Cementitious Materials Content: 540 lb/cu. yd.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 5 percent, plus or minus 1 percent at point of delivery for 1-inch nominal maximum aggregate size.
5. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
6. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate.

2.12 FABRICATING REINFORCEMENT

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

2.13 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer or round exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

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

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 48 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Contracting Officer’s Representative.

3.4 VAPOR RETARDERS

A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by the Contracting Officer’s Representative.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Joints shall be spaced 24 to 30 times the thickness of the slab, or as shown on the drawings. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks. **No Sawed Joints are allowed on concrete exposed to freezing**.

D. Expansion Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

A. As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

B. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane.
2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot- long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/8 inch.

D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, walkways steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Contracting Officer before application.

3.10 MISCELLANEOUS CONCRETE ITEMS

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

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

3.11 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist

cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

    a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

    a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

3.12 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Contracting Officer’s Representative. Remove and replace concrete that cannot be repaired and patched to Contracting Officer's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Contracting Officer’s Representative.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Contracting Officer's Representative's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Contracting Officer's Representative's approval.

3.13 FIELD QUALITY CONTROL

A. Testing and Inspecting: Contractor will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: See Table 014100-1 in Section 014100. A composite sample set consists of one slump test, one air entrainment test, and one temperature test.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample. Perform additional tests when concrete consistency appears to change or water is added.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete;one test for each composite sample.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M. Cast and laboratory cure one set of three standard cylinder specimens for every 30 cubic yards delivered.

    a. Compressive-Strength Tests: ASTM C 39/C 39M; test one of three laboratory-cured specimens at 7 days and one specimen at 28 days. If either previous tests fail, test third specimen at 28 days.
    b. Strength of each batch delivered will be satisfactory if 28-day compressive-strength tests equals or exceeds specified compressive strength.

C. Test results shall be reported in writing to Contracting Officer's Representative and Contractor within 48 hours of testing. Reports shall contain project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

E. Correct deficiencies in the work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION 033000

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 033020 - CONCRETE FROM PACKAGED DRY MIX FOR MINOR STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes constructing small concrete structures such as thrust blocks.

1. Thrust blocks shall be included on any mainline pipe 4” in diameter and larger. Thrust blocks shall be installed at all 90’s and tees and constructed as shown on the detail in the Drawings.

1.2 MEASUREMENT AND PAYMENT

A. There will be no separate measurement or payment for work in this Section. Concrete from packaged dry mix is considered incidental to other items of work shown in the Schedule of Items.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete Dry Mix:

1. Design: ASTM C 387, made using dry pre-portioned, blended and bagged mix.
2. Minimum 28-day Compressive Strength: 4000 psi
3. Product: Sakrete Concrete Mix, as manufactured by US Mix Products Company, or an approved equal.

B. All reinforcement bars shall be deformed billet steel conforming to the requirement of ASTM A615, Grade 60.

C. Water: Clean and free from alkali and other deleterious materials.

PART 3 - EXECUTION

3.1 CONCRETE INSTALLATION

A. Mixing:

1. Mix dry concrete and water thoroughly according to the manufacturer. Do not place dry concrete directly into the excavation prior to mixing with water.
2. Mixing Equipment: Mechanical mixer or wheelbarrow.
3. Place concrete while fresh; any concrete in which initial set has begun shall be wasted.

B. Placing: Place the fresh concrete in the forms and work as necessary to remove the air pockets.

1. Place thrust blocks according to the Drawings.

C. Finishing: Apply medium trowel finish to exposed concrete surfaces.

D. Protection From Cold: Keep the air temperature surrounding the fresh concrete above 40ºF for a period of five days after the concrete is placed.

E. Curing: If determined necessary by the Contracting Officer's Representative, cover exposed surfaces with plastic sheeting after the concrete has taken its initial set.

END OF SECTION 033020

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 099013 – INTERIOR COATING – WATER STORAGE TANK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Surface preparation for and field application of a protective interior coating system for welded steel potable water storage tanks.
2. Quality control, holiday detection and correction, and curing procedures.

B. Related Sections include the following:

1. 099014 – Exterior Coating – Water Storage Tank
2. 099100 – Internal Ladder – Water Storage Tank
3. 221100 – Water Distribution Systems
4. 221103 – Plumbing Appurtenances

1.2 DEFINITIONS

A. PFAS-Free: Products that contain zero per- or polyfluoroalkyl substances, including no Polytetrafluoroethylene (PTFE), fluorinated polymers, or fluorosurfactants.

B. Potable water, or drinking water, or potable drinking water: Water that is safe and intended for human consumption.

1.3 SUBMITTALS

A. Product Data:

1. For all products used.
2. Submit manufacturer’s technical data sheets, coating system data, and application instructions.

B. Certifications:

1. Submit manufacturer’s official certification that all products are certified to NSF/ANSI 61-2025 for health effects and NSF/ANSI 372-2024 as lead-free and safe for use in drinking water storage.
2. Submit manufacturer’s official certification that all products are PFAS-Free.
3. Certification of compliance with VOC limits.
4. Manufacturer’s written certification that the selected system is compliant with AWWA D102 Interior Coating System requirements.

1.4 REFERENCES

A. AWWA D100 – Welded Carbon Steel Tanks for Water Storage

B. AWWA D102 – Coating Steel Water-Storage Tanks

C. AWWA D104 – Automatically Controlled, Impressed-Current Cathodic Protection for the Interior Submerged Surfaces of Steel Water Storage Tanks

D. AWWA D106 – Sacrificial Anode Cathodic Protection Systems for the Interior Submerged Surfaces of Steel Water Storage Tanks

E. AWWA C652 – Disinfection of Water Storage Facilities

F. AWWA C655 – Field Dechlorination

G.

NACE SP0188 – Holiday Detection of Protective Coatings

H. NSF/ANSI 61-2025 – Drinking Water System Components – Health Effects

I. NSF/ANSI 372-2024 – Drinking Water System Components – Lead Content

J. NSF/ANSI 600-2024 – Health Effects Evaluation and Criteria for Chemicals in Drinking Water

K. SSPC/AMPP: The Society of Protective Coatings Standards

L. SSPC-PA1: Shop, Field, and Maintenance Painting of Steel

M. SSPC-PA2: Procedure for Determining Conformance to Dry Coating Thickness Requirements

N. The “Ten States Standards” (officially the *Recommended Standards for Water Works*)

O. The Virginia Plumbing Code, Current Edition

P. The Uniform Statewide Building Code, Current Edition

Q. 12VAC5-590 – Virginia Administrative Code – Virginia Waterworks Regulations

1.5 ENVIRONMENTAL CONDITIONS

A. Product shall be applied in accordance with manufacturer temperature and humidity recommendations. Coating shall not be applied to wet or damp surfaces.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: A firm with a minimum of five years documented experience in applying potable drinking water storage tank interior coatings.

B. Pre-Installation Conference: Conduct a mandatory meeting on-site with the Owner, Contractor, Coating Applicator, and Manufacturer’s Technical Representative prior to commencing work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver coatings in original, unopened containers with manufacturer's labels intact.

B. Store materials in an enclosed, climate-controlled area in accordance with manufacturer's recommendations.

1.8 MEASUREMENT AND PAYMENT

A. Water Storage Tank Re-Coating - Lump Sum including full compensation for all labor, materials, and incidentals necessary to complete the work. Work shall include preparing the storage tank by removing the existing coating and making any needed welding repairs to the Tank. The Tank is a 24,000 gallon aboveground steel storage tank with two 30-inch manways The nominal tank diameter is 16 feet and the nominal wall height is 16 feet. The tank has a domed roof as shown on the Drawings.

PART 2 - PRODUCTS

2.1 GENERAL

A. All components, materials, and products that will be in contact with source water or drinking water shall be certified to NSF/ANSI 61-2025 for health effects imparted to drinking water and to NSF/ANSI 372-2024 as lead-free and safe for the storage of drinking water.

B. All materials, equipment, and construction/application methods, including decontamination and de-chlorination, for this drinking water system must fully comply with the **Virginia Uniform Statewide Building Code (USBC)**, the **Virginia Plumbing Code (VPC)**, and the **Recommended Standards for Water Works (Ten State Standards)**. In cases of overlapping or conflicting requirements, the most stringent specification shall govern.

C. All products shall be PFAS-Free.

D. All components, materials, and products shall comply with the requirements for interior coatings included in AWWA D102, AWWA D104, and AWWA D106 for the storage of drinking water.

E. The materials referred to by trade name, make, or catalog number on the drawings shall be regarded as establishing a minimum standard of quality; substitutions of equal or greater quality can be made by submitting a data sheet of the proposed substituted item to the COR, for approval.

F. Color shall be white or off-white.

2.2 MATERIALS

A. Interior Coating System (Potable Water):

1. Type: High-performance, heavy-duty, immersion-grade, ultra-high-solids epoxy or 100% solids epoxy coating for long-term corrosion resistance.
2. Volatile Organic Compounds (VOC): Maximum VOC content shall be in accordance with NSF/ANSI 61-2025 and NSF/ANSI 372-2024.
3. Number of Coats: Minimum 2 to 3 coats.
4. Dry Film Thickness (DFT): Total minimum system thickness of 12.0 to 16.0 mils.

PART 3 - EXECUTION

3.1 GENERAL

A. All work shall be performed in accordance with the requirements for interior coatings included in AWWA D102 for the storage of drinking water.

3.2 EXAMINATION

A. Verify that all interior welding, grinding, and structural steel preparations are complete and approved prior to abrasive blasting.

3.3 SURFACE PREPARATION

A. Abrasive Blast Cleaning: All interior steel surfaces shall be prepared in accordance with SSPC/AMPP standards.

B. Profile: Blast clean to SSPC-SP10 / NACE No. 2 (Near-white Blast Cleaned Surface) with a sharp, angular surface profile of 2.5 to 3.5 mils.

C. Cleanliness: Remove all abrasive residue and dust from surfaces via industrial vacuuming before coating application.

D. Round off sharp edges and rough welds. Surfaces must be clean, dry and free of any rust, dirt, chalk, grease, oil, etc. prepared in accordance with the manufacturer's recommendations for the coating to be applied.

3.4 APPLICATION

A. Environmental Conditions:

1. Do not apply coatings when air or surface temperature is outside of manufacturer's guidelines.
2. Surface temperature must be at least 5°F above the dew point.
3. Do not apply coatings when Relative Humidity is outside of manufacturer's guidelines, nor when Relative Humidity is 85% or greater.
4. Apply in accordance with all of the manufacturer's recommendations.

B. Stripe Coat:

1. Apply a stripe coat of the intermediate coating to all welds, edges, corners, bolts, and difficult-to-reach areas by brush or roller to ensure adequate film build in these critical

areas. This coat must be allowed to cure completely before applying full intermediate coat.

C. Application Method:

1. Apply in strict accordance with manufacturer's recommendations regarding wet-film thickness (WFT) to avoid runs, sags, or mud cracking.

D. Recoat Windows:

1. Adhere strictly to manufacturer's recoat time windows. Ensure previous coats are completely cured and prepared in accordance with manufacturer's specifications before applying the subsequent coat.

3.5 FIELD QUALITY CONTROL AND TESTING

A. Dry Film Thickness (DFT): Measure coating thickness using a calibrated magnetic gauge in accordance with SSPC-PA 2.

B. Holiday Testing:

1. Test all coated surfaces for holidays (pinholes) in accordance with NACE SP0188 using a non-destructive, low-voltage holiday detector.
2. Repair all detected holidays and re-test.

3.6 CURING AND DISINFECTION

A. Curing: Allow the coating system to cure completely per the manufacturer's instructions before introducing water. Ventilate the tank adequately to release any residual solvents.

B. Disinfection: Wash and disinfect the tank interior in accordance with AWWA C652 prior to placing the tank into potable water service. The disinfection of the storage facilities shall be repeated until it is determined, by bacteriological testing, that the water is free of coliform bacteria.

END OF SECTION 099013

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 099014 – EXTERIOR COATING – WATER STORAGE TANK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Surface preparation and field application of a protective exterior protective coating system for welded steel potable water storage tanks.
2. Quality control, holiday detection and correction, and curing procedures.

B. Related Sections include the following:

1. 099013 – Interior Coating – Water Storage Tank
2. 099100 – Internal Ladder – Water Storage Tank
3. 221100 – Water Distribution Systems

1.2 DEFINITIONS

A. PFAS-Free: Products that contain zero per- or polyfluoroalkyl substances, including no Polytetrafluoroethylene (PTFE), fluorinated polymers, or fluorosurfactants.

B. Potable water, drinking water, or potable drinking water: Water that is safe and intended for human consumption.

1.3 SUBMITTALS

A. Product Data:

1. For all products used.
2. Submit manufacturer’s technical data sheets, coating system data, and application instructions.

B. Certifications:

1. Submit manufacturer’s official certification that all products are certified to NSF/ANSI 61-2025 for health effects imparted to drinking water and to NSF/ANSI 372-2024 as lead-free and safe for use in drinking water storage (for any products that may come into contact with the tank contents or vapor space).
2. Submit manufacturer’s official certification that all products are PFAS-Free.
3. Certification of compliance with local VOC limits.
4. Manufacturer’s written certification that the selected system is compliant with AWWA D102 Outside Coating System (OCS) requirements.
5. Coating Contractor’s Qualifications: Submit documentation of NACE or AMPP certified applicators on-site.

1.4 REFERENCES

A. AWWA D100 – Welded Carbon Steel Tanks for Water Storage

B. AWWA D102 – Coating Steel Water-Storage Tanks

C. NACE SP0188 – Holiday Detection of Protective Coatings

D. NSF/ANSI 61-2025 – Drinking Water System Components – Health Effects

E. NSF/ANSI 372-2024 – Drinking Water System Components – Lead Content

F. NSF/ANSI 600-2024 – Health Effects Evaluation and Criteria for Chemicals in Drinking Water

G. SSPC/AMPP: The Society of Protective Coatings Standards

H. SSPC-PA1: Shop, Field, and Maintenance Painting of Steel

I. SSPC-PA2: Procedure for Determining Conformance to Dry Coating Thickness Requirements

J. SSPC-SP1: Solvent Cleaning

K. SSPC-SP6/NACE No. 3: Commercial Blast Cleaning

L. The Virginia Plumbing Code, Current Edition

M. 12VAC5-590 – Virginia Administrative Code – Virginia Waterworks Regulations

1.5 ENVIRONMENTAL CONDITIONS

A. Product shall be applied in accordance with manufacturer temperature and humidity recommendations. Coating shall not be applied to wet or damp surfaces.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: A firm with a minimum of five years of documented experience in coating steel water storage tanks. Applicators must possess certification from NACE (National Association of Corrosion Engineers) or AMPP (Association for Materials Protection and Performance) at Level 1 or higher.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver coatings in original, unopened containers with manufacturer’s labels intact.

B. Store materials in an enclosed, climate-controlled area in accordance with manufacturer’s recommendations.

1.8 MEASUREMENT AND PAYMENT

A. Water Storage Tank Re-Coating - Lump Sum including full compensation for all labor, materials, and incidentals necessary to complete the work. Work shall include preparing

the storage tank by removing the existing coating and making any needed welding repairs to the Tank. The Tank is a 24,000-gallon aboveground steel storage tank with two 30-inch manways. The nominal tank diameter is 16 feet and the nominal wall height is 16 feet. The tank has a domed roof as shown on the Drawings.

PART 2 - PRODUCTS

2.1 GENERAL

A. Any components, materials, or products that may come into contact with source water or drinking water shall be certified to NSF/ANSI 61-2025 for health effects imparted to drinking water and to NSF/ANSI 372-2024 as lead-free and safe for drinking water storage.

B. All materials, equipment, and construction/application methods, including decontamination and de-chlorination, for this drinking water system must fully comply with the **Virginia Uniform Statewide Building Code (USBC)**, the **Virginia Plumbing Code (VPC)**, and the **Recommended Standards for Water Works (Ten States Standards)**. In cases of overlapping or conflicting requirements, the most stringent specification shall govern.

C. All products that may come into contact with source water or drinking water shall be PFAS-Free.

D. All components, materials, and products shall comply with the requirements for exterior coatings included in AWWA D102.

E. The materials referred to by trade name, make, or catalog number on the drawings shall be regarded as establishing a minimum standard of quality; substitutions of equal or greater quality can be made by submitting a data sheet of the proposed substituted item to the COR, for approval.

F. Color: The performance of the coating system is more important than an exact color match, and many high-performance coatings cannot be custom-tinted. Color shall be as close to Forest Service Brown (Hex #6A5147) as possible. Submit color to COR for approval.

2.2 MATERIALS

A. Exterior Coating System (Potable Water):

1. Type: High-performance, heavy-duty, high-solids epoxy or 100% solids epoxy coating for long-term corrosion resistance.
2. Volatile Organic Compounds (VOC): Maximum 250 g/L, or lower if mandated by local regulations.
3. Number of Coats: Minimum 2 to 3 coats.
4. Dry Film Thickness (DFT): Total minimum system thickness of 12.0 to 16.0 mils.

2.3 ACCESSORIES

1. Abrasive Media: Clean, hard, sharp, and properly-graded, free of contaminants that might damage the steel substrate.
2. Stripe Coat: Brushable epoxy matching the intermediate coat for stripe painting of welds, bolts, and crevices.

PART 3 - EXECUTION

3.1 GENERAL

A. All work shall be performed in accordance with the requirements for exterior coatings included in AWWA D102.

3.2 EXAMINATION

A. Verify that all interior and exterior welding, grinding, and structural steel preparations are complete and approved prior to abrasive blasting.

3.3 SURFACE PREPARATION

A. Solvent Cleaning: All surfaces shall be cleaned per SSPC-SP1 to remove all oil, grease, and dirt prior to blasting.

B. Weld Prep: Grind all sharp edges, weld spatter, and discontinuities smooth to a radius of at least 1/8 inch prior to abrasive blasting.

C. Abrasive Blast Cleaning:

1. All exterior steel surfaces shall be abrasive-blasted to a SSPC-SP6/NACE No. 3 Commercial Blast finish.
2. The surface profile shall be angular, 1.5 to 2.5 mils, as recommended by the coating manufacturer.

D. Dust and debris shall be completely removed from all surfaces via vacuuming or dry air blast before painting. Round off sharp edges and rough welds. Surfaces must be clean, dry and free of any rust, dirt, chalk, grease, oil, etc. prepared in accordance with the manufacturer's recommendations for the coating to be applied.

3.4 APPLICATION

A. General: Apply coatings in accordance with SSPC-PA1 and the manufacturer's instructions.

B. Environmental Conditions:

1. Do not apply coatings when air or surface temperature is outside of manufacturer's guidelines.
2. Do not apply coatings when the steel surface temperature is less than 5°F above the dew point.
3. Do not apply coatings when Relative Humidity is outside of manufacturer's guidelines, nor when Relative Humidity is 85% or greater.

4. Apply in accordance with all of the manufacturer's recommendations.

C. Stripe Coat:

1. Apply a stripe coat of the intermediate coating to all welds, edges, corners, bolts, and difficult-to-reach areas by brush or roller to ensure adequate film build in these critical areas. This coat must be allowed to cure completely before applying full intermediate coat.

D. Coating Sequence:

1. Apply first coat immediately after cleaning following abrasive blasting and prior to the development of flash rust.
2. Each coat must visually contrast in color from the preceding coat.

E. Application Method:

1. Apply in strict accordance with manufacturer's recommendations regarding wet-film thickness (WFT) to avoid runs, sags, or mud cracking.

F. Recoat Windows:

1. Adhere strictly to manufacturer's recoat time windows. Ensure previous coats are completely cured and prepared in accordance with manufacturer's specifications before applying the subsequent coat.

3.5 FIELD QUALITY CONTROL AND TESTING

A. Dry Film Thickness (DFT): Measure DFT for each coat using a calibrated magnetic gauge in accordance with SSPC-PA 2.

B. Holiday Detection:

1. Spark-test all coated surfaces for holidays (pinholes) in accordance with NACE SP0188 using a non-destructive, low-voltage holiday detector.
2. Repair all detected holidays and re-test.

3.6 CLEANING AND REPAIR

A. Remove all overspray, drips, and splashes from adjacent surfaces and equipment.

B. Touch-up or repair damaged or defective coatings. Sand, feather the edges, and re-apply the coating system to match the surrounding surface.

3.7 PROTECTION

A. Protect coated surfaces from damage during the remaining construction and curing period. Do not allow tank to be filled with water until the exterior and interior coatings have fully cured in accordance with the manufacturer's instructions.

END OF SECTION 099014

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 099100 – INTERNAL LADDER – WATER STORAGE TANK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Internal Tank Ladder:

    a. Remove existing internal ladder in the 24,000-gallon treated drinking water storage reservoir (the Tank) and install a new internal ladder in accordance with applicable regulations and codes, including 29CFR1910, and AWWA D100.
    b. The new internal tank ladder shall be installed in accordance with a design sealed by a Professional Engineer (P.E.) registered in the Commonwealth of Virginia. Cost of design shall be included in Contractor's bid price; no additional funding or change order shall be requested at a later time.
    c. All ladder components and appurtenances shall be certified by NSF/ANSI 61-2025 and NSF/ANSI 372-2024 as lead-free and safe for drinking water storage.
    d. The new ladder shall be installed prior to the interior coating of the Tank and shall be epoxy coated along with the rest of the Tank interior.

2. Grab Bars (Outside of Upper Manway)

    a. Evaluate the existing grab bars located on the exterior of the Tank near the upper manway for compliance with current codes and regulations for use with the new internal tank ladder. If the existing grab bars are not in compliance, install new grab bars for the new internal tank ladder.
    b. The new grab bars (if needed) shall be installed in accordance with a design sealed by a P.E. registered in the Commonwealth of Virginia. Cost of design shall be included in Contractor's bid price; no additional funding or change order shall be requested at a later time.

B. Related Sections include the following:

1. 099013 – Interior Coating – Water Storage Tank
2. 099014 – Exterior Coating – Water Storage Tank
3. 221100 – Water Distribution Systems

1.2 DEFINITIONS

A. PFAS-Free: Products that contain zero per- or polyfluoroalkyl substances, including no Polytetrafluoroethylene (PTFE), fluorinated polymers, or fluorosurfactants.

B. Potable water, or drinking water, or potable drinking water: Water that is safe and intended for human consumption.

1.3 SUBMITTALS

A. Product Data:

1. Submit manufacturer's official certification that all structural components and appurtenances are certified to NSF/ANSI 61-2025 for health effects imparted to drinking water and to NSF/ANSI 372-2024 as lead-free and safe for use in drinking water systems.
2. Submit manufacturer's official certification that structural components and appurtenances are PFAS-free.
3. P.E.-sealed design for new internal tank ladder and any new external grab bars.

1.4 REFERENCES

A. ASTM A36 – Standard Specification for Carbon Structural Steel

B. ASTM A325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

C. AWWA C652 – Disinfection of Water Storage Facilities

D. AWWA C655 – Field Dechlorination

E. AWWA D100 – Welded Carbon Steel Tanks for Water Storage

F. AWWA D102 – Coating Steel Water-Storage Tanks

G. NSF/ANSI 61-2025 – Drinking Water System Components – Health Effects

H. NSF/ANSI 372-2024 – Drinking Water System Components – Lead Content

I. NSF/ANSI 600-2024 – Health Effects Evaluation and Criteria for Chemicals in Drinking Water

J. Recommended Standards for Water Works ("Ten States Standards")

K. The Virginia Plumbing Code, Current Edition

L. The Uniform Statewide Building Code (USBC), Current Edition

M. 12VAC5-590 – Virginia Administrative Code – Virginia Waterworks Regulations

N. 29CFR1910.23 – OSHA requirements for Ladders

O.

1.5 MEASUREMENT AND PAYMENT

A. Lump Sum for: removing the existing ladder and all supports and attachments; evaluating the existing grab bars for current code compliance; engaging a P.E. to design the new

ladder and attachments, and new grab bars (if needed); and installing new ladder and grab bars (if needed).

PART 2 - PRODUCTS

2.1 GENERAL

A. All components, materials, and products that may come into contact with source water or drinking water shall be certified to NSF/ANSI 61-2025 for health effects imparted to drinking water and to NSF/ANSI 372-2024 as lead-free and safe for drinking water storage.

B. All materials, equipment, and construction methods, including decontamination and de-chlorination, for this drinking water system must fully comply with the **Virginia Uniform Statewide Building Code (USBC)**, the **Virginia Plumbing Code (VPC)**, and the **Recommended Standards for Water Works (Ten States Standards)**. In cases of overlapping or conflicting requirements, the most stringent specification shall govern.

C. All structural components and appurtenances shall be PFAS-Free.

2.2 INTERNAL TANK LADDER AND GRAB BARS

A. The internal tank ladder and any grab bars shall be designed and installed in accordance with the following codes and regulations:

1. AWWA D100
2. 29CFR1910.23

B. Materials used in the construction and installation of the internal tank ladder shall comply with the following codes:

1. ASTM A36
2. ASTM A325
3. NSF/ANSI 61-2025
4. NSF/ANSI 372-2024

PART 3 - EXECUTION

3.1 PREPARATION AND WELDING

A. Field welding must be performed by welders qualified in accordance with AWWA D100 and ASME Section IX.B of the ASME Boiler and Pressure Vessel Code.

B. Steel brackets shall be welded directly to the tank wall or anchor plates as shown on the approved shop drawings.

C. Round off sharp edges and rough welds. Surfaces shall be left in a clean, dry and free of any rust, dirt, chalk, grease, oil, etc., acceptable for coating all surfaces.

3.2 FIELD QUALITY CONTROL

A. Inspect the ladder after installation to ensure rigid mounting, proper alignment, and safe clearance from all tank components, and to ensure all sharp edges and rough welds have been eliminated.

B.

END OF SECTION 099100

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 133402 - UTILITY VAULTS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes underground utility vaults and manholes, including plumbing appurtenances, ladder, lid and all work within 5 feet of the outside of the vault or manhole. Wherever it is used in this section, the term “vault” shall also apply to “manholes”.

B. Related sections include the following:

1. 221100 – Water Distribution Systems
2. 221103 “Plumbing Appurtenances.”
3. 312000 “Earthwork.”

C. See Section 221100 – Water Distribution Systems for information about NSF/ANSI 61-2025 and NSF/ANSI 372-2024 compliance.

1.2 DEFINITIONS

A. CMP: Corrugated metal pipe

B. HDPE: High density polyethylene

1.3 SUBMITTALS

A. Product data for the following:

1. Concrete Vault and Lid Drawings
2. Vault insulation.

B. Vault and Lid Shop Drawings: Include plans and details.

C. Product Certificates: Signed by manufacturer certifying that products furnished comply with requirements.

1.4 QUALITY ASSURANCE

A. Welding: Certified welder, qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel" or AWS D1.2 “Structural Welding Code – Aluminum.”

1.5 MEASUREMENT AND PAYMENT

A. Payment will be for the number of Utility Vaults of each type installed and will include the vault and lid, ladder, steps, plumbing appurtenances, pipe, gravel, excavation, backfill and all work within 5 feet of the vault.

PART 2 - PRODUCTS

2.1 PREFABRICATED CONCRETE BOX AND LID

A. Prefabricated Concrete Vault and Extensions: High density reinforced concrete, of the type and quality normally furnished by Oldcastle Infrastructure or equivalent.

1. Dimensions: 14'x8' large concrete vault for large utility vault near Williams Branch Rest Room. See Drawings for actual dimensions and plumbing appurtenances.
    a. Model Number 814WA custom or equivalent.
    b. Load rating shall meet load level 2 according to ASTM C1802-20.
2. Follow section 2.2 "Manholes" for steps, pipe connectors, and joint sealant.

B. Spring Assisted Lid: Welded aluminum manufactured by Bass & Hays Foundry, Inc. or an approved equal.

1. Dimensions: As indicated on the Drawings.
2. Load Rating: Shall meet level 2 according to ASTM C1802-20.

2.2 MANHOLES

A. Normal-Traffic Precast Concrete Manholes: ASTM C478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.

1. Diameter: 48 inches minimum, unless otherwise indicated.
2. Base Section: Open bottom with 5-inch minimum thickness for walls and base riser section. All open-bottom manholes and other in-ground vaults shall have a well-draining crushed-stone floor.
3. Riser Sections: As shown on Drawings.
4. Top Section: As shown on Drawings.
5. Steps shall be a ½-inch steel rod encapsulated with polypropylene, 12-inch step, 10 inches center to center leg distance x 5 ¾-inches projection, designed for installation into precast concrete. Steps shall be Model PS1 as manufactured by M. A. Industries, or approved equal.
6. Pipe Connectors: Each pipe connection to manhole shall be made with pipe-to-manhole flexible connector system for use with cored holes in concrete manhole or tank, made of a polyisoprene rubber resilient connector meeting ASTM C-923, with type 304 stainless steel compression clamps. Connector system shall be PSX: Direct Drive in appropriate size as manufactured by Press-Seal Gasket Corporation, or approved equal.
7. Manhole Frames and Covers: ASTM A48 CL35, grey iron castings. Cover shall have a minimum of 2 pick bar locations. Frame shall have a minimum 30 ID by minimum 5-inch riser with 3-inch minimum width flange, and minimum 30-inch-diameter

cover, sized to fit on manhole top section. Include indented top design with lettering "WATER" cast into cover. Frame and cover shall be 1342 series as manufactured by East Jordan Iron Works, Inc., or approved equal.

8. Mastic Joint Sealant: Preformed flexible joint gasket meeting all requirements of ASTM C990. Sealant shall be RAM-NEK as manufactured by Henry Company, or approved equal.
9. Non-Shrink Grout: Cement based non-shrink grout, Masterflow 713 Plus, by Degussa Building Systems, or approved equal.

2.3 LOCKING MECHANISM

A. Provision shall be made to secure the lid to the vault using a FS Yale Lock on the Utility Vault only. The padlock will be furnished by the Forest Service.

1. All other curb boxes and utility boxes (48") do not require locks.

2.4 LADDER

A. Description: Encapsulated with polypropylene.

B. Dimensions: Indicated in above section.

2.5 GRAVEL

A. Description: Hard, durable screened material varying in size from 1/4 inch to 1 inch, without lumps of soil or clay.

1. "Special Bedding," as specified in Section 312000 "Earthwork" is acceptable.

B. Gravel shall be placed to the depth indicated on the Drawings.

2.6 CONCRETE SUPPORTS

A. Plumbing appurtenances shall be supported using concrete blocks or other braces as shown on the Drawings. Blocks and stands/braces shall be approved by the Contracting Officer.

2.7 VAULT INSULATION

A. Description: Polyurethane sheets or approved equal as approved by the Contracting Officer's Representative.

1. Minimum R value of 10.

2.8 POST (FOR VENT)

A. Material: HDPE type material in wood look alike finish.

1. Manufacturer: Lumberock or an approved equal.
2. Color: Chateau Brown or equivalent, as close to Forest Service Brown as possible.
3. Rounded Edges.

2.9 PLUMBING APPURTENANCES

A. According to Section 221103 “Plumbing Appurtenances.”

PART 3 - EXECUTION

3.1 BOX INSTALLATION

A. Large Utility Vault Only

1. Excavation and Box Placement: Excavation shall be made with minimum damage to surrounding trees, vegetation, and adjacent slopes and surfaces. Place the vault as indicated on the Drawings. Compact the surface on which the vault sets to 97 percent maximum density (AASHTO T99 or ASTM D698) and test.
2. Pipe Clearance: 1" to 2" clearance between the box and pipeline at any point.

B. Backfilling

1. Remove all debris from the excavation before backfilling.
2. Compaction: Backfill shall be placed in 6-inch maximum thickness layers and compacted by three passes of a mechanical vibrator which has been approved by the Contracting Officer’s Representative.
3. No rocks larger than 2-inches in diameter shall be placed within 6 inches of inlet and outlet pipes, or vault.
4. If native material is unsuitable for backfill, “Pipe Zone Material,” as specified in Section 312000 “Earthwork” may be used.

C. Gravel Placement: Smooth and compact the natural earth bottom of the vault before placing the gravel layer. Gravel shall be placed in the bottom of the vault to the thickness indicated on the Drawings.

D. Installation of Plumbing Appurtenances: Install plumbing appurtenances as shown on the Drawings and according to Section 221103 “Plumbing Appurtenances.” Support all appurtenances and piping near floor and on brick or concrete piers unless otherwise specified.

E. Lid: The lid shall be installed and secured as indicated on the Drawings.

3.2 MANHOLE INSTALLATION

A. Install complete with appurtenances and accessories indicated.

1. Install precast concrete manhole sections with joint sealant according to ASTM C891.
2. Core drill or use hole former for pipe openings in pre-cast base section of shallow manhole.
3. Connect pipe to structures with specified pipe gasket.
4. Set frame with mastic joint sealant. Center frame over opening in grade ring. Grout frame to manhole with non-shrink grout. Strike off grout and tool joint to smooth, dense, surface.

5. Set tops of frames and covers flush with the surrounding finished surface, unless otherwise indicated.

3.3 VAULT INSULATION

A. Insulate the vault and lid as indicated on the Drawings. Attach to vault and lid in manner approved by the Contracting Officer's Representative. Lid insulation shall fit snugly onto vault insulation without appreciable gaps.

B. Minimum R-value: R-10.

3.4 HDPE POST INSTALLATION (FOR VENT AND HYDRANTS)

A. HDPE Posts: 4' post, Furnish required lengths as shown on the Drawings.

B. Excavate hole for post no larger than necessary for proper backfilling and compacting. Set post plumb and secure vent or hydrant piping to post. Backfill 6-inch lifts at optimum moisture content. Compact each lift with three complete passes of a mechanical compaction device.

1. Contractor may set post in 4000 psi concrete in-lieu of Section B.

3.5 CLEANUP

A. After backfilling and installation is complete, the general area shall be cleaned by removing all excavated material not used in the backfill and all debris and construction material. Finish-grade the area to blend into the surroundings and create a natural appearance.

END OF SECTION 133402

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 221100 - WATER DISTRIBUTION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section shall consist of furnishing and installing the following:

1. Potable water distribution pipe, components, appurtenances, and fittings.
2. Drains.

B. This Section shall also include the flushing, testing and disinfection of waterlines.

C. Related Sections include the following:

1. 024100 “Waste Material Disposal.”
2. 033020 “Concrete From Package Dry Mix for Minor Structures.”
3. 099013 “Interior Coating – Water Storage Tank”
4. 099014 “Exterior Coating – Water Storage Tank”
5. 1133402 “Utility Vaults”
6. 221102 “Curb Valves and Boxes.”
7. 221103 “Plumbing Appurtenances”
8. 221105 “Water Hydrants”
9. 221220 “Submersible Well Pump”
10. 312000 “Earthwork.”

1.2 REFERENCES

A. AWWA C651 - Disinfecting Water Mains

B. AWWA C652 - Disinfection of Water Storage Facilities

C. AWWA C653 – Disinfection of Water Treatment Plants

D. AWWA C654 – Disinfection of Wells

E. AWWA C655 – Field Dechlorination

F. NSF/ANSI 61-2025 – Drinking Water System Components – Health Effects

G. NSF/ANSI 372-2024 – Drinking Water System Components – Lead Content

H. NSF/ANSI 600-2024 – Health Effects Evaluation and Criteria for Chemicals in Drinking Water

I. Recommended Standards for Water Works (“Ten State Standards”)

J. The Virginia Plumbing Code, Current Edition

K. The Uniform Statewide Building Code (USBC), Current Edition

L. 12VAC5-590 – Virginia Administrative Code – Virginia Waterworks Regulations

1.3 DEFINITIONS

A. SS: Stainless Steel

B. GSP: Galvanized Steel Pipe – The use of galvanized steel pipe or fittings is strictly forbidden on this project.

C. HDPE: High Density Polyethylene plastic.

D. PVC: Polyvinyl Chloride plastic.

E. PFAS-Free: Products that contain zero per- or polyfluoroalkyl substances, including no Polytetrafluoroethylene (PTFE), fluorinated polymers, or fluorosurfactants.

F. Potable water, or drinking water, or potable drinking water: Water that is safe and intended for human consumption.

1.4 SUBMITTALS

A. Product Data: For all supply and distribution system components, including the following:

1. Pipe, fittings, and appurtenances.
2. Pump controls, including all components.
3. Water meters and accessories.
4. Drain and vent screens.
5. Valves.
6. Interior epoxy paint for storage tank.
7. Exterior paint for storage tank.
8. Pipe brackets for attaching supply line to storage tank.

B. Submit manufacturer’s official certification that all pipe, valves, fittings, and mechanical components are certified to NSF/ANSI 61-2025 for health effects imparted to drinking water and to NSF/ANSI 372-2024 as lead-free and safe for use in drinking water systems.

C. Submit manufacturer’s official certification that all pipe, valves, fittings, and mechanical components are PFAS-free.

D. Plan for disposal of water used for testing and disinfection of waterlines.

E. Operation and Maintenance Data: For all supply and distribution system components, including the following:

1. Water meters.
2. Pump control system.
3. Valves.

F. Water System Operations and Maintenance Manual.

1.5 QUALITY ASSURANCE

A. All work is to be completed according to applicable Federal, State and Local codes. This work includes, but is not limited to, materials, installation, testing and disinfection

B. Piping components (e.g., materials, fittings, valves, meters, and other appurtenances) shall bear label, stamp, or other markings of specified testing agency. Certification documents for any component without a label, stamp, or other marking shall be submitted to the COR and maintained on-site throughout the construction duration.

C. Code Compliance:

1. All piping components (e.g., pipe, fittings, valves, meters, materials, thread sealant, and other appurtenances) shall be certified by NSF/ANSI 61-2025 and NSF/ANSI 372-2024 as lead-free and safe for use in drinking water systems.
2. All piping components (e.g., pipe, fittings, valves, meters, materials, thread sealant, and other appurtenances) shall comply with all requirements included NSF/ANSI 61-2025, NSF/ANSI 372-2024, the Virginia Waterworks Regulations, and the Virginia Plumbing Code.
3. .

1.6 MINIMUM SYSTEM REQUIREMENTS

A. Unless otherwise noted, the minimum working pressure for piping and specialties shall be 200 psi.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

B. Protect stored piping from moisture and dirt. Elevate above grade.

C. Protect flanges, fittings, and specialties from moisture and dirt.

D. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

E. Handle Meters and other components to avoid damage to exposed parts.

1.8 PROJECT CONDITIONS

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

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

1.9 COORDINATION

A. Coordinate connection to existing waterlines with Contracting Officer's Representative.

B. Verify piping materials, sizes, entry locations and pressure requirements are compatible with connection point.

C. Coordinate other utility impacts.

1.10 MEASUREMENT AND PAYMENT

A. Payment will be as listed for the following items:

1. Pipeline: Linear Feet of pipe of each type and size designated, including fittings, trench**,** tracer wire, metallic marking tape, pipe zone material, backfill, compaction, non-potable and sewerline crossings, and connections to existing waterlines.
2. Daylight Drains: Number of Daylight Drains, including excavation, pipe, fittings, screen, suction strainer, riprap, backfill and all work within 10 feet of the drain outlet, as shown on the Drawings.
3. Pumpout Drains: Number of pumpout drains of each size and type designated. Pumpout drains include the shutoff valves and valve boxes at this location and will not be paid separately under section 221102.
4. Connection to Existing Buildings: Payment shall be each for each connection to the existing building. Each refers to each building connection including all plumbing appurtenances to make the connection.
5.
6. Water Storage Tank: Lump Sum for attaching new supply line to the exterior of the tank and into the tank. Payment shall include all aboveground pipe, connections, and brackets.t.
7. HDPE Electrofusion Machine: This item is to provide a new unused HDPE electrofusion machine as indicated at a location agreed upon by the Contracting Officer's Representative. The item also includes 6 hours of training for Forest Service maintenance personnel at a location and time agreed upon with the Contracting Officer's Representative. Training should outline the process on how to weld and provide FS personnel practice on electrofusion with HDPE pipe of various sizes.
8. Water System Operations and Maintenance Manual: This item is lump sum for an operation and maintenance manual that includes start up and shut down procedures for the system as well as maintenance costs and maintenance schedule for all components. Contractor shall provide one hard copy format and a digital format copy. This item also includes 8 hours of on-site training for Forest Service personnel on how to start-up, shut-down, and winterize the system.

PART 2 - PRODUCTS

2.1 GENERAL

A. All pipe, valves, fittings, and mechanical components shall be certified to NSF/ANSI 61-2025 for health effects imparted to drinking water and to NSF/ANSI 372-2024 as lead-free and safe for use in drinking water systems.

B. All materials, equipment, and construction methods, including decontamination and de-chlorination, for this drinking water system must fully comply with the **Virginia Uniform Statewide Building Code (USBC)**, the **Virginia Plumbing Code (VPC)**, and the **Recommended Standards for Water Works (Ten States Standards)**. In cases of overlapping or conflicting requirements, the most stringent specification shall govern.

C. All waterlines, pipes, and fittings shall be new and unused, of the type, pressure rating or class, and size specified and as shown on the Drawings.

2.2 PIPES AND FITTINGS

1.

B. HDPE:

1. All HDPE pipe shall be DR11 solid-wall pressure pipe approved for use in potable drinking water systems.
2. Pipe and fittings shall be in certified conformance with the current editions of the following standards:

    a. Must be certified safe for drinking water contact in accordance with NSF/ANSI 61-2025 and NSF/ANSI 372-2024.
    b. Pipe sizes from ¾" to 3” diameter shall conform with AWWA C901.
    c. Pipe sizes 4” diameter and larger shall conform with AWWA C906.
    d. Material Designation: PE 4710 resin
    e. Material Classification: ASTM D1248
    f. Minimum Cell Classification: ASTM D 3350, 445574C
    .
    g. Molded HDPE Fittings: ASTM D 3350, PE 4710 resin, butt-fusion type, made to match HDPE pipe dimensions and class. Insert Fittings: Not allowed.

3. Dimension Ratio and Minimum Pressure Rating: DR11, 200 psig at 73.4°F.
4. Minimum Hydrostatic Design Basis (HDB) shall be 1,600 psi at 73.4°F (23°C).
5. Pipe sections and fittings shall be joined using the thermal butt-fusion method, creating a monolithic, leak-free system that exceeds the tensile strength of the pipe itself. Procedures must conform with ASTM F2620.
6. Pipe shall be solid blue, or black with a minimum of three equally-spaced blue co-extruded longitudinal stripes identifying it for potable water service.
7. Pipe Larger than 2-inch Diameter: Provide in 40-foot lengths rather than in rolls.
8. Transition Fittings to non-HDPE Pipe shall be one of the following, as appropriate for the adjoining pipe:

    a. Mechanical joint (MJ) adapters, backup rings, and stainless steel stiffeners.
    b. Butt-fused on one end and stainless steel threaded on the other end. Compression-type fittings are not allowed.

C. Drilling fluids:

1. The drilling fluids used in boring applications shall consist of a bentonite clay and potable water. No toxic additives or polymer gels may be used.

D. PVC:

1. All PVC pipes and fittings shall be Schedule 80 rigid unplasticized polyvinyl chloride and approved for use in potable drinking water systems. All piping and joining components shall be in certified conformance with the current editions of the following standards:

    a. NSF/ANSI 61-2025
    b. NSF/ANSI 372-2024
    c. 4” to 12” diameter: ANSI/AWWA C900
    d. Smaller than 4” diameter: ASTM D1785
    e. Primer must meet ASTM F656 requirements.
    f. Solvent must meet ASTM D2564 requirements.

2. Pipe and fittings must be made of clean, virgin PVC with a cell classification of 12454 as defined by ASTM D1784.
3. Socket fittings shall conform to ASTM D2467.
4. Primer and solvent shall be approved for use with potable drinking water and shall carry the NSF-pw certification.

E. Stainless Steel:

1. All steel pipe and fittings shall be Type 316/316L stainless steel and approved for use in potable drinking water systems. All piping, fittings, and components shall be in certified conformance with the current editions of the following standards:

    a. Potable Water Safety; Components must be certified safe to contact with drinking water per NSF/ANSI 61-2025.
    b. Lead-Free Compliance: Weighted average lead content must be less than 0.25%, certified to NSF/ANSI 372-2024.
    c. Piping Standards: Seamless and welded stainless steel must meet ASTM A312 or ASTM A269.
    d. Fitting Standards: Threaded fittings must conform to ASME B16.11 for forged components, or ASTM A351 for cast components.
    e. Thread Specifications: Threads must be tapered pipe threads (NPT) conforming to ASME B1.20.1.

2. Wall Thickness: Pipe must be Iron Pipe Size (IPS) Schedule 40S in accordance with ASME B36.19M.
3. Pressure Class: Threaded fittings must meet a minimum of Class 150.

F. Thread Sealant: See Specification Section 221103.

2.3 PIPING SPECIALTIES

A. Dielectric Fittings: Provide dielectric fittings, unions, flanges, couplings, and/or nipples as appropriate to prevent galvanic corrosion when joining dissimilar metals (e.g. ductile iron and stainless steel).

1. Dielectric Unions: Factory-fabricated union assembly, designed for 250-psig minimum working pressure at 180 deg F. Include insulating material that isolates dissimilar metals and ends with inside threads according to ASME B1.20.1.
2. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum working pressure to suit system pressures.
3.
4. Dielectric-Flange Isolation Kits: See Specification Section 221103.
5. Dielectric Couplings: Stainless steel couplings with inert and noncorrosive thermoplastic lining, with threaded ends and 200-psig minimum working pressure at 180 deg F).
6. Dielectric Nipples: Stainless steel nipples with inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 200-psig minimum working pressure at 180 deg F.

B. Daylight Drains and Overflows:

1. Suction Strainer

   a. Design: Stainless, cold rolled, 16-gage steel strainer with threaded end to fit stainless steel drain pipe size.
   b. Model: “SSS” Series, Round Hole Strainer, as manufactured by Campbell Manufacturing Inc., or an approved equal.

2. Insect Screens

   a. For Daylight Drains: 4-mesh woven wire cloth, galvanized steel.
   b. For Water Storage Tank Drains and Overflows: 24-mesh woven wire cloth, type 304 stainless steel standard grade, non-corrodible.

3. Riprap

   a. The stones may be obtained from on-site excavated material or a borrow source approved by the Contracting Officer’s Representative. Stones used shall be such that not more than 10 percent of the individual stones shall have a perimeter less than 12 inches in the smallest section. All of the stones shall have a volume less than 1/2 cubic foot.
   b. The stones shall be sound, hard, durable and free from laminations, fractures, or other structural defects. They shall be of such quality that they will not disintegrate on exposure to water or weathering.

2.4 PUMPOUT DRAINS

A. Concrete: According to Section 033020 “Concrete From Package Dry Mix for Minor Structures."

B. Pump: The Contractor shall furnish a battery-operated utility pump capable of pumping water from the pumpout drains.

1. Design: Battery operated, self-priming, non-corroding, minimum suction head of 18’, minimum 1.57 gallon-per-minute (at 46 feet of head), with 3/4” garden hose

connections. Provide two (2) 15-foot garden hoses and one (1) 6-foot ¾" PVC stinger with ¾" garden hose connector..

2. Available Models: Milwaukee M18™ Transfer Pump 2771-20 or approved equal.
3.

2.5 WATER STORAGE TANK REHABILIATATION AND MODIFICATIONS

A. Water Storage Tank Modifications: New hole in the water storage tank shall be opened to allow the new 1.5" supply line to enter as shown on the Drawings. The new hole shall have a 1.5" threadeded steel nipple welded to the tank as shown on the Drawings. A threaded flange will be installed on the nipple for connecting the HDPE supply pipe to using a butt-fusion HDPE adapter flange and steel follower ring. The HDPE supply shall be suspended inside a 3" Sch. 40 steel pipe using a bolted riser clamp. The 3" Sch. 40 steel pipe shall be attached to the tank using 4 bolted brackets that shall be welded to the tank at even intervals. All brackets holding the pipe to the side of the tank shall be welded and no bolts/gaskets shall be used through the wall of the tank.

B. Interior Water Storage Rehabilitation: After complete installation of the supply line and brackets, as well as the internal tank ladder, the interior of the tank shall be cleaned and free of any dirt and debris. See Section 099013 for specifications on surface preparation and coating.

C. Exterior Water Storage Rehabilitation: After complete installation of the supply line and brackets, as well as the internal tank ladder, the exterior of the tank shall be cleaned and free of any dirt and debris. See Section 099014 for specifications on surface preparation and coating. The 3" Sch. 40 steel pipe shall be coated using the tank external coating.

2.6 CONTRACTOR FURNISHED WELDING MACHINES

A.

Jackman Roughneck Electrofusion Processor with Smartscanner. Model ROUGHNECK972-1. 120V adapter included.

2.7 OPERATION AND MAINTENANCE MANUAL

A. The Contractor shall furnish three sets of instructions for operating and maintaining the complete water system, including start-up and shut-down procedures, operator safety procedures, location of valves and other key system features marked on as-built drawings, parts list and parts order form, instructions for draining the system, etc.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Section 312000 "Earthwork" for excavating, trenching, bedding, and backfilling.

3.2 PIPING INSTALLATION

A. Install water system in accordance with 12VAC5-590.

B. Construct the water system to the lines and grades shown or established in the field.

C. Stake locations of waterlines as shown on the Drawings. Waterline location shall be approved by the Contracting Officer's Representative before installation.

D. All waterline shall be graded to drain to ensure full winterization of water system.

E. All pipe, fittings, and appurtenances shall be handled and installed in strict conformance to the manufacturer's recommendations.

F. Drains, valves, and other regulating and controlling devices shall be installed in the line where called for on the drawings.

G. The interior of all pipe, fittings, and other accessories shall be kept as free as possible from dirt and foreign matter at all times. Each piece of line as it is laid shall be cleaned of all debris. When the pipeline has become dirty on the inside during shipment or storage, it shall be swabbed out by drawing a damp swab through the line before placing in trench. Care shall be exercised to keep all joining surfaces clean. Any pipe with contaminated or damaged joining surfaces, which cannot be satisfactorily cleaned or repaired, shall be discarded. Under no circumstances shall pipe be installed in water, and no pipe shall be installed when trench conditions or the weather is unsuitable for such work. At all times when work is not in progress, all open ends of the pipe and fittings shall be securely closed to the satisfaction of the Contracting Officer's Representative so that no trench water, rodents, earth, or other substance will enter the pipe or fittings.

H. Any section of pipe already installed and found to be defective shall be removed and replaced with new pipe at the Contractor's expense.

I. Water and Non-Potable/Sewer Line Crossings

1. Potable and non-potable lines (NPWL) shall never be installed in the same trench.
2. The Contractor shall comply with all requirements for the separation of water lines from sewer lines and other non-potable lines included in the Sherando Recreation Area Rehabilitation Specifications.

    a.

J. Culvert Crossings: Where waterline crosses a road culvert, adjust grade of waterline to provide a minimum of 12 inches of separation between the waterline and culvert, maintaining slope of waterline to drain.

K. A minimum of one-foot separation shall be maintained between electric and waterlines in the same trench. Unless the electric conductors are in conduit the waterline shall be a minimum of one foot below the electric conductors.

L. <u>Pipe Burial Depths, Steel Casing, and Backfill Requirements</u>

1. Bury all piping with depth of cover over the top of the pipe of at least 24 inches.
2. The pipe between the Lower A loop well house and Office shall have a minimum cover depth of 36 inches over the top of the pipe.

3. All stream crossings shall have a minimum cover depth of 60 inches over the top of the casing pipe.
4. All unpaved road crossings shall have a minimum cover depth of 36 inches over the top of the pipe.
5. Piping under any asphalt-paved road crossing shall be installed inside a steel casing pipe. The minimum depth of cover over the top of the casing pipe shall be 36 inches.
6. Casing Pipes: All casing pipes under asphalt-paved roads shall be ASTM A139 Grade B steel with a minimum wall thickness of 0.5 inches and an inside diameter that is at least 2 inches larger that the outside diameter of the carrier pipe. Carrier pipes shall be centered in the casing pipes using non-metallic spacers spaced at 8-foot intervals. Casing pipes must extend at least 5 feet beyond the edge of asphalt on each end and must be sealed again soil/debris intrusion with rubber, neoprene, or other boot material and stainless steel band clamps.
7. Piping under roadways must be bedded in Pipe Zone Material to 1 foot above the top of the carrier pipe in accordance with the Drawings. Engineered Fill or VDOT #21A or #21B crushed aggregate shall be placed in 1-foot (maximum) lifts and compacted to 95% maximum density up to the elevation of the sub-base course.

M. Cutting and Handling of Pipe

1. Cutting of pipe for closure pieces or for other reasons shall be done in a neat manner by methods, which will not damage the pipe. The pipe and fittings shall be handled in such a manner as to ensure delivery and final placement in good, undamaged condition. Particular care shall be exercised not to injure the pipe surfaces or coatings. Damaged pipe shall not be used in the work.

N. Laying Pipe

1. No pipe shall be placed in the trench until the Contracting Officer's Representative has approved the trench and the surface on which the pipe shall be placed.
2. Do not drop pipe into trench. If HDPE pipe is fusion welded above ground outside of the trench, gently lay pipe into the trench. Ensure installation procedures meet the manufacturer's requirements.
3. Pipes shall be placed true to the lines and grades shown on the Drawings and as specified. Complete water system shall be constructed to drain by gravity to drains for seasonal shutdown. Waterlines shall be constructed to drain at a minimum grade of **1%**. Waterlines not meeting this requirement shall be removed by the Contactor and replaced at no cost to the Government.
4. Each section of the pipe shall rest upon the pipe bed for the full length of its barrel.
5. Backfill the pipe within 24 hours after installing the pipe in the trench, leaving the joints and one foot of pipe on each side of each joint exposed until testing is complete.
6. When work is not in progress, securely close open ends of pipe and fittings.
7. When high density polyethylene or solvent weld joint pipe is used, it shall be weaved in the trench to provide horizontal slack in the line for expansion and contraction.
8. High density polyethylene pipe shall be allowed to cool to within 20ºF of the shaded trench bottom temperature before backfilling.
9. When pipes are installed in a structure or utility vault, they shall be adequately supported.

10. Use proper fittings in order to follow the required line and grades and to avoid excessive curvature. Deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offsets, shall not exceed the manufacturer's recommended maximum joint deflection or curvature for their pipe.
11. When more than one pipeline is in the same trench, the pipes shall be separated by at least eight horizontal inches, or as shown on the Drawings.
12. Bends that result in joint tension or permanent pipe deformation are prohibited.
13. Pipelines may be relocated slightly, if necessary, to avoid existing obstacles. However, the required slopes must be maintained.

O. Installing Pipe by Boring

1. Pulling forces must not exceed the pipe's Allowable Tensile Load (ATL) calculated per ASTM F1804.
2. The dynamic bend radius must be at least 27 times the pipe's nominal outside diameter (OD).
3. The final backreamed hole diameter must be at least 1.5 times the nominal OD of the HDPE pipe for sizes up to 8 inches, and 1.3 times the OD for pipes larger than 8 inches.
4. Injection pressures must be continually monitored and kept below the maximum allowable formation limit to precent hydrofracture of the surrounding soil matrix.

P. Branch Connections

1. Branch connections to the main shall be made with tees.
2. Horizontal tees for waterline laterals shall not be permitted. The branch side of tees shall be up when drainage is toward the tee, and down when drainage is away from the tee.
3. Waterline tees shall be the same diameter as the largest pipe connected to the tee.

Q. Pipe Joints

1. Joints shall be made using jointing materials and applied with the proper accessories, in accordance with the manufacturer's instructions. Completed joints shall be watertight, and capable of passing the required hydrostatic testing. If pipe and fittings are assembled with a lubricant, it must be nontoxic.
2. Dissimilar Joints: Connections between two dissimilar pipes or fittings shall be installed in manner recommended by the pipe manufacturer and approved by the Contracting Officer's Representative. Use adapters compatible with both piping materials, outer diameters and system working pressure.

    a. The polyethylene flange adapters at pipe material transitions shall be backed up by stainless steel flanges conforming to ANSI B16.1 and shaped as necessary to suit the outside dimensions of the pipe. The flange adapter assemblies shall be connected with corrosion resisting bolts and nuts of Type 316 Stainless Steel as specified in ASTM A726 and ASTM A307. All bolts shall be tightened to the manufacturer's specified torques. Bolts shall be tightened alternatively and evenly. After installation, apply a bitumastic coating to bolts and nuts.

b. For HDPE pipelines:

13. Use HDPE/SS transition fittings for connections to stainless steel pipe.

c. Compression-type fittings are not allowed.

3. Threaded Metal Joints:

a. Thread pipes with tapered pipe threads according to ASME B1.20.1, apply joint compound, and apply wrench to fitting and valve ends into which pipes are being threaded.

b.

c. Field cut ends shall be squared off by grinding or filing; ends shall be reamed with all chips and flakes removed.

d. Field cut threads or machined joints shall be made with sharp tools to sharp finished ends.

4. HDPE Heat-Fusion Joints

a. According to ASTM D 2657 and piping manufacturer's written instructions.

b. The pipe shall be joined with butt, heat fusion joints as outlined in ASTM D2657 and conform to the Generic Butt Fusion Joining Procedure for Field Joining of Polyethylene Pipe, Technical Report TR-33/2005, published by the Plastic Pipe Institute (PPI). All joints shall be made in strict compliance with the manufacturer's recommendations.

c. A factory qualified joining technician as designated by pipe manufacturer or experienced, trained technician shall perform all heat fusion joints

between pipe ends or pipe ends and fitting and valve outlets, of like outside diameter and wall thickness, SDR or DR. Butt fusion joining between same diameters but unlike wall thickness shall not be permitted. Transitions between unlike wall thickness shall be made with a transition nipple (a short length of the heavier wall pipe with one end machined to the lighter wall) or by mechanical means.

d. Branch connections to the main shall be made with polyethylene fittings, and butt fused.

e. Bent Strap Test: On each day that butt fusions are to be made, perform a "Bent Strap Test." The first fusion of the day shall be a trial fusion. The trial fusion shall be allowed to cool completely, and then fusion test straps shall be cut out. The test strap shall be 12" (min) or 30 times the wall thickness in length with the fusion in the center, and 1" (min) or 1.5 times the wall thickness in width. Bend the test strap until the ends of the strap touch. If the fusion fails at the joint, a new trial fusion shall be made, cooled completely and tested. Butt fusion of pipe to be installed shall not commence until a trial fusion has passed the bent strap test.

f. Lengths of pipe shall be assembled into suitable installation lengths by the butt fusion process. All pipes so joined shall be made from the same class and type of raw material made by the same raw material supplier. Pipe shall be furnished in standard laying lengths not to exceed 50 feet and no shorter than

20 feet. Shorter than 20’ lengths may be used when connection to fittings is reasonable and other situations, upon approval of the COR

R. Install piping by directional boring under streams and other obstructions that cannot be disturbed.

3.3 IDENTIFICATION

A. According to Section 312000 “Earthwork.”

B. Wrap all buried, non-metallic, nonperforated piping with tracer wire.

C. Use detectable warning tape over piping and at outside edges of underground structures.

3.4 DAYLIGHT DRAINS

A. Transition from water system piping to stainless steel pipe downstream of the valve and 10-feet from atmospheric outlet of daylight drain.

B. Install suction strainer and insect screens on the atmospheric outlet of daylight drains. Attach insect screens to pipe with stainless steel hose clamps.

C. Minimum grade of slope of drain shall be **2%**.

D. Place riprap securely around outlet with a minimum 12” air gap.

3.5 PUMPOUT DRAINS

A. Construct and install as shown on the Drawings.

3.6 WELDING

A. Welding shall be done AS SHOWN ON THE DRAWINGS in accordance with the best modern practice and the applicable requirements of AWS D 2.0, except as otherwise provided herein or on the drawings.

3.7 HYDROSTATIC TESTING

A. General

1. The Contractor shall conduct pressure and leakage tests on all newly constructed portions of the water system, including water mains, service lines, fittings, valves, and hydrants. New waterlines that are extensions or modifications of an existing water system shall be tested at the test pressure specified here unless the Contracting Officer’s Representative specifies another pressure. Pneumatic testing will not be allowed.
2. The contractor shall ensure that any appurtenance attached to the pipeline at the time of testing is rated to withstand the pressures that will exist during testing.
3. Conduct piping tests before joints are covered and after thrust blocks, if required, have hardened sufficiently. Joints shall remain uncovered until testing is completed satisfactorily.

4. The Contractor shall furnish the pump, pipe, gauge, measuring device, connections, and all other necessary equipment, and shall furnish the necessary personnel to conduct the tests. All equipment, gauges, and attachments shall be subject to approval by the Contracting Officer's Representative.
5. The Contracting Officer's Representative shall be present during the testing period.
6. Waterlines shall be tested in sections not to exceed 2,000 ft in length or a maximum pressure differential of 30 psi in the test section.
7. No paints, asphalts, tars, enamels, or other types of pipe compounds shall be used to eliminate leaks.

B. Pressure and Leakage Test

1. The test pressure shall:

   a. Equal at least 125 psi at the highest elevation of the test but not exceed 160 psi at any point being tested.
   b. Not vary by more than +/- 5 psi from the established test pressure.
   c. Not exceed twice the rated pressure of valves when the test section includes closed valves.
   d. Be not less than 100 psi for all piping within buildings.

2. Pressure Test Procedure

   a. Equipment: The test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Contracting Officer's Representative.
   b. Preparation: Fill pipeline 24 hours before testing. Use only potable water. Each valved section of pipeline shall be slowly filled with water and all air shall be expelled from the pipeline. Apply test pressure to stabilize system.
   c. Pressurization:

      13. Increase pressure in 50-psig increments and inspect each joint between increments.
      23. Hold at test pressure for 1 hour.
      33. Decrease to 0 psig.
      43. Slowly increase again to test pressure and hold for 1 more hour. If the test pressure cannot be sustained within +/- 5 psi during this time, then the system will be determined to have leakage.
      53. Leakage shall be verified by the Contractor and the Contracting Officer's Representative.
      63. Locate and repair leaking joints with new materials and repeat test until leakage is within allowed limits. All visible leaks are to be repaired regardless of the amount of leakage.

   d. Examination: All exposed pipe, fittings, valves, and joints shall be carefully examined. Any cracked or defective pipe, fitting, or valve discovered shall be repaired or replaced by the Contractor at his own expense with new material and the test repeated until satisfactory to the Contracting Officer's Representative.

3. Results

    a. The Contractor shall furnish a written report to the Contracting Officer's Representative describing the results of each test. The report must identify the specific portions of the pipeline tested, the pressure, the duration of the tests, and the amount of leakage.

3.8 CLEANING AND DISINFECTION

A. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or as described below:

    a. Flushing Pipelines

        13. After the pressure and leakage testing has been completed, all water pipes shall be thoroughly flushed.
        23. Flushing shall remove all debris from the pipeline, including HDPE pipe shavings, gravel and any other material that may have accidentally entered the pipeline during construction.
        33. Remove all self-closing faucets and drinking fountains from hydrants before flushing lines. Failure to do so will likely clog the internal parts of the faucet.
        43. If no hydrants or other outlets are installed at the end of the waterline, an outlet at the end of each lateral shall be provided. Outlets shall be large enough to develop a velocity in the waterlines of at least 2.5 feet per second (see Table l for necessary flows). If necessary, use a booster pump or other method to obtain the necessary flows.
        53. Minimum velocities must be obtained in all mainlines, laterals and drainlines.
        63. Ensure flushing outlets have adequate drainage and no damage or erosion will occur from the flushing process. Install hoses and/or pipe extensions if necessary.

TABLE 1
Required Flow in Gallons per Minute
(GPM) to provide 2.5 feet per second
Flushing Velocity

Type of Pipe			
Nominal Pipe Size (inches)	HDPE (SDR 11)	PVC (160 psi)	Galv. Steel (Schedule 40)
1	7	9	7
1 ¼	11	15	12
1 ½	14	19	16
2	22	30	27
2 ½	-	44	38
3	49	64	58
3 ½	-	84	77
4	81	106	100
5	-	162	156
6	175	229	225
8	274	388	390
10	461	603	615
12	648	848	872

b. Requirement of Chlorination

13. Pipelines: After flushing, all new waterlines and repaired portions of, or extensions to, existing waterlines shall be disinfected by chlorination. Chlorination shall provide a minimum of 25 mg/l residual after 24 hours contact in the system. This may be expected with an application of 50 mg/l, although some conditions may require more. The entire system including the storage tank or spring box shall be filled with the disinfecting solution. All taps, hydrants, and other outlets shall be opened and left open until chlorine is noticeable by odor or testing in the water coming from each. Immediately close taps, hydrants, and other outlets. The chlorinated water shall be retained in the waterlines for at least 24 hours. An alternative of introducing a chlorine solution of 300 mg/l for a period of 3 hours is also approved.

23. Reservoirs Only: For large reservoirs where water is not going to be reused to disinfect connecting distribution lines, or where it is not economical to treat the entire contents with 50 mg/l of chlorine, disinfection can be accomplished by swabbing or spraying the walls, floor, and ceiling with a chlorine solution containing 300 mg/l of available chlorine. A minimum of 3 hours shall elapse before the structure is flushed and returned to service.

c. Preparation of Disinfecting Mixture: Chlorine-bearing compounds used for disinfection shall comply with ANSI/NSF 60.

13. Calcium hypochlorite must be prepared as a water mixture for introduction into the waterlines. The powder should first be made into a paste and then thinned to either a 1 percent or 5.25 percent chlorine solution.
23. Sodium hypochlorite is already a water mixture.
33. Table 2 gives the amount of chlorine-bearing compound to mix to obtain either a 1 percent or 5.25 percent solution.
43. Table 3 gives the amount of a 1 percent or 5.25 percent solution required to obtain a 50 mg/l solution for various volumes.
53. Table 4 gives the volume of water contained in each 100 feet of pipe of various sizes.

TABLE 2

Amount of Chlorine-bearing Compound to Mix to Obtain a 1% or 5.25% Solution				
Product	1% Solution		5.25% Solution	
	Amount of Compound	Gallons of Water	Amount of Compound	Gallons of Water
Calcium Hypochlorite (65% Cl)	1 pound	7.67	1 pound	1.36
Sodium Hypochlorite (5.25% Cl)	1 gallon	4.25	1 gallon	0

TABLE 3

Amount of Chlorine-Water Solution Required to make 50 mg/l Chlorine Solution for Various Volumes		
Volume (Gallons)	5.25% Solution	1.00% Solution
100	1.52 cup	0.50 gal.
500	0.48 gal.	2.50 gal.
1,000	0.95 gal.	5.00 gal.
5,000	4.76 gal.	25.0 gal.
10,000	9.52 gal.	50.0 gal.
50,000	47.6 gal.	250 gal.
100,000	95.2 gal.	500 gal.

TABLE 4

Volume in Gallons per 100 feet of Pipe			
	Type of Pipe		
Nominal Pipe Size (inches)	HDPE (SDR 11)	PVC (160 psi)	Galv. Steel (Schedule 40)
1	4.6	5.8	4.5
1 1/4	7.3	9.6	7.8
1 1/2	9.6	12.6	10.6
2	15.0	19.6	17.4
2 1/2	-	28.8	24.9
3	32.6	42.6	38.4
3 1/2	-	55.6	51.4
4	53.8	70.4	66.1
5	-	107.5	103.9
6	116.7	152.6	150.1
8	182.8	258.6	259.9
10	307.2	401.8	409.6
12	432.2	565.2	581.4

63.

d. Method of Chlorine Application: The preferred method is to fill the storage tank (for a distribution system) or the spring head box (for a supply system) with chlorinated water of the proper strength. The water shall then be released through the outlet lines to the remainder of the system and retained there for the required period of time. If either of these points of application is unavailable, chlorinated water of the proper strength may be added to the beginning of the pipeline extension, or to any valved section of the extension, through a corporation stop installed by the Contractor in the top of the pipe. Other methods may be approved by the Contracting Officer's Representative.

e. Testing of Chlorine Residual: To ascertain the concentration, the chlorine residual shall be measured by the Contracting Officer's Representative in accordance with the procedures described in the current edition of "Standard Methods for the Examination of Water and Wastewater," or AWWA M12, or by using an appropriate high-range chlorine test kit

f. Final Flushing and Testing: Following the retention period, as specified in this Section, all heavily chlorinated water shall be thoroughly flushed from the pipeline until the chlorine concentration in the water leaving any part of the line is no higher than 1 mg/1.

g. Disposal:

13. Heavily chlorinated water shall not be drained directly into streams, rivers, lakes or drainage ditches which lead to surface water.

23. When emptying the lines or tank after the 24-hour period, whether the system has passed or failed, the chlorine solution shall be neutralized before being discharged. Neutralize system by adding sodium thiosulfate to the storage tank in accordance with Table 5 below. Let

the sodium thiosulfate sit in the storage tank for 24-hours and then release the water from the tank and flush the system. Residual chlorine at the outlets shall be minimal.

TABLE 5
Amounts of Chemical Required to Neutralize
Various Residual Chlorine Concentrations in
1,000 gallons of Water

Residual Chlorine Concentration mg/L	Pounds of Sodium Thiosulfate ($Na_2 S_2 O_3 – 5H_2O$)
1	0.012
2	0.024
10	0.12
50	0.60

h. Bacteriological Examination: After the system has been disinfected as specified, but before the new water piping is put to use or connected to existing piping, the Contractor shall test the water for bacteriological contamination from representative points in the system as approved by the Contracting Officer's Representative. Contractor shall retrieve tests from Group Loop, Warehouse/Volunteer Village, C Loop, B Loop, A Loop Upper, A Loop Lower, and Beach area for a total of 7 tests. The coliform organisms shall be tested for presence/absence in accordance with State drinking water regulations. If coliform bacteria are present, testing shall be repeated in accordance with State drinking water regulations. If the report of this examination is unsatisfactory, the system shall be flushed and the disinfection procedure repeated until the results of bacteriological examinations are satisfactory.

END OF SECTION 221100

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 221102 - CURB VALVES AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Curb Valves and Boxes.

B. Related Sections include the following:

1. 221100 “Water Distribution Systems”
2. 221103 “Plumbing Appurtenances”
3. 312000 “Earthwork.”

C. See Section 221100 – Water Distribution Systems for information about NSF/ANSI 61-2025 and NSF/ANSI 372-2024 compliance.

D.

1.2 QUALITY ASSURANCE

A. All work is to be completed according to applicable Federal, State and Local codes.

B. Code Compliance:

1. All piping components (e.g., pipe, fittings, valves, meters, materials, thread sealant, and other appurtenances) shall be certified by NSF/ANSI 61-2025 and NSF/ANSI 372-2024 as lead-free and safe for use in drinking water systems.
2. All piping components (e.g., pipe, fittings, valves, meters, materials, thread sealant, and other appurtenances) shall comply with all requirements included the Virginia Waterworks Regulations and the Virginia Plumbing Code.

1.3 MEASUREMENT AND PAYMENT

A. Payment will be as listed for the following items:

1. Curb Valves and Boxes: Number of valves of each type and size designated, including boxes, operating rods, lid keys and all work within five feet of the center of the valve box.
2. Exception: Water lines shall be paid for separately under Section 221100 “Water Distribution Systems.”

1.4 DEFINITIONS

A. PFAS-Free: Products that contain zero per- or polyfluoroalkyl substances, including no Polytetrafluoroethylene (PTFE), fluorinated polymers, or fluorosurfactants.

B. Potablewater, or drinking water, or potable drinking water: Water that is safe and intended for human consumption.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Curb valves and boxes.

B. Operation and Maintenance Data: For the following:

1. Curb valves and boxes.

C. Submit manufacturer's official certification that all pipe, valves, fittings, and mechanical components are certified to NSF/ANSI 61-2025 for health effects imparted to drinking water and to NSF/ANSI 372-2024 as lead-free and safe for use in drinking water systems.

D. Submit manufacturer's official certification that all pipe, valves, fittings, and mechanical components are PFAS-free.

1.6 REFERENCES

A. AWWA C651 – Disinfecting Water Mains

B. AWWA C655 – Field Dechlorination

C. NSF/ANSI 61-2025 – Drinking Water System Components – Health Effects

D. NSF/ANSI 372-2024 – Drinking Water System Components – Lead Content

E. NSF/ANSI 600-2024 – Health Effects Evaluation and Criteria for Chemicals in Drinking Water

F. Recommended Standards for Water Works ("Ten States Standards")

G. The Uniform Statewide Building Code (USBC), Current Edition

H. The Virginia Plumbing Code, Current Edition

I. 12VAC5-590 – Virginia Administrative Code – Virginia Waterworks Regulations

PART 2 - PRODUCTS

2.1 GENERAL

A. All pipe, valves, fittings, and mechanical components shall be certified to NSF/ANSI 61-2025 for health effects imparted to drinking water and to NSF/ANSI 372-2024 as lead-free and safe for use in drinking water systems.

B. All materials, equipment, and construction methods, including decontamination and de-chlorination, for this drinking water system must fully comply with the **Virginia Uniform Statewide Building Code (USBC)**, the **Virginia Plumbing Code (VPC)**, and the **Recommended Standards for Water Works (Ten States Standards)**. In cases of overlapping or conflicting requirements, the most stringent specification shall govern.

C. All pipe, valves, fittings, and mechanical components shall be PFAS-Free.

2.2 CURB VALVES AND BOXES

A. Valves: Valves shall be the same nominal size as the line in which they are installed or as indicated on the Drawings.

1. Valve Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and end matching curb valve. Furnish one valve operating wrench or shut-off rod with every five (or fraction thereof) curb boxes installed, as indicated on the Drawings.
2. Poly Valves: Curb valves shall be certified by NSF/ANSI 61-2025 and NSF/ANSI 372-2024 as lead-free and safe for use in drinking water systems.
3. Valves 3 inches and Larger: Valves 3 inches and larger shall be gate valves with ASTM A582 stainless steel stems with stainless steel bonnets, and HDPE pipe stubs included on each end.

    a. The valve shall be a ductile iron body, gray iron or ductile iron bonnet, non-rising stem, open left, resilient seated, with AWWA standard 2-inch square operating nut and shall be protectively coated inside and out.
    b. All bolting shall be stainless steel AISI grade 316. If nuts are used on the bolts, the nuts shall be 316 stainless steel and the bolt threads shall be coated with and anti-galling compound.
    c. Resilient gate:

        12. The valve gate shall be ductile iron, fully-encapsulated with EPDM rubber, and shall be capable of drip-tight shutoff of flow in either direction.
        22. The resilient rubber material shall be permanently vulcanized to the gate.

    d. Stems:

        12. Valve stems shall be made of stainless steel with a minimum yield strength of 40,000 psi.
        22. Stems shall be provided with separate or integral thrust collars.

    e. Seals and gaskets:

        12. Valve stem seals shall be an O-ring type with not less than one O-ring below the thrust collars and two O-rings above the thrust collars.
        22. If an O-ring groove is cut into the stem, the diameter shall not be less than the root diameter of the stem threads.

32. Bolt gaskets shall be an O-ring type that completely encircle each individual bonnet bolt so that the bolts are isolated from internal or external water sources.

f. Protective coatings:

12. The exposed ferrous surfaces shall be coated with a fusion-bonded epoxy that shall be certified to the NSF/ANSI 61-2025 standard.
22. The valve shall be coated inside and outside to meet the requirements of AWWA C550.

g. End connections:

12. The end connections of the valve body shall be a male-barbed spigot.
22. The internal diameter of the steel compression sleeve shall be machined to match the compression requirements for the specified SDR of the pipe stub.
32. After installation, the steel compression sleeve shall be covered with a "heat-activated shrink tube" to prevent corrosion.
42. The assembled valve-to-pipe connection shall be capable of withstanding an internal pipe pressure that is, at a minimum, equal to twice the working pressure rating of the installed HDPE pipe without any signs of loosening or leakage.

h. Polyethylene pipe stubs:

12. The polyethylene (PE) pipe stub installed on the valve shall be sized to match the adjoining piping and be DR11 wall thickness.
22. The PE pipe stub shall contain a minimum of 2% carbon black to protect against ultraviolet degradation during storage. Colored stripes are allowed on the pipe exterior for identification purposes.
32. Scratches of gouges in the PE pipe surface that are more than 10% of the wall thickness in depth shall result in rejection of the valve.Valves Smaller Than 3-inch: Similar quality to AWWA C906.
42. Valves shall:

a) Be made for the isolation of water;
b) Be seamlessly installable by butt fusion or electrofusion;
c) Have integral DR11 HDPE outlets;
d) Comply with AWWA C521;
e) Have a double reducer length, allowing for a second electrofusion weld if the first one fails;
f) Have a body and reducers manufactured from high-performance PE4710;
g) Be equipped with two weather seals, preventing ingress of ground water and dirt into the operating mechanism;
h) Have an anti-blow-out stem with a double O-ring seal to guarantee safety at all times;

i) Have a full port ball, to ensure a low pressure drop and greater flow through the valve and allow for pigging of the pipeline;
j) Have a smooth inner surface to prevent deposits and minimize flow resistance;
k) Have an operating temperature range of –20°F to 140°F; and
l) Have a pressure rating of 200 psi.

i. Dimension Ratio and Pressure Rating: Same as pipe in which the valve is installed

B. Curb Boxes:

1. Lids: Lockable, with pentagon-type bolt, compatible with valve box; labeled "WATER".
2. Pentagon Lid Keys: Furnish one key with every five (or fraction thereof) curb boxes installed.
3. Curb Boxes for Poly Valves:

a. Design: Slider or screw type, Buffalo pattern.
b. Bottom Sections: Compatible with valve.
c. For 2-Inch Through 6-Inch Valves: 5-1/4-Inch shaft, Series 500 Plastic Boxes, as manufactured by Bingham and Taylor or an approved equal.

12. Bottom Sections for 2" or 3" Valves: #104

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating and backfilling for valves and boxes is specified in Section 312000 "Earthwork."

3.2 CURB VALVE AND BOX INSTALLATION

A. Crushed Gravel Bed: Under each valve, 12-inch minimum diameter, 6-inch minimum depth.

B. Knockouts: Remove knockouts from valve box.

C. Curb Box Position: Centered over valve bonnet, no part in contact with valve. The curb valve box shall not rest on the pipe, but shall be fully supported by the gravel base.

D. Valve Support Base: Shall be included to support ball valves. Support shall be set on concrete block and attached.

E. Curb Box Lid: Flush with finished grade, unless indicated otherwise on the Drawings.

END OF SECTION 221102

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 221103 - PLUMBING APPURTENANCES

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes piping, fittings, valves, flow meters, gauges, and other plumbing devices within utility boxes or at other locations.

B. Related sections include the following:

1. 133402 “Utility Box.”
2. 221100 “Water Distribution Systems”
3. 221102 “Curb Valves and Boxes”
4. 221105 “Water Hydrants”
5. 221220 “Submersible Well Pump”
6. 260500 “Common Work Results for Electrical.”

1.2 SUBMITTALS

A. Product Data: For all plumbing components, including the following:

1. All plumbing fixtures.
2. All gauges.
3. All valves.
4. Air and vacuum valves.
5. Pressure relief valves.
6. Pressure regulating valves.
7. Flow meters.
8. Backflow preventers.
9. Altitude Pressure Gauges.

B. Operation and Maintenance Data: To be used in emergency, operation, and maintenance manuals. Include the data for the following:

1. All plumbing fixtures.
2. All gauges.
3. All valves.
4. Air and vacuum valves.
5. Pressure relief valves.
6. Pressure regulating valves.
7. Flow meters.
8. Backflow preventers.
9. Altitude Pressure Gauges.

C. Submit manufacturer's official certification that all pipe, valves, fittings, and mechanical components are certified to NSF/ANSI 61-2025 for health effects imparted to drinking water and to NSF/ANSI 372-2024 as lead-free and safe for use in drinking water systems.

D. Submit manufacturer's official certification that all pipe, valves, fittings, and mechanical components are PFAS-free.

1.3 DEFINITIONS

1. PFAS-Free: Products that contain zero per- or polyfluoroalkyl substances, including no Polytetrafluoroethylee (PTFE), fluorinated polymers, or fluorosurfactants.
2. Potable Water or Drinking Water or Potable Drinking Water: Water that is safe an intended for human consumption.

1.4 MINIMUM SYSTEM REQUIREMENTS

A. Unless otherwise noted, the minimum working pressure for piping and specialty valves and devices shall be **200** psig.

1.5 QUALITY ASSURANCE

A. Code Compliance:

1. All piping components (e.g., pipe, fittings, valves, meters, materials, thread sealant, and other appurtenances) shall be certified by NSF/ANSI 61-2025 and NSF/ANSI 372-2024 as lead-free and safe for use in drinking water systems.
2. All piping components (e.g., pipe, fittings, valves, meters, materials, thread sealant, and other appurtenances) shall comply with all requirements included the Virginia Waterworks Regulations and the Virginia Plumbing Code.
3. All products shall be PFAS-Free.
4. Eye Wash and Shower components shall adhere to OSHA requirements.

1.6 REFERENCES

A. ASME B16.42: Ductile Iron Pipe Flanges and Flanged Fittings

B. ASME B16.5: Pipe Flanges and Flanged Fittings NPS ½" through 24"

C. ASTM A182: Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges

D. ASTM D709 – Standard Specification for Laminated Thermosetting Materials

E. AWWA C550 – Protective Epoxy Interior Coatings for Valves and Hydrants

F. AWWA C651 – Disinfecting Water Mains

G. AWWA C652 – Disinfection of Water Storage Facilities

H. AWWA C653 – Disinfection of Water Treatment Plants

I. AWWA C654 – Disinfection of Wells

J. AWWA C655 – Field Dechlorination

K. AWWA C701 – Cold-Water Meters – Turbine Type, for Customer Service

L. NSF/ANSI 61-2025 – Drinking Water System Components – Health Effects

M. NSF/ANSI 372-2024 – Drinking Water System Components – Lead Content

N. NSF/ANSI 600-2024 – Health Effects Evaluation and Criteria for Chemicals in Drinking Water

O. Recommended Standards for Water Works ("Ten States Standards")

P. The Uniform Statewide Building Code (USBC), Current Edition

Q. The Virginia Plumbing Code, Current Edition

R. 12VAC5-590 – Virginia Administrative Code – Virginia Waterworks Regulations

1.7 MEASUREMENT AND PAYMENT

A. There will be no separate measurement or payment for the work in this Section. Plumbing Appurtenances is considered incidental to other items of work shown in the Schedule of Items.

PART 2 - PRODUCTS

2.1 GENERAL

A. All plumbing appurtenances shall be new and unused, of the type, pressure rating or class, and size specified and as shown on the Drawings.

B. All pipe, valves, fittings, and mechanical components shall be certified to NSF/ANSI 61-2025 for health effects imparted to drinking water and to NSF/ANSI 372-2024 as lead-free and safe for use in drinking water systems.

C. All materials, equipment, and construction methods, including decontamination and de-chlorination, for this drinking water system must fully comply with the **Virginia Uniform Statewide Building Code (USBC)**, the **Virginia Plumbing Code (VPC)**, and the **Recommended Standards for Water Works (Ten States Standards)**. In cases of overlapping or conflicting requirements, the most stringent specification shall govern.

D. All products shall be PFAS-Free.

2.2 EYE WASH STATIONS

A. Description: Adhere to OSHA requirements for eye wash equipment required where hazardous materials are being used.

B. Model: Honeywell Eyesaline Two-bottle Eyewash Station or equivalent.

2.3 WATER METER

A. Submittals:

1. Certification Documentation: Submit official documentation from the manufacturer certifying the meter assembly, including all components, holds active certification to NSF/ANSI 61-2025 and NSF/ANSI 372-2024.
2. PFAS-Free Certification: Submit official documentation from the manufacturer certifying the meter assembly, including all components, contains zero PFAS compounds.

B. Description: Inline, flanged, turbine-type meter complying with AWWA C701 Class II requirements. Meters shall have the following features:

1. Working pressure rating: Continuous 150 psi, minimum.
2. Operating Range: 4 to 200 gpm
3. Accuracy:
    a. 98.5% - 101.5% in normal operating range
    b. 95.0% to 101.0% at low flow
4. Maximum Continuous Flow: 160 gpm
5. Pressure Loss: Not to exceed 3.8 psi at maximum continuous flow of 160 gpm.

C. Materials and Construction

1. Housing and Cover Plate: Ductile iron or lead-free bronze alloy, conforming to AWWA C701 standards.
2. Measuring Element: Unitized, completely removable design. Nose cone and straightening vanes shall be high-impact, PFAS-free thermoplastic.
3. Rotor: Direct-coupled turbine based on a “floating rotor” design to reduce bearing friction and wear.
4. Bearings:
    a. Rotor radial bearings: Lubricated thermoplastic.
    b. Rotor thrust bearing: Sapphire jewels.
5. Register/Encoder: Permanently sealed, magnetic drive register. Register housing and cover shall be impact resistant thermoplastic or lead-free bronze, containing no PFAS in the enclosure or sealing gaskets.
6. Measuring chamber and rotor: lightweight, wear-resistant, non-hydrolizing polymer or stainless steel, running on graphite or ceramic jewel bearings.
7. Fasteners shall be 316 stainless steel.
8. Register shall be hermetically sealed, with scratch resistant tempered glass lens.
9. Units: Gallons.
10. Scale: 8-wheel odometer type, with low-flow leak indicator.

D. Installation:

1. Install meter in strict accordance with AWWA Manual M6 and manufacturer’s installation guidelines.
2. Provide a minimum of five pipe diameters of straight pipe upstream and two pipe diameters of straight pipe downstream to ensure proper flow conditioning.

3. Include 1-inch NPT test plug for field accuracy and pressure testing without removal of the meter from the line.

2.4 BALL VALVES

A. Submittals:

1. Certification Documentation: Submit official documentation from the manufacturer certifying the valve assembly, including all components, holds active certification to NSF/ANSI 61-2025 and NSF/ANSI 372-2024.
2. PFAS-Free Certification: Submit official documentation from the manufacturer certifying the valve assembly, including all components, contains zero PFAS compounds.

B. Description:

12. Ball valves for inclusion in HDPE pipe runs shall:

a) Be made for the isolation of water;
b) Have HDPE pipe stubs on each end and be seamlessly installable by butt fusion or electrofusion;
c) Have integral DR11 HDPE outlets;
d) Comply with AWWA C521;
e) Have a double reducer length, allowing for a second electrofusion weld if the first one fails;
f) Have a body and reducers manufactured from high-performance PE4710;
g) Be equipped with two weather seals, preventing ingress of ground water and dirt into the operating mechanism;
h) Have an anti-blow-out stem with a double O-ring seal to guarantee safety at all times;
i) Have a full port ball, to ensure a low pressure drop and greater flow through the valve and allow for pigging of the pipeline;
j) Have a smooth inner surface to prevent deposits and minimize flow resistance;
k) Have an operating temperature range of –20°F to 140°F; and
l) Have a pressure rating of 200 psi.

22. Ball valves for inclusion in stainless steel pipe runs shall:
32. Be stainless steel and have a pressure rating of 200 psi.
42. Be certified by the manufacturer to be PFAS-Free.

2.5 GATE VALVES

A. Submittals:

1. Certification Documentation: Submit official documentation from the manufacturer certifying the valve assembly, including all components, holds active certification to NSF/ANSI 61-2025 and NSF/ANSI 372-2024.
2. PFAS-Free Certification: Submit official documentation from the manufacturer certifying the valve assembly, including all components, contains zero PFAS compounds.

B. Description: ASTM A582 stainless steel stems with stainless steel bonnet bolts. HDPE pipe stubs included on each end.

1. The valve shall be a ductile iron body, gray iron or ductile iron bonnet, non-rising stem, open left, resilient seated, and shall be protectively coated inside and out. Below-grade (i.e., buried) valves shall have an AWWA standard 2-inch square operating nut. Above-grade valves shall have an operating wheel or handle.
2. All bolting shall be stainless steel AISI grade 316. If nots are used on the bolts, the nuts shall be 316 stainless steel and the bolt threads shall be coated with an anti-galling compound.
3. Resilient gate:
    a. The valve gate shall be ductile iron, fully-encapsulated with EPDM rubber, and shall be capable of drip-tight shutoff of flow in either direction.
    b. The resilient rubber material shall be permanently vulcanized to the gate.
4. Stems:
    a. Valve stems shall be made of stainless steel with a minimum yield strength of 40,000 psi.
    b. Stems shall be provided with separate or integral thrust collars.
5. Seals and gaskets:
    a. Valve stem seals shall be an O-ring type with not less than one O-ring below the thrust collars and two O-rings above the thrust collars.
    b. If an O-ring groove is cut into the stem, the diameter shall not be less than the root diameter of the stem threads.
    c. Bolt gaskets shall be an O-ring type that completely encircle each individual bonnet bolt so that the bolts are isolated from internal or external water sources.
6. Protective coatings:
    a. The exposed ferrous surfaces shall be coated with a fusion-bonded epoxy that shall be certified to the NSF/ANSI 61-2025 and NSF/ANSI 372-2024 standards.
    b. The valves shall be coated inside and out to meet the requirements of AWWA C550.
7. End connections:
    a. The end connections of the valve body shall be a male-barbed spigot.

b. The internal diameter of the steel compression sleeve shall be machined to match the compression requirements for the specified SDR of the pipe stub.
c. After installation, the steel compression sleeve shall be covered with a "heat-activated shrink tube" to prevent corrosion.
d. The assembled valve-to-pipe connection shall be capable of withstanding an internal pipe pressure that is, at a minimum, equal to twice the working pressure rating of the installed HDPE pipe without any signs of loosening or leakage.

8. Polyethylene pipe stubs:

a. The polyethylene (PE) pipe stub installed on the valve shall be sized to match the adjoining piping and be DR11 wall thickness.
b. The PE pipe stub shall contain a minimum of 2% carbon black to protect against ultraviolet degradation during storage. Colored stripes are allowed on the pipe exterior for identification purposes.
c. Scratches or gouges in the PE pipe surface that are more than 10% of the wall thickness in depth shall result in rejection of the valve.

C.

2.6 STRAINERS

A. Submittals:

1. Certification Documentation: Submit official documentation from the manufacturer certifying the assembly, including all components, holds active certification to NSF/ANSI 61-2025 and NSF/ANSI 372-2024.
2. PFAS-Free Certification: Submit official documentation from the manufacturer certifying the assembly, including all components, contains zero PFAS compounds.

B. Description: Heavy-duty, high-capacity pipeline strainers for drinking water systems.

C. Performance & Design Requirements

1. Configuration: "H-Style" straight-through flow design with a large-volume sediment chamber.
2. Flow Efficiency: Total open area of the screen must be at least 400% of the pipe cross-sectional area.
3. Pressure Rating: Minimum working pressure of 250 psi at 150°F.
4. Maintenance Access: Top-entry, bolted-bonnet design allowing screen removal without disconnecting the strainer body from the pipeline.

D. Materials & Coatings:

1. Strainer Body and Cover: Ductile Iron complying with ASTM A536.
2. External & Internal Coating: Fusion-bonded epoxy (FBE) complying with AWWA C550.
3. Strainer Screen: Heavy-gauge, precision-perforated 316 stainless steel with 2000-micron/0.0078-inch openings.
4. Bolting: Type 316 stainless steel hex bolts and nuts.

5. Seals: NBR (Buna-N) or EPDM synthetic rubber seals suitable for drinking water service.

E. Installation:

1. Orientation: Install strainer horizontally with the bolted bonnet facing upward.
2. Clearance: Provide adequate vertical clearance above the unit for screen removal during maintenance.
3. Testing: Pressure-test the installed strainer concurrently with the main piping system.

2.7 PIPE AND FITTINGS

A. Submittals:

1. Certification Documentation: Submit official documentation from the manufacturer certifying the pipe, fittings, and all components, hold active certification to NSF/ANSI 61-2025 and NSF/ANSI 372-2024.
2. PFAS-Free Certification: Submit official documentation from the manufacturer certifying the pipe, fittings, and all components, contain zero PFAS compounds

B. Stainless Steel:

1. All steel pipe and fittings shall be Type 316/316L stainless steel and approved for use in potable drinking water systems. All piping, fittings, and components shall be in certified conformance with the current editions of the following standards:
2. Potable Water Safety; Components must be certified safe to contact with drinking water per NSF/ANSI 61-2025.
3. Lead-Free Compliance: Weighted average lead content must be less than 0.25%, certified to NSF/ANSI 372-2024.
4. Piping Standards: Seamless and welded stainless steel must meet ASTM A312 or ASTM A269.
5. Fitting Standards: Threaded fittings must conform to ASME B16.11 for forged components, or ASTM A351 for cast components.
6. Thread Specifications: Threads must be tapered pipe threads (NPT) conforming to ASME B1.20.1.
7. Wall Thickness: Pipe must be Iron Pipe Size (IPS) Schedule 40S in accordance with ASME B36.19M.
8. Pressure Class: Threaded fittings must meet a minimum of Class 150.

C. HDPE: All pipe connections shall be butt fused. If transitioning to stainless steel or flange, one side of the connection shall be a fused end.

2.8 THREAD SEALANTS

A. Submittals:

1. Product data: Manufacturer’s technical data for each thread sealant product, including physical properties and limitations.

2. Certifications: Copies of certificates from an ANSI-accredited certification body (e.g., NSF International) verifying product compliance with NSF/ANSI 61-2025 and NSF/ANSI 372-2024 for use in drinking water systems.
3. Manufacturer's Certification: A signed manufacturer's statement certifying that all thread sealants to be used are 100% free of PTFE/PFAS compounds.

B. Quality Assurance:

1. Thread sealants shall conform to the requirements for drinking water safety included in the following:

    a. International Plumbing Code (IPC)
    b. Uniform Plumbing Code (UPC)
    c. Virginia Plumbing Code (VPC)
    d. Virginia Waterworks Regulations

C. Thread Tapes and Coated Monofilament Threads:

1. All materials shall be PFAS-free and certified in accordance with NSF/ANSI 61-2025 and NSF/ANSI 372-2024 for use in drinking water systems.
2. Characteristics:

    a. Flexible, durable, and non-toxic.
    b. Capable of sealing the type of pipe for which it will be used.

D. Thread Compounds (Paste/Dope):

1. All materials shall be PFAS-free and certified in accordance with NSF/ANSI 61-2025 and NSF/ANSI 372-2024 for use in drinking water systems.
2. Characteristics:

    a. Soft-setting, non-hardening, slow-drying paste.
    b. Lubricates threads to prevent galling, seizing, and cross-threading.
    c. Zero VOCs.
    d. Safe for contact with hot and cold potable water.

E. Application:

1. Install products in accordance with manufacturer's printed instructions and industry-accepted plumbing practices.
2. Apply only to the male threads.
3. Leave the first two threads of the pipe end bare to prevent sealant from entering the piping system.

F. Cleaning and Inspection:

1. After installation and prior to system pressurization, flush the piping system to remove any loose debris or installation byproducts.
2. Test the system for leaks in accordance with 221100 – Water Distribution Systems. Repair any leaks using fresh sealant. Repeat procedure until system is fully watertight.

2.9 PIPE FLANGES

A. Submittals:

1. Certification Documentation: Submit official documentation from the manufacturer certifying the flange holds active certification to NSF/ANSI 61-2025 and NSF/ANSI 372-2024.
2. PFAS-Free Certification: Submit official documentation from the manufacturer certifying the flange contains zero PFAS compounds.

B. Section includes:

1. Requirements for Class 150 and Class 300 raised-face flanges.
2. Flange types: Weld-neck, slip-on, blind, socket-weld, threaded, and lap joint.

C. Description:

1. Pressure-Temperature Rating: Class 150 or Class 300, as indicated on the Drawings or elsewhere in these Specifications.
2. Facing Type: Raised Face. The raised face shall have a height of 1/16".

2.10 FLANGE ISOLATING KITS

A. Function: Flange isolating kits shall be installed wherever flanges of dissimilar metals (e.g., ductile iron and stainless steel) are to be mated, and shall prevent galvanic corrosion by isolating the dissimilar metals from each other.

B. Submittals:

1. Product data: Include material compositions and pressure ratings.
2. Certifications: Copies of certificates from an ANSI-accredited certification body (e.g., NSF International) verifying product compliance with NSF/ANSI 61-2025 and NSF/ANSI 372-2024 for use in potable water systems.
3. Manufacturer's Certification: A signed manufacturer's statement certifying that all thread sealants to be used are 100% free of PTFE/PFAS compounds.

C. Description:

1. Gasket type: Type F (Ring gasket fitting inside the flange bolt circle)
2. Rating: Compatible with ASME Class 150 or Class 300 raised face flanges, as appropriate for the location.
3. Gasket construction:
    a. Retainer material: NEMA Grade G-10 glass-reinforced epoxy laminate (ASTM D709), PFAS-free, with a minimum dielectric strength of 800 V/mil
    b. Sealing element: Fully-encapsulated EPDM Quad-Ring
4. Bolt isolating components (per bolt):
    a. Isolating Sleeves: Full-length G-10 glass-reinforced epoxy or high-density polyethylene
    b. Isolating Washers: Two G-10 glass-reinforced epoxy washers per bolt, 1/8-inch minimum thickness
    c. Backing Washers: Two stainless steel washers per bolt.

D. Installation:

1. Install flange isolation kits in accordance with manufacturer's written recommendations and recommended torque value.

2.11 COMBINATION AIR VALVE FOR PIPELINES

A. Submittals:

1. Certification Documentation: Submit official documentation from the manufacturer certifying the assembly, including all components, holds active certification to NSF/ANSI 61-2025 and NSF/ANSI 372-2024.
2. PFAS-Free Certification: Submit official documentation from the manufacturer certifying the assembly, including all components, contains zero PFAS compounds.

B. General Design and Functional Requirements

1. Type: Valves shall be single-body, kinetic/automatic combination air valves designed for clean, treated water distribution networks.
2. Dual-Orifice Mechanism: The valve shall incorporate a dual-orifice mechanism within a single housing:
    a. Large Air Orifice: Designed to automatically exhaust large volumes of air during pipeline filling and to admit large volumes of air during pipeline drainage or vacuum conditions to prevent structural pipe collapse.
    b. Small Air Orifice: Designed to continuously release small pockets of accumulated, entrained air while the pipeline is bully pressurized and operating under normal flow conditions.
3. Anti-Shock/Air Gap Design: The internal geometry shall feature an inherent air-gap design that positions the sealing mechanism above the liquid water line under normal pressurized operations, mitigating structural shock and reducing continuous water contact with the primary kinetic seals.

C. Health, Safety, and Regulatory Compliance:

1. Potable Water Certification: The entire fully assembled valve unit, including all structural components, internal linings, coatings, seals, and gaskets, shall be certified to NSF/ANSI 61-2025 and NSF/ANSI 372-2024 for use in drinking water systems.
2. PFAS-Free Mandate: Every component of the valve assembly shall be 100% free of per- and polyfluoroalkyl substances (PFAS).
    a. Explicit Material Prohibitions: The use of Fluorocarbon rubber (FKM/Viton), Polytetrafluoroethylene (PTFE/Teflon), or any related fluoropolymer-based materials, structural fillers, or internal lubricants is strictly prohibited.
3. Flange Configuration: End connections shall feature raised-face ASME Class 150 ductile iron flanges.

D. Materials of Construction:

1. Body and Cover: Structural body and upper enclosure shall be constructed of heavy-duty ductile iron conforming to ASTM A536 (Minimum Grade 65-45-12).
2. Corrosion Isolation Coating: The interior and exterior surfaces of the valve body and cover shall be fully encapsulated with a non-toxic, holiday-free, fusion-bonded epoxy coating. Coating thickness shall be a minimum of 8 mils. Coating shall be certified to NSF/ANSI 61-2025 and NSF/ANSI 372-2024.
3. Internal Kinetic Mechanisms: The internal float, linkage arms, leverage frame, guide pins, and all associated structural fasteners shall be constructed of Type 316 Stainless Steel (ASTM A240/A276).
4. Primary Body-to-Cover Gaskets: The sealing interface between the structural body and the top enclosure cover shall be a solid, non-porous Ethylene Propylene Diene Monomer (EPDM) elastomer certified to NSF/ANSI 61-2025 and NSF/ANSI 372-2024.
5. Dynamic Orifice Seats and Needles: All resilient seats, small-orifice needles, and vacuum-sealing cushions shall be constructed EPDM rubber certified to NSF/ANSI 61-2025 and NSF/ANSI 372-2024.

E. Submittals:

1. Certification Documentation: Submit official documentation from the manufacturer certifying the valve assembly, including all components, holds active certification to NSF/ANSI 61-2025 and NSF/ANSI 372-2024.
2. PFAS-Free Certification: Submit official documentation from the manufacturer certifying the valve assembly, including all components, contains zero PFAS compounds and explicitly confirming that EPDM has been substituted for all standard cork, fiber, or fluoropolymer-based gaskets or seals.

F. Factory Testing and Quality Control:

1. Hydrostatic Testing: Each valve assembly shall undergo factory hydrostatic shell testing at 1.5 times its rated working pressure to verify casting integrity and seal performance.
2. Low-Pressure Sealing: The valve mechanism shall achieve a positive drip-tight shutoff against the resilient seats at pressures as low as 5 psi to guarantee sealing performance during low-flow or system ramp-down sequences.

2.12 PRESSURE RELIEF VALVE FOR USE WITH PRESSURE-REGULATING VALVES

A. Summary:

1. Section Includes: Direct-acting, spring-loaded, diaphragm-actuated pressure relief valves for potable water systems, sized ¾-inch, designed to maintain strict system pressure limits, and the appurtenant ¼" NPT drain valve (ball valve).

B. Submittals:

1. Product Data: Include dimensions, weight, rated capacities, pressure ratings, and operating curves showing pressure drop versus flow rate.
2. Certification Documentation: Submit official documentation from the manufacturer certifying the valve assembly and appurtenant drain valve (ball valve), including all

components, holds active certification to NSF/ANSI 61-2025 and NSF/ANSI 372-2024.

3. PFAS-Free Certification: Submit official documentation from the manufacturer certifying the valve assembly and appurtenant drain valve (ball valve), including all components, contains zero PFAS compounds.

C. Direct-acting Potable Water Pressure Relief Valves (3/4-inch)

1. Performance Design Basis: Specifications are based on the operating and performance geometry of the Cla-Val Model 55F. Alternative products must strictly match the direct-acting sensitivity, and rapid opening/drip-tight closing tolerances of this design.
2. Operation Parameters:
    a. Direct-Acting Mechanical Design: The valve must be normally closed, held shut be an adjustable compression spring above the diaphragm chamber.
    b. Sensing Mechanism: Equipped with an isolated pressure-sensing chamber underneath the diaphragm, fed by an external sensing line connected to the valve inlet.
    c. Hydraulic Control: The valve must open instantly when system pressure under the diaphragm exceeds the spring setpoint, and close drip-tight within narrow pressure differentials as pressure normalizes.
    d. Packing Requirements: No packing glands or stuffing boxes are permitted.
3. Physical Characteristics and Materials:
    a. Valve Size: ¾-inch Threaded NPT.
    b. Configuration: Globe pattern with an integrated external sensing circuit.
    c. Pressure Rating: Minimum sage working pressure of 400 psi.
    d. Temperature Range: Fluid capability up to 180°F.
    e. Body and Cover Material: Cast Stainless Steel conforming to ASTM A743 Grade CF-8M or CF-16Fa to eliminate galvanic corrosion risks when mated directly to stainless steel piping networks.
    f. Internal Trim Material: All internal metallic components (including seat, stem, spring, retainers, and disc guide) shall be constructed from 316 Stainless Steel. Commercial brass or standard 303 stainless steels are prohibited to maintain strict chemical compatibility and leachate standards.
4. Elastomers & Seals (PFAS-Free Criteria):
    a. Diaphragm: Nylon-fabric reinforced EPDM or heavy-duty PFAS-free Buna-N synthetic rubber. Diaphragm formulations containing PTFE, Viton (FKM), or fluoropolymers are prohibited.
    b. Sealing Disc: Replaceable resilient rubber compound molded into a solid stainless steel retainer, yielding a drip-tight bubble closure.
5. Adjustment Range:
    a. Spring Range Selection: Factory-set and field-adjustable using a top-mounted adjusting screw protected by a threaded cap and locknut.

b. Pressure Range: 20 to 105 psi.

6. Field Quality Control and Commissioning

a. Hydrostatic Testing: Test the completed assembly alongside the main domestic water line installation under standard system testing constraints.
b. Field Adjustments: Calibrate the top adjusting screw under live pressure utilizing a calibrated system pressure gauge to verify that the relief point matches the designated design criteria exactly. Secure the adjustment assembly using the factory locknut and protective cap upon validation.

D. ¼" NPT DRAIN VALVE

1. The normally-closed drain valve for the pressure-relief valve shall be ¼" NPT.
2. The valve shall be stainless steel and shall be capable of withstanding a normal operating pressure of 150 psi.
3. The valve shall be certified by the manufacturer to be PFAS-Free.
4. The valve shall be mounted on the drain outlet of the pressure-relief valves using a ¼" stainless steel nipple.

2.13 PRESSURE REGULATING VALVE FOR DISTRIBUTION SYSTEM PIPELINES

A. Section Includes: Hydraulically operated, pilot-controlled, diaphragm-type automatic pressure reducing valves (PRVs) for potable drinking water systems.

B. Submittals:

1. Product data: Include dimensions, rated capacities, and operating pressure ranges.
2. Certification Documentation: Submit official documentation from the manufacturer certifying the valve assembly, including all components, holds active certification to NSF/ANSI 61-2025 and NSF/ANSI 372-2024.
3. PFAS-Free Certification: Submit official documentation from the manufacturer certifying the valve assembly, including all components, contains zero PFAS compounds.

C. Performance and Operation Criteria

1. Functional Profile: Automatically reduce a higher, fluctuating upstream inlet pressure to a constant, pre-determined lower downstream pressure regardless of changing system flow rates or varying inlet pressures.
2. Drip-Tight Closure: When downstream system pressure exceeds the design spring setting of the control pilot, the main valve shall close drip-tight to eliminate downstream pressure creep.
3. Flow & Cavitation Characteristics: Internal design must minimize turbulence and scale buildup.

D. Main Valve Body and Cover

1. Sizing: 3-inch and 4-inch line configurations.
2. Pattern Profile: Globe-style configuration with a full-port, unobstructed flow path.
3. Material Standard: Ductile Iron, ASTM A536.

4. Internal and External Coating: Fusion-bonded epoxy coating, minimum 10 mils thickness, certified by NSF/ANSI 62-2025 and NSF/ANSI 372-2024 for potable water service.
5. End Connections: Class 300 raised-face flanges conforming to ASME B16.42.

E. Internal Valve Trim (All Stainless Steel)

1. Actuation Design: Hydraulically-operated, single diaphragm-actuated, utilizing a resilient disc guide, a stainless steel stem, and a single top-guided return spring.
2. Frictionless Movement: Design shall employ a fully-supported, frictionless diaphragm layout. Pistons, packing glands, or internal roll-diaphragms prone to mechanical binding are prohibited.
3. Seat & Stem Assemblies: Removable, 316 stainless steel seat. Stem, stem-nut, return spring, and disc guide components must be constructed of high-tensile 316 stainless steel.

F. Elastomers and Seals (PFAS-free)

1. Diaphragm & Disc Material: Certified premium-grade EPDM or nylon-reinforced Buna-N rubber formulated without the use of fluoropolymers or PFAS processing aids.
2. Performance Range: Suitable for continuous potable water operations from 32°F to 180°F.

G. Pilot Control System (All Stainless Steel Upgrade)

1. Control Assembly: Direct-acting, spring-loaded, diaphragm-type 316 stainless steel adjustment pilot.
2. Adjustment Mechanism: Single field-adjustable downstream pressure screw equipped with a protective, tamper-resistant sealed cap.
3. Pilot Tubing & Fittings: Rigid 316 stainless steel control lines, fittings, and connectors.
4. System Protection: See Subpart 2.7 STRAINERS above.

H. Installation:

1. Orientation: Install pressure reducing valves in horizontal piping runs with the valve cover facing upward, allowing adequate clearance for maintenance access, pilot adjustment, and internal component extraction without removing the valve body from the pipeline.
2. Isolation & Protection: Provide upstream and downstream Flange Isolation Kits in accordance with Subpart 2.11 FLANGE ISOLATION KITS above.

I. Field Quality Control & Commissioning

1. Hydrostatic Testing: Pressure test installed valve assemblies to 1.5 times the maximum rated system working pressure to ensure pressure retention integrity.
2. Calibration & Adjustment: Adjust the pilot screw setting under active flowing conditions until the system achieves the specified downstream baseline target. Verify the valve achieves full drip-tight closure during zero-demand cycles.

J. Performance Requirements

1. Ends: Flanged, 300 Class
2. Outlet Pressure Range: 30 to 300 psi
3. Min. Continuous Flow: 4 GPM
4. Max. Continuous Flow: 800 GPM
5. Max. Intermittent Flow: 990 GPM
6. Temperature Range: Water to 180 deg F.
7. Rated Working (Inlet) Pressure: 250-psig or greater.
8. Accessories:

    a. With direct-action pilot valve
    b. With Flow Strainer on inlet
    c. Inlet Pressure Gauge (0- psi)
    d. Outlet Pressure Gauge (0-150 psi)
    e. CV Flow Control (Opening)

K. Model: 90-01-ASPKC with the above special-order modifications, as manufactured by Cla-Val Company, or an approved equal.

L. Substitutions for this model could have substantial effects on the hydraulic performance of the water system.

2.14 ALTITUDE PRESSURE GAUGE

A. General: Contractor shall be responsible for removing the existing altitude pressure gauge on the storage tank. Contractor shall furnish and install a new altitude pressure gauge.

B. Submittals:

1. Product data: Include dimensions, materials of construction, and operating pressure range.
2. Certification Documentation: Submit official documentation from the manufacturer certifying the gauge assembly, including all components, holds active certification to NSF/ANSI 61-2025 and NSF/ANSI 372-2024.
3. PFAS-Free Certification: Submit official documentation from the manufacturer certifying the gauge assembly, including all components, contains zero PFAS compounds.

C. Description:

1. Dial-type, low-pressure, liquid-filled, bourdon-tube pressure gauges calibrated for hydrostatic measurement, optimized for potable water service in sub-freezing temperatures.
2. Design and calibration must comply with ASME B40.100.

D. Physical Characteristics

1. Case and Bezel Material: AISI 304 stainless steel with a crimp-on bezel ring.

2. Dial Size: 2.5-inch white aluminum with high-visibility markings.
3. Lens: UV-stabilized clear Polycarbonate.
4. Enclosure rating: Weatherproof and dust-tight IP65 rated according to EN 60529.
5. Ventilation: Case must feature a top-mounted, ventable elastomeric plug to equalize internal case pressure and prevent low-pressure distortion.

E. Performance & Wetted Element Characteristics

1. Certified Lead-Free Brass or Lead-Free Phosphor Bronze.
2. Movement: Stainless steel.
3. Case Filling Liquid: 100% Interfacial Silicone Fluid. Glycerin or water-glycol mixtures are unacceptable.
4. Seals, O-rings, & Gaskets: EPDM or NBR (Buna-N) rubber.
5. Accuracy: Plus or minus 1.5% of full-scale value across the entire range (ASME B40.100 Grade B).
6. Temperature Limits: Ambient operating range: -40°F to 150°F.
7. Connection Size & Location: ¼-inch NPT, Bottom-connect.
8. Pressure and Measurement Range: Dial face must feature a dual-scale layout reading 0-15 psi on the outer scale and 0-34 Feet of Head on the inner scale.

F. Altitude pressure gauge shall be considered subsidiary to the storage tank rehabilitation and no separate payment shall be made.

2.15 SUPPORTS FOR PIPES AND APPURTENANCES

A. Description: Galvanized steel framing system, pipe clamps and hangers.

B. Manufacturer: Unistrut Corporation or an approved equal.

2.16 WILLIAMS BRANCH WELL UPGRADES

A. General:

1. The existing well casing does not extend to the required 12” minimum height above the surrounding finished floor and does not have a sanitary seal or cap. The well is also slightly artesian, meaning that it sometimes produces a small amount of overflow from the top of the casing. This overflow currently runs onto the floor of the well house and contributes to the moisture problem in the building.
2. The upgrades are intended to address the above problems by:
    a. Raising the casing to minimum of 12” above the finished floor using a short section of casing attached with a Dresser-style coupling;
    b. Providing a sanitary seal; and
    c. Allowing the well to overflow, while controlling the location of the discharge of the overflow by directing it via piping to an existing hole through the well house wall. This drain piping shall have a check valve as shown on the Drawings.

B. Product requirements:

1. In accordance with the requirements of these Specifications for all of the water system components, all components used for the Williams Branch Well upgrades shall be certified by NSF/ANSI 61-2025 and NSF/ANSI 372-2024 as lead-free and safe for use in drinking water systems and shall be PFAS-Free.
2. Dresser-style coupling:
    a. While Buna-N (Nitrile/NBR) is commonly certified for drinking water use by gasket and valve manufacturers, Dresser manufactures its specific "Grade 42 (Buna-N)" gaskets strictly for oil, petroleum, and hydrocarbon resistance and it is not intended or certified for use in drinking water applications.
    b. Dresser manufactures gaskets that are certified for use in drinking water applications. Dresser uses their "Grade 27 (Buna-S)" gaskets for potable water distribution.

C. Submittals:

1. Submit manufacturers' official certifications that all products used in the well upgrades comply with NSF/ANSI 61-2025 and NSF/ANSI 372-2024 for use with drinking water.
2. Submit manufacturers' official certifications that all products used in the well upgrades are free of any PFAS including PTFE.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install piping, fittings, valves, gauges, and other plumbing devices within utility buildings, utility boxes or at other locations according to the manufacturer's written instructions and as indicated on the Drawings. Install so water can be drained from each appurtenance for winterization of the system.

3.2 COMBINATION AIR VALVE FOR PIPELINES INSTALLATION

A. Install combination air valve as shown on the Drawings. Support the air valve using pipe supports as specified in Part 2. Air valve shall be securely attached to the utility box wall through the supports. The completed installation shall fully support the weight of the air valve and prevent unnecessary stress on the HDPE pipe riser. Installation method subject to Contracting Officer's Representative approval.

3.3 PRESSURE REGULATING VALVE INSTALLATION

A. Install a pressure relief valve just downstream of pressure regulating valves when used in a distribution system.

3.4 WATER METER INSTALLATION

A. Install water meters level and plumb in accordance with manufacturer's written instructions and AWWA M6 manual recommendations. Maintain strict compliance with straight-pipe clearance rules: provide a minimum of 5 pipe diameters of straight,

unobstructed pipe upstream of the meter strainer, and 3 pipe diameters downstream. Support meter body independently to avoid placing structural strain or stress on adjacent piping.

END OF SECTION 221103

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 221105 - WATER HYDRANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Provides for furnishing and installing hydrants as follows:

1. Type A: Frostproof, pollution proof, *fully accessible*.
2. Type B: Frostproof, pollution proof, *not accessible*.

B. Related Sections include the following:

1. 024100 “Waste Material Disposal.”
2. 033000 “Cast-In-Place Concrete.”
3. 221100 “Water Distribution Systems”
4. 221103 “Plumbing Appurtenances”
5. 321204 “Crushed Aggregate Base or Surface Coarse.”

C. See Section 221100 – Water Distribution Systems for information about NSF/ANSI 61-2025 and NSF/ANSI 372-2024 compliance.

1.2 LOCATION

A. General location and orientation of all hydrants are shown on the drawings.

B. Exact location and orientation shall be approved by the Contracting Officer’s Representative.

1.3 SUBMITTALS

A. Product Data for the following:

1. Yard hydrants.
2. Vacuum breakers.
3. Hose bibs.
4. Water fill towers.

B. Submit manufacturer’s official certification that all pipe, valves, fittings, and mechanical components are certified to NSF/ANSI 61-2025 for health effects imparted to drinking water and to NSF/ANSI 372-2024 as lead-free and safe for use in drinking water systems.

C. Submit manufacturer’s official certification that all pipe, valves, fittings, and mechanical components are PFAS-free.

1.4 REFERENCES

A. ADAAG – Americans with Disabilities Act Accessibility Guidelines

B. ASSE 1052 – Hose Connection Backflow Preventers

C. ASSE 1057 – Performance Requirements for Freeze Resistant Sanitary Yard Hydrants with Backflow Protection

D. AWWA C651 – Disinfecting Water Mains

E. AWWA C655 – Field Dechlorination

F. NSF/ANSI 61-2025 – Drinking Water System Components – Health Effects

G. NSF/ANSI 372-2024 – Drinking Water System Components – Lead Content

H. NSF/ANSI 600-2024 – Health Effects Evaluation and Criteria for Chemicals in Drinking Water

I. Recommended Standards for Water Works (“Ten States Standards”)

J. The Uniform Statewide Building Code (USBC), Current Edition

K. The Virginia Plumbing Code, Current Edition

L. 12VAC5-590 – Virginia Administrative Code – Virginia Waterworks Regulations

1.5 DELIVERY, STORAGE, AND HANDLING

A. Products shall be kept free from damage during delivery, storage, and handling. Protect from dirt and moisture during storage.

1.6 DEFINITIONS

A. PFAS-Free: Products that contain zero per- or polyfluoroalkyl substances, including no Polytetrafluoroethylee (PTFE), fluorinated polymers, or fluorosurfactants.

B. Potable Water or Drinking Water or Potable Drinking Water: Water that is safe an intended for human consumption.

1.7 QUALITY ASSURANCE

A. Code Compliance:

1. All pipe, valves, fittings, and mechanical components shall be certified to NSF/ANSI 61-2025 for health effects imparted to drinking water and to NSF/ANSI 372-2024 as lead-free and safe for use in drinking water systems.
2. All materials, equipment, and construction methods, including decontamination and de-chlorination, for this drinking water system must fully comply with the **Virginia Uniform Statewide Building Code (USBC)**, the **Virginia Plumbing Code (VPC)**,

and the **Recommended Standards for Water Works (Ten States Standards)**. In cases of overlapping or conflicting requirements, the most stringent specification shall govern.

3. All products shall be PFAS-Free.

1.8 MEASUREMENT AND PAYMENT

A. Hydrants: Number of hydrants of each type designated, including all work within five feet of hydrant.

1. Exception: Buried water supply line shall be paid for separately under Section 221100 “Water Distribution Systems.”

B. Water Fill Station: Number of Water Fill Stations designated, including all work within five feet of fill station.

1. Exception: Buried water supply line shall be paid for separately under Section 221100 “Water Distribution Systems.”

PART 2 - PRODUCTS

2.1 GENERAL MATERIALS

A. Galvanized Steel Drain Grate

1. Design: 1/2” x 2” on-center press-locked close mesh, ADA compliant, hot-dipped galvanized steel, and 1-1/2” depth with welded lugs. Length and width shall be as shown on the Drawings.
2. Model: 8-P-2 as manufactured by Alabama Metal Industries Corporation (AMICO), or an approved equal.

B. Washed Rock for Gravel Sump: 3/4-inch to 1-inch washed and screened material, without lumps of soil, clay or organic material.

C. All posts shall be made of HDPE material and cut to a 45-degree angle on the top as shown on the Drawings.

D. All hydrant clamps and components shall be 304 stainless steel.

2.2 TYPE A FROSTPROOF HYDRANTS

A. Description: Type A hydrants shall be self-closing, backflow-protected, automatic-draining, frost-proof, sanitary yard hydrants that meet all ADAAG accessibility requirements, particularly for operating force and height. The sanitary design shall incorporate a non-contaminating, closed-loop below-frost reservoir. Type A hydrants shall have a non-threaded discharge nozzle, ensuring that no hose or other device can be connected to the hydrant.

B. General:

1. Hydrant shall provide immediate water flow in sub-zero temperatures.

2. All components shall be certified PFAS-Free.
3. All components shall be certified by NSF/ANSI 61-2025 and NSF/ANSI 372-2024 as lead-free and safe for use in drinking water systems.

C. Operating Characteristics:

1. Operating Pressure Range: 20 psi to 100 psi.
2. Maximum Water Temperature: 120°F.

D. ADAAG Compliance:

1. The valve operating handle must be self-closing, require a maximum operating force of 5.0 lb to open, and sit at an accessible height meeting ADAAG requirements.

E. Hydrant Construction:

1. All wetted pipe and other components shall be 304 or 316 stainless steel. NO galvanized are allowed.
2. Operating Rod: High-strength stainless steel operating rod.
3. Valve Mechanism: Diverter spout design allowing independent water flow and positive shut-off.
4. Sanitary Protection: Hydrant shall be a sealed, closed system. Unlike conventional frost-proof hydrants that drain water into the subsoil, the unit must safely evacuate water into a sealed, underground reservoir/canister instead. A venturi assembly must evacuate this stored water into the main hydrant flow upon the next use cycle.
5. Maintenance: All internal working parts, including the plunger, rod, and linkage, must be removable from aboveground through the hydrant head without excavation.

F. Accessories:

1. Backflow Prevention: Hydrant shall be equipped with an ASSE 1052 approved double check backflow preventer.
2. Vacuum Breaker: Provide ASSE 1057 listed single check vacuum breaker. Vacuum breaker shall have a non-threaded nozzle outlet, so that connection of a hose is not possible.
3. Operating Handle: Cast iron lever handle with hole for padlock to prevent unauthorized use.
4. Hose Connection: ¾-inch male hose thread (GHT) outlet.

G. Field Quality Control & Testing:

1. Hydrostatic Pressure Testing: Pressurize the network to system specifications (only up to 100 psi, maximum) to inspect the entire riser and head packing assembly for structural weeping or leaks.
2. Backflow Certification: Field test the integrated ASSE 1052 double-check valve with a differential pressure test kit to verity operation prior to project closeout.

2.3 TYPE B FROSTPROOF HYDRANTS

A. Description: Type B hydrants shall be backflow-protected, automatic-draining, frost-proof, sanitary yard hydrants. The sanitary design shall incorporate a non-contaminating, closed-loop below-frost reservoir. Type B hydrants shall have a threaded nozzle with a hose connection vacuum breaker.

B. General:

1. Hydrant shall provide immediate water flow in sub-zero temperatures.
2. All components shall be certified PFAS-Free.
3. All components shall be certified by NSF/ANSI 61-2025 and NSF/ANSI 372-2024 as lead-free and safe for use in drinking water systems.

C. Operating Characteristics:

1. Operating Pressure Range: 20 psi to 100 psi.
2. Maximum Water Temperature: 120°F.

D. Hydrant Construction:

1. All wetted pipe and other components shall be 304 or 316 stainless steel. NO galvanized are allowed.
2. Operating Rod: High-strength stainless steel operating rod.
3. Valve Mechanism: Diverter spout design allowing independent water flow and positive shut-off.
4. Sanitary Protection: Hydrant shall be a sealed, closed system. Unlike conventional frost-proof hydrants that drain water into the subsoil, the unit must safely evacuate water into a sealed, underground reservoir/canister instead. A venturi assembly must evacuate this stored water into the main hydrant flow upon the next use cycle.
5. Maintenance: All internal working parts, including the plunger, rod, and linkage, must be removable from aboveground through the hydrant head without excavation.

E. Accessories:

1. Backflow Prevention: Hydrant shall be equipped with an ASSE 1052 approved double check backflow preventer.
2. Vacuum Breaker: Provide ASSE 1057 listed single check vacuum breaker.
3. Operating Handle: Cast iron lever handle with hole for padlock to prevent unauthorized use.
4. Hose Connection: ¾-inch male hose thread (GHT) outlet.
5. Diverter Spout Assembly: Hydrant shall be equipped with a pull-down diverter sleeve that allows uninhibited open-spout flow when disengaged. It must automatically trip and vent to break vacuum pressure upon handle shut-off.

F. Field Quality Control & Testing:

1. Hydrostatic Pressure Testing: Pressurize the network to system specifications (only up to 100 psi, maximum) to inspect the entire riser and head packing assembly for structural weeping or leaks.
2. Backflow Certification: Field test the integrated ASSE 1052 double-check valve with a differential pressure test kit to verity operation prior to project closeout.

2.4 WATER FILL TOWER

A. Summary:

1. The work under this section includes furnishing and installing a freeze-proof, sanitary RV potable water filling station.
2. Each unit shall feature a frost-proof, self-draining, sanitary design.

B. Design and Construction Requirements:

1. Type: Post-style, sanitary water filling tower designed specifically for RV and bulk potable water transfer. The tower shall incorporate a self-draining underground valve system to ensure no standing water remains above the frost line.
2. Sanitary Protection:
    a. Tower shall be a sealed, closed system. Unlike conventional frost-proof towers that drain water into the subsoil, the unit must safely evacuate water into a sealed, underground reservoir/canister instead. A venturi assembly must evacuate this stored water into the main hydrant flow upon the next use cycle.
3. Materials:
    a. Waterway: All underground and aboveground waterway piping shall be constructed of 304 or 316 stainless steel. NO galvanized materials are allowed.
4. Operation:
    a. The unit shall use a self-closing, lever-operated or push-button valve to minimize waste and ensure the unit is not left running.
5. Vacuum Breaker:
    a. Provide a Pressure Vacuum Breaker at the top of the stainless steel pipe arm that is certified by NSF/ANSI 61-2025 and NSF/ANSI 372-2024.
    b. The Pressure Vacuum Breaker shall be a Watts LF800M4FR, or equivalent. Though the LF800M4FR is not 100% PFAS-Free, it complies with the PFAS leaching requirements of NSF/ANSI 61-2025.

C. Field Quality Control:

1. Pressure Test:
    a. Test the water filling station and supply piping under a hydrostatic pressure of at least 150 psi for 2 hours. Repair any leaks and retest.
2. Disinfection:

a. Disinfect the complete assembly in accordance with AWWA C651. Flush the system with potable water until the residual chlorine matches the incoming water supply.

3.

2.5 PAD SURFACING

D. Concrete: As shown on the Drawings and according to Section 033000 “Cast-In-Place Concrete.”

1. Crushed Aggregate Base: 3/4-inch to 1-inch washed and screened material, without lumps of soil, clay or organic material.

PART 3 - EXECUTION

3.1 FROSTPROOF HYDRANT INSTALLATION

A. Install hydrants in accordance with the manufacturer’s recommendations and as shown on the Drawings.

B. Install HDPE posts and clamps as shown on the Drawings.

C. Fabricate and install frame, sump, grate and pad as shown on the Drawings.

3.2 WATER TOWER

A. Install water tower in accordance with the manufacturer’s recommendations and as shown on the Drawings.

3.3 GENERAL INSTRUCTIONS

A. Pipe and Fittings: Pipe and fittings shall be watertight. If any appurtenances are not rated for the pressure required for pressure testing the pipelines, ensure hydrant will be isolated from the pipeline during pressure testing.

B. Backfill and compact area where supply line enters. Backfill with material removed from sump area. Remove stones over 1-inch size. Backfill and compact in 6-inch lifts with three complete passes of a mechanical compaction device. Shape, clean, and fill sump with approved sump gravel. Compact in 8-inch layers to work rocks into a dense mass. Level gravel even with adjacent subgrade elevation required.

C. Grate Frame: Set grate frame on natural ground or compacted subgrade material rather than on the gravel. Position frame at required elevation shown on Drawings for later installation of the grate.

D. Elevation of edge of pad or gravel sump shall be the same as adjacent finished surface of edge of road, spur, or trail. Pads not meeting this requirement shall be removed by the Contractor and replaced at no cost to the Government. Backfill and fine grade around the outside of the pad.

E. After hydrant pad base material is placed and compacted around hydrant area, anchor grate to the frame as shown on the Drawings. Prevent base material from entering sump area.

3.4 GRADING AND CLEANUP

A. Remove all debris and material not utilized when complete according to Section 024100 “Waste Material Disposal.”

END OF SECTION 221105

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 221120 - SUBMERSIBLE WELL PUMP

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes furnishing and installing a submersible well pump at the Loop A Well House.

B. Related Sections include the following:

1. 221100 “Water Distribution Systems”
2. 221103 “Plumbing Appurtenances”
3. 260500 “Common Work Results for Electrical.”
4. 260519 “Low Voltage Electrical Power Conductors and Cables”
5. 260523 “Pump Controls and Control Voltage Electrical Power Conductors and Cables”

C. See Section 221100 – Water Distribution Systems for information about NSF/ANSI 61-2025 and NSF/ANSI 372-2024 compliance.

1.2 DEFINITIONS

A. PFAS-Free: Products that contain zero per- or polyfluoroalkyl substances, including no Polytetrafluoroethylene (PTFE), fluorinated polymers, or fluorosurfactants.

B. Potable water, or drinking water, or potable drinking water: Water that is safe and intended for human consumption.

1.3 SUBMITTALS

A. Product Data: Submit product data, including materials information, performance curves, and rated capacities of selected well pumps and furnished specialties for each type and size of well pump indicated.

B. Submit manufacturer’s official certification that all pipe, valves, fittings, and mechanical components are certified to NSF/ANSI 61-2025 for health effects imparted to drinking water and to NSF/ANSI 372-2024 as lead-free and safe for use in drinking water systems.

C. Submit manufacturer’s official certification that all pipe, valves, fittings, and mechanical components are PFAS-free.

1.4 QUALITY ASSURANCE

A. All work is to be completed according to applicable Federal, State, and Local codes. This work includes, but is not limited to, materials, installation, testing, and disinfection.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C.

1.5 REFERENCES

A. AWWA C651 – Disinfecting Water Mains

B. AWWA C654 – Disinfection of Wells

C. AWWA C655 – Field Dechlorination

D. NSF/ANSI 61-2025 – Drinking Water System Components – Health Effects – Incorporating Supplement 600

E. NSF/ANSI/CAN 372-2024 – Drinking Water System Components – Lead Content

F. NSF/ANSI 600-2024 – Health Effects Evaluation and Criteria for Chemicals in Drinking Water

G. Recommended Standards for Water Works (“Ten States Standards”)

H. The Uniform Statewide Building Code (USBC), Current Edition

I. The Virginia Plumbing Code, Current Edition

J. 12VAC5-590 – Virginia Administrative Code – Virginia Waterworks Regulations

1.6 MINIMUM SYSTEM REQUIREMENTS

A. Unless otherwise noted, the minimum working pressure for piping and specialties shall be 200 psig.

1.7 MEASUREMENT AND PAYMENT

A. Submersible Well Pump: Lump Sum for Submersible Well Pump including furnishing and installing the well pump, motor, check valve, discharge pipe, electrical wiring, operating and maintenance manuals and all incidentals necessary to complete this item.

PART 2 - PRODUCTS

2.1 GENERAL

A. All pipe, valves, fittings, and mechanical components shall be certified to NSF/ANSI 61-2025 for health effects imparted to drinking water and to NSF/ANSI 372-2024 as lead-free and safe for use in drinking water systems.

B. All materials, equipment, and construction methods, including decontamination and de-chlorination, for this drinking water system must fully comply with the **Virginia Uniform**

Statewide Building Code (USBC), the **Virginia Plumbing Code (VPC)**, and the **Recommended Standards for Water Works (Ten States Standards)**. In cases of overlapping or conflicting requirements, the most stringent specification shall govern.

C. All pipe, valves, fittings, and mechanical components, including the well pump cables and housings, shall be PFAS-Free.

2.2 SUBMERSIBLE PUMP AND MOTOR

A. Pump

1. Capacity: 4-20 GPM
2. Rated Power: 3 HP
3. Model: 13GS30 as manufactured by Xylem, or an approved equal

B. Motor: Capable of continuous operation under water, with protected submersible power cable.

C. Pump Bowls: Made of polycarbonate and free of blow holes, sand holes, and other detrimental defects. Capable of withstanding a hydrostatic pressure equal to twice the head at rated capacity or 1-1/2 times the shutoff head, whichever is greater. Each bowl equipped with replaceable stainless steel wear rings on both sides of the impeller.

D. Impellers: Closed type and statically balanced. Securely fastened to the impeller shaft with splines, keys, taper bushings, locknuts, or setscrews.

E. Pump-to-Motor Coupling: Solid stainless steel, Capable of transmitting the total torque and thrust of the unit in either direction.

2.3 OPERATION AND MAINTENANCE MANUAL

A. The Contractor shall furnish three sets of instructions for operating and maintaining all mechanical and electrical equipment for the pump installation. The instructions shall include a complete diagram of the pump and plumbing details, an electrical wiring diagram with color coding indicated, parts lists, and all other drawings and instructions that are required to successfully operate the pump.

2.4 ELECTRICAL SUPPLY AND CONTROLS

A. The power cable and all fittings shall be watertight at the pressure encountered in use. The cable shall be one continuous length and shall not contain any splices. The cable's jacket material must be oil- and water-resistant synthetic rubber, plastic, or other suitable protective material. The cable shall be of the size recommended by the manufacturer of the submersible pump and shall have a sufficient conductor area to meet the minimum requirement of the Insulated Power Cable Engineer's Association (IPCEA) code for operation in air.

PART 3 - EXECUTION

3.1 DISINFECTING EQUIPMENT

A. Before installing any equipment or other components in the well, the Contractor shall disinfect the equipment by flushing with a 200 PPM chlorine solution.

3.2 SUBMERSIBLE PUMP INSTALLATION

A. Install well pump at approximately 225ft depth. New well pump shall be installed at the same depth as the existing well pump.

1. Before lowering permanent pump into well, start pump to verify correct rotation.
2. Securely tighten discharge piping joints.
3. Support pump from well seal.

3.3 ELECTRICAL SUPPLY AND CONTROLS

A. Sufficient submarine cable shall be provided and installed as recommended, to connect the submersible pump to the control box. In the well, the cable shall be attached to the discharge pipe at intervals recommended by the manufacturer of the pump with non-corrosive metal bands. From the well head to the control box, the cable shall be installed in conduit of the size to handle the cable in conformance with the National Electrical Code.

B. Installation shall conform to Section 260500 “Common Work Results for Electrical.”

3.4 PUMP, WELL AND ELECTRICAL DATA SHEETS

A. Print and laminate the 11”x17” As-Built Drawing sheets (typically 2 sheets total) that contain the following information:

1. Pump: Pump model, design flow and head. Pump curve if available.
2. Pump Electrical System: Electrical Schematic including float controls meeting requirements of NEC 409.110(6). This may be met by a similar requirement in the electrical specs or drawings, if existing.

B. Permanently attach the laminated sheets to the wall of the pumphouse adjacent to the pump control box (or affix per applicable codes). Sheets must be easily readable at eye-level.

END OF SECTION

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Electrical equipment coordination and installation.
2. Grout.
3. Common electrical installation requirements.
4. Hangers and supports.

1.2 SUBMITTALS

A. Product Data:

1. For any substitutions for equipment referred to by name in Division 26 specifications or the drawings.

1.3 QUALITY ASSURANCE

A. The installation shall conform to the 2023 Edition of the National Electrical Code (NFPA 70) and to the requirements specified herein.

B. The Contractor shall perform all work necessary and required to accomplish the task as detailed on the drawings and discussed in the installation notes. All work shall be done by a state licensed electrician.

1.4 MEASUREMENT AND PAYMENT

A. No separate measurement and/or payment will be made for this section. Payment shall be included with work shown in the schedule of items.

PART 2 - PRODUCTS

2.1 PRODUCTS REFERRED TO BY NAME

A. The materials referred to by trade name, make, or catalog number on the drawings shall be regarded as establishing a minimum standard of quality; substitutions of equal or greater quality can be made by submitting a data sheet of the proposed substituted item to the Contracting Officer’s Representative, for approval.

2.2 GROUT

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

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.

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.

3.2 RACEWAY AND SIMILAR PENETRATIONS (NON-FIRE RATED, NOT SLEEVED)

A. Concrete Slabs and Walls: Core-drilled holes.

1. Fill oversized holes with grout to within 1/4-inch.

B. Roof-Penetrations: Seal penetration of individual raceways with flexible boot-type flashing units applied in coordination with roofing work.

C. Aboveground, Exterior-Wall Penetrations: Seal exterior opening around the raceway or cable, using a flexible, waterproofing, joint sealant appropriate for size, depth, and color to closely match the surrounding surface. Finish interior openings, filling opening and matching the exiting surface with appropriate materials and finish quality for the space.

3.3 HANGERS AND SUPPORTS

A. Installation:

1. Comply with NECA 1 and NECA 101 for installation requirements, except as specified in this article.
2. Separate dissimilar metals and metal products from contact with wood or cementitious materials by painting each metal surface in area of contact with a bituminous coating or by other permanent separation.

3. 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 or required by Code:

    a. To Wood: Fasten with lag screws or through bolts.
    b. To New Concrete: Bolt to concrete inserts.
    c. To Existing Concrete: Expansion anchor fasteners.

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

END OF SECTION 260500

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Connectors, splices, and terminations rated 600 V and less.

1.2 DEFINITIONS

A. PV: Photovoltaic.

B. RoHS: Restriction of Hazardous Substances.

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Field quality-control reports.

1.4 MEASUREMENT AND PAYMENT

A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

C. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

D. Conductor Insulation:

1. Types RHW and RHW-2: Comply with UL 44.
2. Type THHN/THWN-2: Comply with UL 83.

3. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.

E. Cable: Comply with NEMA WC 70/ICEA S-95-658 for:
1. Photovoltaic cable, Type PV.
2. Type USE-2 with ground wire.
3. Pump cable, Type RHW and THW.

2.2 CONNECTORS AND SPLICES

A. 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. Circuits: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

1. Aluminum conductors are prohibited unless specifically called for on the drawings.

B. Exposed to Direct Sunlight: Sunlight resistant.

C. PV Circuits: Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance and Feeders: Type THHN/THWN-2 or XHHW, single conductors in raceway.

B. Exposed Branch Circuits: Type THHN/THWN-2, single conductors in raceway.

C. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

D. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

E. PV Circuits:

1. Wiring on roofs or under PV modules shall be rated at 90 degrees C.
2. Exposed Single Conductors: Type USE-2 or PV for PV source circuits rated at 600 V or less.
3. DC source circuits entering buildings shall be installed in metal raceway or Type MC cable.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

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

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

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

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

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

3.4 CONNECTIONS

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

B. Make splices, terminations, and taps that are compatible with conductor material.

1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

END OF SECTION 260519

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 260523 - PUMP CONTROLS AND CONTROL-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Well pumps control system.
2. Control cable.
3. Control-circuit conductors.

1.2 SUBMITTALS

A. Field quality-control reports.

B. Control System product data, including description of control logic..

C. Pressure transducer product data.

1.3 SUMMARY OF WORK

A. The Contractor shall provide and install a Control System that automatically controls both well pumps based on the water level in the storage reservoir. The Control System central control panel shall be located in the Loop A Well House and shall include the following components:

1. NEMA 12 steel enclosure with hinged door
2. Hand-Off-Auto toggle switch for each pump
3. Pump run indicator light for each pump
4. Dial or digital display that indicates the water level (in feet) in the storage reservoir
5. Pressure transducer in storage reservoir

B. The Control System shall have the following operation settings:

1. High Level Alarm (visible and audible)
2. Pump(s) Off
3. Lead Pump On
4. Lag Pump On
5. Low Level Alarm (visible and audible)
6. Contractor shall coordinate these setting levels with the COR

C. It shall be possible to operate the Control System in the “Hand” (manual) or “Auto” (automatic) mode. When in Auto mode, the Control System shall determine water levels in the storage reservoir using a pressure transducer. When the level in the reservoir drops below the “Lead Pump On” level, the Control System shall energize one pump. If the

water level in the reservoir drops below the Lag Pump On level, the Control System shall energize both pumps. The pump(s) shall operate until the Pump(s) Off level is reached. The pump that is the “lead” pump shall alternate from one cycle to the next.

D. The Control System will not be used during winter months, but the Loop A Well supplies water to the Office/Residence during winter months. Therefor the Contractor shall provide a way to switch control of the Loop A Well over to a pressure switch in an existing pressure tank in the Loop A Well House during winter months.

E. The Control System shall be American Manufacturing Company, Inc. S-Series Storage Tank Controls, or pre-approved equivalent.

F.

1.4 MEASUREMENT AND PAYMENT

A. Payment will be made in Lump Sum for all work related to the controls system. Payment shall include all conduit, wiring, panel boxes, probes, switches, and all other necessary items to connect the control system between the reservoir and both pump houses. Work includes delegated design for pump control system and design including specifications from section 1.3.

PART 2 - PRODUCTS

2.1 CONTROL CABLE

A. Paired Cable: NFPA 70, Type CMG.

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1685.
6. Flame Resistance: Comply with NFPA 262.

2.2 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, per Section 260519 “Low-Voltage Electrical Power Conductor and Cables.

B. Class 2 Control Circuits, Class 3 Remote-Control and Signal Circuits: Also allowed power-limited cable, concealed in building finishes.

C. Class 2 Control Circuits and Class 3 Remote-Control and Signal Circuits That Supply Critical Circuits: Circuit Integrity (CI) cable.

1. Smoke control signaling and control circuits.

PART 3 - EXECUTION

3.1 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Conceal cables in conduit unless otherwise indicated. Cables may not be spliced and must be continuous from terminal to terminal. Do not splice cable between termination, tap, or junction points.
2. Cables serving a common system may be grouped in a common raceway. Do not group conductors from different systems or different voltages.
3. Secure and support cables at intervals not exceeding 30 inches and not more than 6-inch from cabinets, boxes, and outlets.
4. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
5. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
6. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.

C. Installation of Control-Circuit Conductors:

1. Install wiring in raceways.
2. Use insulated spade lugs for wire and cable connection to screw terminals.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2.
3. Cable must not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.

3.2 REMOVAL OF CONDUCTORS AND CABLES

A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified with a tag for future use.

3.3 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits; No 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.4 GROUNDING

A. For control-voltage wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.5 IDENTIFICATION

A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Identify each wire on each end and at each terminal with a number-coded identification tag. Each wire must have a unique tag.

3.6 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test cabling for direct-current loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination, but not after cross-connection.
4. Test operation of control system to be sure the reservoir and both pumphouses are communicating and working as designed.

B. End-to-end cabling will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 260523

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1.2 MEASUREMENT AND PAYMENT

A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

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. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.

2.3 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Ground Rod Clamps: Mechanical type, copper or copper alloy.

C. Lay-in Lug Connector: Mechanical type, tinned-copper rated for direct burial terminal with set screw and listed for use bonding to different metals.

D. Tower Ground Clamps: Mechanical type, copper or copper alloy, terminal two-piece clamp.

E. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

F. Water Pipe Clamps:

1. Mechanical type, two pieces.

a. a. Material: Die-cast zinc alloy.
b. b. Listed for direct burial.

2.4 GROUNDING ELECTRODES

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

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor.

1. Bury at least 24 inches below grade.

3.2 EQUIPMENT GROUNDING

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

B. Arrays: Use oxide inhibitor in each termination and tap for aluminum mount equipment and module.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

C. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting

is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Well Casing: Install copper grounding conductors from main service equipment to well casing routing through and bonding well pump panel with submersible pump circuit. Connect grounding conductor to casing using a bolted lug connector.

END OF SECTION 260526

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

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

1.2 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

B. IMC: Intermediate metal conduit.

1.3 MEASUREMENT AND PAYMENT

A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. GRC: Comply with ANSI C80.1 and UL 6.

C. IMC: Comply with ANSI C80.6 and UL 1242.

D. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit or IMC.

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

E. EMT: Comply with ANSI C80.3 and UL 797.

F. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Fittings for EMT:

a. Material: Steel.
b. Type: compression.

2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. RNC: Type EPC-40-PVC Insert type, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

C. LFNC: Comply with UL 1660.

D. Rigid HDPE: Comply with UL 651A.

E. Continuous HDPE: Comply with UL 651B.

F. Fittings for RNC: Comply with NEMA TC 3; match to conduit and material.

G. Fittings for LFNC: Comply with UL 514B.

2.3 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

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

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

E. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, with gasketed cover.

F. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

G. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, 3R, or 12 with continuous-hinge cover with flush latch unless otherwise indicated.

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

2.4 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

    a. Armorcast Products Company.
    b. Carson Industries LLC.
    c. Oldcastle Precast, Inc.
    d. Quazite: Hubbell Power Systems, Inc.; Hubbell Power Systems.
    e. Synertech Moulded Products.

4. Standard: Comply with SCTE 77.
5. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
6. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
7. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
8. Cover Legend: Molded lettering, "ELECTRIC."

B. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of fiberglass.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC or IMC.

    a. EMT also allowed where UL listed raintight compression fittings are used and the raceway is 5-ft minimum above finished grade.

2. Underground Conduit within 5-ft of exposed grade penetration or building foundation penetration: PVC coated or wrapped GRC or IMC
3. Underground Conduit beyond 5-ft of exposed grade penetration or building foundation penetration: HDPE; or RNC, Type EPC-40-PVC direct buried.
4. Connections Between PV Modules: LFMC, LFNC, and approved cable or individual conductors.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
6. Application of Handholes and Boxes for Underground Wiring:

    a. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf vertical loading.

        13. Install a minimum of 10-feet from any roadway.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed: EMT.
2. Boxes and Enclosures: NEMA 250, Type 1.

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. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Complete raceway installation before starting conductor installation.

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

D. Support within 12 inches of changes in direction.

E. Install conduits parallel or perpendicular to building lines.

F. Support conduit within 12 inches of enclosures to which attached.

G. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

H. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

I. Install raceways square to the enclosure and terminate at enclosures with locknuts.

J. Cut conduit perpendicular to the length.

K. Mounting heights of boxes are not individually indicated, give priority to ADA requirements.

L. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Trenches shall be 24 inches to top of conduit unless otherwise indicated. Trench depth for utility company controlled primary and secondary laterals shall meet utility company trench and conduit installation requirements.
2. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earthwork" for pipe less than 6 inches in nominal diameter.
3. Install backfill as specified in Section 312000 "Earthwork."
4. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earthwork."
5. Install manufactured conduit elbows for stub-ups at poles and towers and at buildings.
6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: Set covers 1 inch above finished grade.

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

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

END OF SECTION 260533

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Identification for conductors and communication and control cable.
2. Underground-line warning tape.
3. Instruction signs.

1.2 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.3 MEASUREMENT AND PAYMENT

A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

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

2.2 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.

PART 3 - EXECUTION

3.1 APPLICATION

A. Conductor Identification: Identify as called for on the drawings.

B. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.

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

1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:

    a. Power disconnect switch.
    b. Controls with external control power connections.

2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment in interior locations.

D. Instruction Signs: Labels for pilot lights, chlorinator receptacle, disconnects, and others as shown on the drawings.

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

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

E. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 12 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.

END OF SECTION 260553

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 311000 - CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 SUMMARY

A. This work shall consist of clearing, grubbing, trimming, removing, and disposing of or treatment of timber, construction slash, and debris. This work shall also include preservation of vegetation and objects designated to remain from injury or defacement.

1.2 DEFINITIONS

A. Areas to be Cleared and Grubbed - The limits of clearing and grubbing will be established by this specification, by other specification items, or on contract Drawings. The clearing and grubbing limits will normally coincide with the designated working limits; however, the Contracting Officer's Representative may also designate individual trees and snags outside the clearing limits for selective removal and disposal, or he may designate areas within the working limits where clearing and grubbing is not required or allowed within the provisions of this specification.

1. Grading Limits - Area that is to be excavated or covered with additional materials during construction
2. Working Limits - Area consisting of the grading limits plus room for equipment to maneuver to perform the necessary clearing and grubbing. These limits, to be held to a minimum, will be designated for each project.
3. Clearing Limits - Area consisting of the working limits plus any additional area to operate a boom or other above-ground clearance requirement.

1.3 MEASUREMENT AND PAYMENT

A. Payment shall be lump sum for Clearing and Grubbing.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 CLEARING AND GRUBBING

A. All trees, brush, shrubs, stumps, roots, and other vegetative material and debris within the designated clearing limits, shall be cleared, grubbed, removed, and disposed of except the following condition:

1. Those items designated to remain by the Contract or Contracting Officer's Representative.

B. Clearing slash shall be treated in accordance with SECTION 311000 – CLEARING AND GRUBBING, 3.4 “Slash Treatment”, below.

C. Trees shall be felled within the clearing limits, usually towards the center, so as to prevent damage to the trees that are to be left standing. In some cases, controlled felling, cutting of trees into sections from the top downward, or other means shall be used when required to prevent damage to property, structures, traffic, and trees/vegetation to remain.

D. Fire-dangerous dead trees or unstable live trees, designated by the Contracting Officer’s Representative within the project area and within 200 feet slope distance of the centerline of roads shall be cut off not more than 12 inches above the uphill ground line and utilized or removed.

3.2 UTILIZATION OF TIMBER

A. A.) Timber in this contract will be considered either “Merchantable Timber” or “Sub-Merchantable Timber”. Utilization standards for Merchantable Timber shall be trees 12-inches in diameter or greater, measured at breast height (4.5 feet from ground). Utilization standards for Sub-Merchantable Timber shall be trees 11.9 inches in diameter down to 4 inches in diameter.

B. B.) Utilization and Removal of Timber: Trees that meet “Merchantable Timber” specs shall be treated as follows:

1. 1.) Merchantable Timber logs meeting utilization standards shall be limbed, cut into 9 foot sections, and decked in designated decking areas located in the project area. Logs stacked shall be stable and free of brush and soil.
2. 2.) Sub-Merchantable Timber logs shall be limbed, cut into 16-inch to 36-inch lengths, and stacked in various locations throughout the recreation development. Logs stacked shall be stable and free of brush and soil.

C. C.) All remaining timber products including top wood slash, debris, logs less than 4-inches in diameter, and bucked out sections of defect shall be consolidated in the project area to be chipped and deposited in clearing area.

D.

3.3 PIONEER

A. Pioneering operations shall be done in a manner that prevents undercutting of final excavation slopes, maintains materials within the road, trail, or parking limits, and controls runoff.

3.4 SLASH TREATMENT

A. Treatment of construction slash larger than 3-inches in diameter and 3-feet in length shall be accomplished by the following method:

1. Stacking of Unmerchantable Material: Logs not meeting utilization standards and other material that exceeds 4-inches in diameter shall be limbed, cut into 16-inch to 36-inch lengths, and stacked in various locations throughout the recreation development. Logs stacked shall be stable and free of brush and soil. Logs shall be stacked in a location approved by the COR.

B. Construction slash less than 3 inches in diameter and 3 feet in length may be scattered within the clearing limits at locations and in a manner as approved by the Contracting Officer's Representative.

C. No construction slash shall be deposited in lakes, meadows, streams, streambeds, campsites, picnic areas, forested areas, or any area not designated by the C.O.R. Construction slash that interferes with drainage structures shall be removed immediately.

3.5 CLEARING AND/OR CLEARING AND GRUBBING REQUIREMENTS FOR VARIOUS ITEMS:

A. Trenches for Water, Sewer, Electrical Lines, and other Underground Utilities - The Contractor shall be allowed to clear a corridor up to 18 feet wide (total), however, the cleared corridor shall be minimized to the greatest extent possible. The Contractor shall prioritize preserving trees larger than 11" dbh to the greatest extent possible in all locations and shall coordinate with the COR to make minor adjustments to alignment in order to preserve large trees.

3.6 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to **Section 023701 "Sediment and Erosion Control Measures**.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.7 WASTE DISPOSAL

A. Debris and refuse shall be disposed of in accordance with Section 024100 "Waste Material Disposal".

END OF SECTION 311000

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 312000 - EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Preparing subgrades for slabs-on-grade.
2. Excavating and backfilling for buildings and structures.
3. Excavating and backfilling for utility trenches.
4. Excavating and backfilling trenches for buried electrical utilities and pits for buried utility structures.
5. Dewatering for trenches during excavation and backfill.

B. Related Sections include the following:

1. Section 329206 “Seeding.”

1.2 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.

B. Borrow or Select Borrow: Satisfactory soil material used for embankment, backfill, or fill construction that is either imported from off-site or excavated from designated locations at the site.

C. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Contracting Officer’s Representative. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction of the Contracting Officer’s Representative. Unauthorized excavation, as well as remedial work directed by Contracting Officer’s Representative, shall be without additional compensation.
3. Unclassified Excavation: Excavation to subgrade elevation and to lines and dimensions indicated regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.

D. Fill: Soil materials used to raise existing grades.

E. Pipe Zone Material: Granular material used beneath, beside, and above all pipes and conduits to provide structural support of the pipe or conduit and protection from large stones and other damaging objects.

F. Structures: Buildings, slabs, and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

G. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, aggregate base, drainage fill, initial or subsequent backfill, or topsoil materials.

H. Utilities include on-site underground pipes, conduits, and cables, as well as underground services within building.

1.3 SUBMITTALS

A. Contractor shall submit to the Contracting Officer's Representative for approval source of aggregates and backfill materials and certified sieve analysis. Materials from Government Sources are exempt from this requirement.

B. Contractor shall submit a dewatering plan for approval prior to construction.

1.4 PROJECT CONDITIONS

A. Existing Utilities:

1. An attempt has been made to label all existing utilities, except in the C-Loop area. It is the Contractor's responsibility to confirm the actual locations of existing utilities prior to excavation. The Contractor shall be responsible for repair if utilities shown on the Drawings become damaged. If a utility was not shown on the Drawings and it becomes damaged the Contractor may seek reimbursement for repairing the damaged utility.
2. No information has been shown on the Drawings for the utilities in the C-Loop Area, but utilities do exist in the C-Loop area and it shall be the responsibility of the Contractor to locate all utilities in the C-Loop area.
3. The precise locations of existing utilities are not known and hand-excavation is recommended in the vicinity of any known or suspected existing utility.
4. Coordinate with the COR to have the electrical service shut off to any area of active excavation.
5. Do not interrupt utilities serving facilities occupied by Government or others unless permitted in writing by Contracting Officer's Representative:

    a. Notify Contracting Officer's Representative not less than two days in advance of proposed utility interruptions.
    b. Do not proceed with utility interruptions without Contracting Officer's Representative's written permission.
    c. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

1.5 MEASUREMENT AND PAYMENT

A. Payment will be as follows:

1. Trenching: There will be no separate measurement or payment for trenching or placing and compacting backfill. Trenching is included in the measurement of the utility lines contained within the trench, except for the following.

   a. Pipe Zone Material - Imported: The number of cubic yards of material excavated, process hauled and installed. The volume will be calculated using the trench configuration shown on the Drawings. A deduction for the volume of pipes greater than 8-inches in diameter will be made.
   b. Above Pipe Zone Material - Imported: The number of cubic yards of material excavated, process hauled and installed. The volume will be calculated using the trench configuration shown on the Drawings.
   c. Use and location of imported material shall be approved by the Contracting Officer's Representative prior to delivery.

2. Bedrock: Contractor shall excavate using a rock hammer or other means to excavate through bedrock to the depth as specified on the Drawings. Payment will be made in CY for in place material.

3. Dewatering: Contractor shall remove all water while working and prior to backfill of areas to ensure backfill specifications are met. Dewatering for horizontal boring pits is included in pay item 330523. Payment will be made per hour of dewatering actively occurring in areas outside of the horizontal boring areas. Minimum 100 gpm pump required for dewatering.

4. All Other Work: There will be no separate measurement or payment for other work in this Section. Payment will be included in the contract unit price as shown on the Schedule of Items for the building.

1.6 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by basic designation only.

B. American Society for Testing and Materials (ASTM):

1. ASTM D2744-25: Standard Practice for Underground Installation of Thermoplastic Pressure Piping.
2. ASTM D2321-20: Standard Practice for Underground Installation of Thermoplastic Piping for Sewers and Other Gravity Flow Applications.

PART 2 - PRODUCTS

2.1 BACKFILL MATERIALS, GENERAL

A. Excavated material may be processed and used for backfill if the Contractor can show compliance with the material specified herein to the satisfaction of the Contracting

Officer's Representative. If excavated material is not sufficient to meet requirements, Contractor shall import needed material.

B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches in any dimension, debris, waste frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Backfill and Fill: Satisfactory soil materials.

1. Remove rocks over 8 inches in maximum dimension, ice or frozen earth, muck, debris, and earth with high void content.
2. Remove rocks over 4 inches in maximum dimension for backfill placed within 12 inches of foundation.

2.2 BACKFILL MATERIALS, UTILITY TRENCHES

A. Pipe Zone Material

1. Pipe Zone Material shall be installed beneath, beside, and above all pipe and conduit as shown on Sheet D-07 of the Drawings.
2. Pipe Zone Material shall meet the requirements of ASTM D2321-20 Class I as modified by Section X1.9 with a maximum particle size of 3/8". Open-graded crushed stone from 3/8" to No. 50 Sieve, such as Virginia #9 crushed stone or equivalent is acceptable.
3. Virginia Size #9 gradation (% finer per Sieve, by Weight):

    a. 3/8": Min 100%
    b. No. 4: 85-100%
    c. No. 8: 10-40%
    d. No. 16: Max 10%
    e. No. 50: Max 5%

4. General Requirements:

    a. Pipe Zone Material shall consist of clean, open-graded crushed stone that is free from organic material, clay, silt, and other deleterious substances.
    b. Pipe Zone Material shall provide adequate drainage, load-bearing support, and resistance to settlement.

B. Above-Pipe-Zone Material

1. Backfill material shall be free from brush, perishable material, trash, rocks, or boulders larger than 6 inches in greatest dimension, or frozen material.
2. Backfill material shall be trench-excavated material whenever it meets specification requirements. Whenever trench excavated material contains less than 10 percent of

oversized material, the Contractor will be required to remove rocks larger than 6 inches from the trench excavated material at no additional compensation and utilize it as backfill material. If, after all suitable trench excavated material has been used as backfill, the trench is not filled to the required grade, the Contractor shall delay his backfill operations until the Contracting Officer's Representative can obtain profile elevations of the top of the partially filled trench. These elevations shall be used in computing the cubic yards for which payment will be made for imported material. Whenever material meeting the specification requirements for backfill above the pipe zone is not available from trench excavation, the Contractor will be required to import material from a designated or approved source. Imported above-pipe-zone material shall be paid for as such.

2.3 ENGINEERED FILL

A. Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1 1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

2.4 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.

B. Tracer Wire: #14 copper wire, covered.

C. Test Station (For Tracer Wire)

1. Below grade concrete utility box with locking lid labeled "TEST STATION," Model B9X box with B9XTL cast iron lid and model B3K key as manufactured by Christy Concrete Products, or an approved equal.

PART 3 - EXECUTION

3.1 LOCATION, ALIGNMENT AND GRADE

A. The location of all structures shall be staked out and grades established by the Contractor. Locations shall be approved by the Contracting Officer's Representative before excavation is started.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.4 EXPLOSIVES

A. Do not use explosives.

3.5 EXCAVATION SUPPORT AND PROTECTION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation.

B. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and resisting soil and hydrostatic pressures and superimposed and construction loads.

C. The contractor shall meet State General Safety Orders and the provisions of the Occupational Safety and Health Administration (OSHA) pertaining to excavation support and protection, including 29 CFR 1926 Subpart P.

D. Walls of excavations 5 feet or more in depth shall be supported by shoring and bracing methods or the walls shall be sloped at one and a half to one.

E. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

3.6 EXCAVATION, GENERAL

A. Rock Excavation: Removal and disposal of solid, homogenous, interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits that cannot be excavated with a late-model, track-mounted hydraulic excavator; equipped with a short-tip-radius rock bucket; rated at not less than 138 hp flywheel power with bucket-curling force of not less than 28,090 lbf and stick-crowd force of not less than 19,000 lbf; measured according to ISO-6015.

B. Topsoil shall be removed from the area to be excavated and from the area where excavated material will be piled, prior to excavation. Topsoil shall be stored as specified below.

C. Maintain the excavations to guard against and prevent injury to employees and the public. Provide adequate shoring and bracing as required by OSHA and other local governing regulations.

D. Excavations left open at the end of the working day shall be fenced to protect the public.

3.7 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavation for Pump Houses and Utility Boxes: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended for bearing surface.

3.8 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.9 EXCAVATION FOR UTILITY TRENCHES

A. All trench excavation shall conform, as near as possible, to the lines and grades illustrated on the drawings.

B. Unsatisfactory Material - During excavation, if material which does not meet the backfill requirements of Article 2 (such as structurally unstable material, solid rock, over-sized rock, angular or sharp rock), as determined by the Contracting Officer's Representative, is encountered at the grade line for the pipe or cable, the unsatisfactory material shall be removed to a minimum depth of 6 inches below the utility line.

C. Trenching by Machine or by Hand - The use of trench digging machines will be permitted except in places where machines may cause damage to existing structures, utilities, or trees, in which case hand methods shall be employed. The precise locations of existing utilities are not known, and hand excavation is recommended in the vicinity of any known or suspected existing utility. Machines shall be of the proper size to operate within the

specified working limits. Depth - Trench excavation shall provide a uniform (for all utilities) or gently changing (for all utilities except gravity flow sewer lines) flow line.

D. Width of Trenches - The bottom width that will be used in arriving at pay quantities that are paid on the basis of volume shall be the design bottom width, as shown on the Schedule of Items, or as shown on the trench cross-section detail on Sheet D-07 of the Drawings. The width of trench allowed when computing excavation and/or backfill quantities shall be vertical lines for trenches less than 5 feet and for trenches greater than 5 feet shall be computed on 1/2 to 1 side slopes. In circumstances where trench sides will not stand or are not considered safe when sloped at 1/2 to 1, a slope will be determined in the field by the Contracting Officer's Representative for which pay quantities will be computed, and the slopes shall be laid back to the stable slope determined.

E. Any over excavation (width) performed by the Contractor for his convenience shall be at his own expense.

F. Alignment and Grade - The location of all pipelines and structures will be staked out and grades established by the Contracting Officer's Representative before excavation is started. All trenches shall conform with the lines and grades illustrated on the drawings or staked on the ground. The Contractor shall set batter boards and shall establish grade lines and levels necessary for the work from dimensions and elevations shown on the drawings and as established in the field. Any shifting or change from the indicated alignment and grade must receive prior approval by the Contracting Officer's Representative in writing. Alignment and grade shall also meet the requirements of Sections governing the utilities which are being installed in the trench.

3.10 APPROVAL OF SUBGRADE

A. Notify Contracting Officer's Representative when excavations have reached required subgrade.

B. If Contracting Officer's Representative determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Contracting Officer's Representative.

3.11 STORAGE OF SOIL MATERIALS

A. Stockpile, borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

B. Topsoil shall be kept separate from trench-excavated material by either stockpiling or by windrowing on the opposite side of the trench from which the trench excavated material will be placed. Topsoil will be reused after backfilling on those areas from which it came.

3.12 STRUCTURE BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, damp proofing, snd waterproofing.
2. Inspecting and testing underground utilities.
3. Removing concrete formwork.
4. Removing trash and debris.
5. Removing temporary shoring and bracing, and sheeting.
6. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place and compact fills and backfills adjacent to structures in such a manner as to prevent wedging action or eccentric lodging upon or against the structures.

C. Place backfill in horizontal layers not more than 12 inches thick with proper moisture content for the required degree of compaction. Flooding or puddling is not allowed. Compact each layer as specified. Backfill layers under concrete flatwork shall be not more than 6 inches thick

D. Do not place backfill against any concrete footings or structure without prior permission of the Contracting Officer's Representative and in no case less than 7 days after placement of concrete.

E. Heavy equipment shall not be operated within four feet of any structure.

F. Provide for anticipated settlement and shrinkage of the backfill and for the finished grades required.

3.13 UTILITY TRENCH BACKFILL

A. Placing of Pipe Zone Material above the pipe and/or conduit and backfilling will be permitted only after all inspections of piping and/or cable have been performed and tests completed and the work to be covered has been approved by the Contracting Officer's Representative. Backfill which has been improperly placed and/or compacted shall be corrected, if directed by the Contracting Officer's Representative, by reopening the trench to the depth required to obtain proper compaction. Then the trench shall be refilled and compacted according to specifications.

B. Place Pipe Zone Material on subgrades free of mud, frost, snow, or ice.

C. Backfill at Pipe Zone

1. Any location in trench bottom where over excavation was performed by the Contractor for his convenience, shall be brought back to the pipe grade indicated at his own expense using Pipe Zone Material. If the trench bottom is prepared in wet

conditions, special bedding conforming to Article 2 shall be used if determined necessary by the Contracting Officer's Representative.

2. The bottom of trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe along its entire length, except for portions of the pipe sections where it is necessary to excavate for pipe joints. Depressions for joints shall be made in accordance with the recommendations of the manufacturers for the particular joint used. The bedding shall be a minimum of 6 inches in depth under the pipe and be of either special bedding or pipe zone material as conditions dictate. Trench bottom preparation shall be such that when final placement of pipe has been made, pipe will be true to line and grade. All adjustment to line and grade shall be made by scraping away or filling in with pipe zone material or special bedding material, as conditions dictate, under the body of the pipe and not by wedging or blocking.
3. After pipe is placed as called for in applicable Sections governing the utilities being placed in the trench, pipe zone material shall be deposited in the trench uniformly on both sides of the pipe for the full width of the trench in 6-inch horizontal layers (loose measurement) and compacted from the bottom of the trench to a depth of 1 foot over the top of the pipe.
4. An exception to this is on water lines and sewer lines where the Contractor elects to hydrostatically pressure test the pipe. Joints, couplings, fittings, and valves shall then be left uncovered until after the pipe has been tested. After testing proves the pipe installation to be satisfactory, pipe zone material shall then be placed carefully and compacted around the joints, couplings, fittings, and valves to a depth of 1 foot above the pipe, after which the remainder of the trench shall be backfilled. On gravity flow sewer lines, the Contractor may elect to pressure test the pipe with air. In this case, the entire trench is to be properly backfilled prior to the acceptance test.
5. Where electrical conduit is buried in the same trench as the waterline or sewer line, the backfill procedure for the conduit shall be performed as outlined in the preceding paragraphs. Location with respect to other utilities in a trench shall be as indicated on the trench cross-section detail as shown on the drawings.
6. When an electrical conduit is buried singly in a trench, or if only conduit is buried in a trench, the bedding shall be a minimum of 2 inches in depth under the conduit. After the conduit is placed, pipe zone material shall be deposited in the trench uniformly for the full width of the trench and compacted from the bottom of the trench to a depth of 4 inches over the top of the conduit.
7. **Compaction and Testing**: All compaction within the pipe zone (electrical conduit area is considered as pipe zone), shall meet the following: Material shall be compacted to not less than 95 percent of the maximum dry unit weight, as determined by AASHTO T 99, Method D, or ASTM D 698, Method D. Ascertain adequate compaction during the backfill operation by performing in-place density tests in accordance with one or more of the following standard test procedures: ASTM D 1556, D 2167, or D 2922, or AASHTO T 191, or T 205.

D. Backfill Above-Pipe-Zone

1. When shown on the drawings as being required, marking tape shall be installed twelve inches below the ground surface and shall run the full length of the trenches.

2. Backfill in trenches in areas other than under roadways and parking areas shall be placed in horizontal layers 12 inches thick or less (loose measurement). Layers shall be compacted before the succeeding lift is placed with at least three passes of an approved mechanical compaction device.
3. **Compaction and Testing**: Backfill in trenches under roadways and parking areas shall be maintained, wetted, or dried to optimum moisture for maximum compaction, placed in the trench in horizontal layers not to exceed 6 inches in thickness (loose measurement), and compacted to not less than 95 percent of maximum dry unit weight, as determined by AASHTO T 99, Method D, of ASTM D 698, Method D. Ascertain adequate compaction during the backfill operation by performing in-place density tests in accordance with one or more of the following standard test procedures: ASTM D 1556, D 2167, or D 2922, or AASHTO T 191, or T 205.

E. Special Bedding – Imported

1. Special bedding shall be placed, as directed by the Contracting Officer's Representative, in trenches, as necessary, to provide a minimum of 6 inches firm bedding on which to set the pipe in areas where relatively unstable conditions exist, due to seeping ground water or mud caused by ground water, or by water from any other source which cannot be diverted. After the material is placed in the trench, leveled, and consolidated, it shall be trimmed to proper sub grade and shaped to receive the pipe.
2. The Contractor shall construct restrictive sections (dams) in the special bedding material at least every 200 feet to minimize the possibility of excessive ground water flows undercutting the pipe. The dam shall extend across the entire width of the trench, be a minimum of 3 feet long, and shall extend to the top of the pipe zone material.

F. Imported Material

1. Any trench excavated material that can be transported less than 300 feet to other areas along the trench and used, in accordance with specifications, shall not be considered as imported material. When the Contractor is required to import material, it shall be from a designated or approved source.

G. Trenches in Embankments

1. When pipelines are to be placed in trenches excavated in embankments, the excavation of each trench shall be performed after the embankment has been constructed to an elevation at least 3 feet over the pipe or to finish grade, whichever is least.

H. Surface Restoration in Areas Other Than Roads

1. All surfaces shall be restored to the required grade (usually original ground line), mounded over or smoothed off as directed, and left in a uniform and neat condition, to the satisfaction of the Contracting Officer's Representative. Surface drainage shall be diverted so that it will not flow along a trench. In areas where natural revegetation is designated (no planting to be done), the Contractor shall scarify all disturbed or compacted areas and rights-of-way such that the surface of the ground is loose to a

depth of at least one inch. In areas to be seeded, the area shall be prepared in accordance with Section 329206 “Seeding.”

I. Warning Tape and Tracer Wire:

1. Warning Tape: Install directly above utilities, as shown on the Drawings.
2. Tracer Wire: Wrap all buried, non-metallic, nonperforated piping with tracer wire.

    a. Conductivity Testing: Conductivity to be tested before and maintained while backfilling trench. After backfilling, the contractor shall perform a continuity test to the satisfaction of the Contracting Officer’s Representative.
    b. Access: Extend tracer wire at least 12-inches above grade at junctions, valves, hydrants and ends of new lines. Attach tracer wire to object or structure where possible. At utility vaults, conceal the end of the wire inside the vault, for other locations, fold or wrap remaining wire so it is accessible to owner, but not generally visible to the public.

3.14 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

C. Place and compact fill material in layers to required elevations as follows:

1. Under sidewalks, concrete slabs and pavements, use satisfactory soil material.

3.15 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.16 COMPACTION OF BACKFILLS AND FILLS

A. The minimum degree of compaction required shall be a percent of the maximum laboratory density obtained by the standard proctor test AASHTO T99 or ASTM D698. The in-place field density shall be determined by AASHTTO T238 or ASTM D2922. The minimum compaction requirements are:

1. For Utility Trenches, see “Utility Trench Backfill” article above.
2. Under structures, septic tanks, utility boxes, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill material at 95 percent.

3. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 90 percent.
4. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 85 percent.

3.17 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

D. Finishing Slopes: Finished slopes shall conform reasonably to the lines staked on the ground or shown on the drawings. The finished slope shall be left in a roughened condition to facilitate the establishment of vegetative growth. The finish associated with template and stringline or hand-raking methods will not be allowed.

3.18 AGGREGATE BASE COURSES

A. Under pavements and walks, place base course on prepared subgrade and as follows:

1. Place base course material over subgrade.
2. Base course compaction required shall be 95 percent of the maximum laboratory density obtained by the standard proctor test AASHTO T99 or ASTM D698. The in-place field density shall be determined by AASHTTO T238 or ASTM D2922.
3. Shape base to required crown elevations and cross-slope grades.
4. When thickness of compacted base course is 6 inches or less, place materials in a single layer.
5. When thickness of compacted base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

3.19 FIELD QUALITY CONTROL

A. Contractor shall hire an independent testing agency to monitor field compliance with the requirements of these Specifications.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work complies with requirements.

C. Testing agency will test compaction of soils in place according to ASTM D 2922. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: One per concrete slab.

D. When testing agency reports that subgrades, fills or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

E. Excessive settlement or other evidence of improper backfill shall be corrected by reopening the trench or excavation to the depth required for proper compaction and then shall be refilled and satisfactorily compacted.

F. The correction and retesting of unacceptable work shall be paid by the Contractor at no expense to the Government.

3.20 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specify tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Contracting Officer's Representative, reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.21 SURFACE FINISH

A. In unpaved areas all surfaces shall be restored to the original ground line or elevations shown on the drawings and left in a uniform and neat condition. Any stockpiled topsoil shall be smoothly distributed over disturbed areas to elevations shown on the drawings.

B. In paved areas, apply surface treatment as specified and shown on the drawings.

3.22 WASTE MATERIAL

A. According to Section 024100 "Waste Material Disposal."

END OF SECTION 312000

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 321200 - HOT-MIX ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes hot-mix asphalt concrete pavement, patching and repair.

B. Related Sections include the following:

1. Section 321204 “Crushed Aggregate Base or Surface Course.”

1.2 DEFINITIONS

A. FP-14: “Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects,” U.S. Department of Transportation, Federal Highway Administration.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

B. Job-Mix Designs: Submit written job-mix formulas for approval at least 28 days before production. Furnish mixes of aggregate, asphalt binder, recycled asphalt pavement, and additives that meet the applicable gradation and material requirements in one of the following:

1. Superpave designed asphalt mixture with performance grade asphalt binder **PG 64-22**.
2. Hveem or Marshall designed asphalt mixture as approved by the Contracting Officer’s Representative.
3. State Department of Transportation approved asphalt concrete pavement mixture as approved by the Contracting Officer’s Representative.

C. Material certificates. For each paving material, signed by manufacturers.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall be registered with and approved by the Department of Transportation of the state in which Project is located.

B. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.

C. Testing Agency Qualifications: The contractor shall hire a qualified independent testing and inspecting agency to perform field tests and to prepare test reports.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp or if the following conditions are not met:

1. Prime and Tack Coats: Minimum surface temperature of 60 deg F.
2. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

1.6 MEASUREMENT AND PAYMENT

A. No additional payment will be made under this pay item. This is considered incidental and will be paid under Section 321216 “Asphalt Concrete Pavement Patching”.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations. Must conform to aggregate requirements in FP-14 Section 703.

B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or properly cured, crushed blast-furnace slag.

C. Fine Aggregate: ASTM D 1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, properly cured blast-furnace slag, or combinations thereof.

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: ASTM D 242 or AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

2.2 MIXES

A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes designed according to one of the following:

1. Volumetric Hot Asphalt Mix Design: 1/2" Maximum Aggregate Size Mix, ESAL Range 3 to <30 as designed in FP-14, Section 401.
2. Hveem or Marshall designed asphalt mixture class B, Grading C as designated in FP-14, Subsection 402.
3. State Department of Transportation approved mix design. The mix design shall have a history of satisfactory performance in geographical area where project is located.
4. Do not begin mix production until the job-mix formula is approved by the Contracting Officer’s Representative.

2.3 ROAD BASE

A. Crushed Aggregate Base shall be according to Section 321204 “Crushed Aggregate Base or Surface Course.”

2.4 PRIME AND TACK COATS

A. Prime coat: Prime coat asphalt grade is designated according to AASHTO M 140 or AASHTO M 208.

B. Tack coat: Tack coat emulsified asphalt grade is designated according to AASHTO M 140 or AASHTO M 208

PART 3 - EXECUTION

3.1 GENERAL

A. Execution is based on requirements of approved mix design. If hot-mix asphalt as identified in Part 2 above is approved execution will be based on FP-14, Sections 401,402, or 403 as applicable.

B. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

C. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces.

D. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.

E. Proceed with paving only after unsatisfactory conditions have been corrected.

F. Saw Cutting of Adjacent Pavement –

1. Make a vertical cut through the full depth of surface in a straight clean line.
2. Where the edge of the existing surface is cracked, broken, or deteriorated, make the cut so the defective surface can be removed.
3. Do not allow traffic or construction equipment to cross the cut edge.
4. Apply a tack coat (at a rate of 0.05 to 0.15 gal./sq.yd.) to the cut edge before placing hot mix asphalt surfacing.
5. Avoid smearing or staining adjoining surfaces.

3.2 MIXING

A. Hot-Mix Asphalt Pavement Mix and Mixing Plant shall conform to AASHTO M156.

3.3 HAULING

A. Trucks used for hauling bituminous mixtures shall have tight, clean, smooth metal beds that have been thinly coated with a material to prevent the mixture from adhering to the beds. Truck beds shall be drained prior to loading. Each truck shall have a cover to protect the mixture from the weather. When necessary to ensure that the mixture will be

delivered at the specified temperature, truck beds shall be insulated and covers shall be securely fastened.

3.4 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lift.
3. Spread mix at minimum temperature of 275 deg F.
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

D. Pavers: Use pavers that are self-contained, power-propelled units with adjustable vibratory heated screeds, capable of spreading and finishing courses of asphalt mix in thicknesses and widths shown on the Drawings without segregating, tearing, shoving, or gouging. When indicated, pavers shall be equipped with automatic screed controls and with sensors capable of sensing grade from an outside reference line, sensing transverse slope of the screed, and providing the automatic signals that operate the screed to maintain grade and transverse slope.

3.5 COMPACTING

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.

B. Thoroughly and uniformly compact the asphalt surface by rolling. Do not cause cracking, shoving, or undue displacement. Continue rolling until all roller marks are eliminated, all cracks are sealed, and the required density is obtained. Do not roll the mix after the surface cools below 175 º F.

C. Monitor the compaction process with nuclear density gauges. Compact to a pavement specific gravity (density) that is no less than **92 percent** of the maximum specific gravity (density) determined according to AASHTO T 209.

3.6 JOINTS, TRIMMING EDGES, AND CLEANUP

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Construct transverse joints as described in AI MS-22, "Construction of Hot Mix Asphalt Pavements."
3. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
4. Compact asphalt at joints to a density within 2 percent of specified course density.

B. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

C. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

D. Disposal: Except for material indicated to be recycled, remove all trimmed or otherwise discarded materials from Project site and legally dispose of them in an EPA-approved landfill. Do not allow waste materials to accumulate on-site.

3.7 PAVEMENT SMOOTHNESS

A. Use a 10-foot metal straight edge to measure at right angles and parallel to the centerline. Defective areas are surface deviations in excess of ¼ inch in 10 feet between any two contacts of the straightedge with the surface. Correct defective areas using approved methods.

3.8 PATCHING AND REPAIR

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Tack Coat: Apply uniformly to clean, vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

C. Patching: Fill excavated pavements with hot-mix asphalt, while still hot, compact flush with adjacent surface.

D. Thickness: The completed pavement shall have a minimum thickness of 3 inches after compaction or as shown on the Drawings.

E. Acceptance: The compacted bituminous surfacing, when ready for acceptance, shall be thoroughly compacted, smooth, and match existing grade and cross section.

3.9 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

B. Herbicide Treatment: When shown on the Drawings, apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.

3.10 ACCEPTANCE

A. Hot Asphalt Concrete Pavement shall be tested as indicated in Part 1 – “Quality Assurance.”

B. Gradation and Asphalt Content

1. Gradation: AASHTO T30
2. Asphalt Content: AASHTO T 308
3. Frequency: 1/700 tons or a minimum of 3 per project
4. The Contractor shall provide a split to the Contracting Officer’s Representative when requested.

C. Field density

1. Shall be determined in place after final rolling by nuclear method according to ASTM D 2950 or other approved procedure. The frequency of testing shall be once per 300 square yards or more frequently if needed to show compliance with the specifications. The test results shall be provided upon completion.

D. Thickness

1. In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549. The frequency of testing shall be once per 1500 square yards or more frequently if needed to show compliance with the specifications. Tests shall be performed after compaction. The test results shall be provided upon completion.

2. Tolerance: Plus 1/4 inch, no minus.

E. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION 321200

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 321204 - CRUSHED AGGREGATE BASE OR SURFACE COURSE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes furnishing, hauling and placing one or more courses of aggregate base or surface course material on roadways, campground spurs, parking areas, concrete pads, sidewalks, and pathways. In addition, may include furnishing, hauling, and placing crushed aggregate for bedding and backfill.

1.2 SUBMITTALS

A. Aggregate source, gradation, and material properties.

B. Compaction density test results and proctor.

1.3 MEASUREMENT AND PAYMENT

A. Crushed Aggregate: Number of Cubic Yards of material supplied and installed measured in place to the lines and grades shown on the Drawings. Crushed aggregate shall be used for the construction of roadways, campground spurs, parking areas, concrete pads, sidewalks, pathways and other items as shown on the Drawings. Aggregate under hydrant pads will be paid for in section 221105.

B. No adjustment in a contract unit price will be made for variations in quantity due to differences in the specific gravity or moisture content.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Furnish aggregate Subbase, Base, or Surface Courses meeting the gradation ranges shown in Table 321204-1 and Table 321204-2. Aggregate grade selection shall be as shown on the Drawings and in the Schedule of Items.

B. Materials shall be obtained from an approved source. Furnish aggregates that consist of hard, durable particles or fragments of crushed stone, crushed slag, or crushed gravel meeting the appropriate gradation and conforming to the following:

1. Los Angeles abrasion, AASHTO T 96 …..……..……... 40% max
2. Sodium sulfate soundness loss (five cycles), AASHTO T 104 …….. 12% max
3. Durability index, AASHTO T 210 ……. 35 min

4. Fractured faces, ASTM D 5821 (Subbase or Base)……. 50% min
5. Fractured faces, ASTM D 5821 (Surface Course).……. 65% min
6. Free from organic matter and lumps or balls of clay.

C. Obtain the aggregate gradation by crushing, screening, and blending processes as necessary.

2.2 AGGREGATE GRADATION

Table 321204-1, Crushed Aggregate Grading Requirements for Subbase and Base.

Percent Passing (AASHTO T27 and T11)					
Sieve	Grading A (Subbase)	Grading B (Subbase)	Grading C (Base)	Grading D (Base)	Grading E (Base)
2 1/2 -inch	100				
2-inch	97-100	100	100		
1-1/2-inch		97-100			
1-inch	65-79		80-100	100	
3/4-inch			60-94	86-100	100
1/2-inch	45-59				
3/8-inch			40-69	51-82	62-90
No. 4	28-42	40-60	31-54	36-64	36-74
No. 40	9-17			12-26	12-26
No. 200	4-8	4-12	4-7	4-7	4-7

Liquid Limit, AASHTO T89 = 25 max. Plastic Limit, AASHTO T-90 = nonplastic.

Table 321204-2, Crushed Aggregate Grading Requirements for Surface Course.

Percent Passing (AASHTO T27and T11)		
Sieve	Grading F (Surface Course)	Grading G (Surface Course)
1-1/2-inch	100	
1-inch	97-100	100
3/4-inch	76-89	97-100
1/2-inch		
3/8-inch	56-68	65-85
No. 4	43-53	45-64
No. 8		
No. 16	23-32	25-42
No. 40	15-23	16-29
No. 200	10-16	8-18

Liquid Limit, AASHTO T 89 = 35 max, Plastic Index, AASHTO T90 = 4 to 10.

PART 3 - EXECUTION

3.1 GENERAL

A. Verify that subgrade is dry and in suitable condition, locate areas that are unstable or that require further compaction.

B. Proceed with aggregate placement only after unsatisfactory conditions have been corrected and subgrade is approved in writing by the Contracting Officer's Representative (COR).

3.2 PREPARATION OF SUBGRADE

A. The subgrade shall be prepared in accordance with requirements of other specifications sections.

B. The subgrade shall conform to the lines and grades shown on the Drawings. Suitable material shall be utilized in the preparation of the subgrade. When embankment or fill is necessary, subgrade shall be placed in compacted layers not exceeding 6 inches. Unless specified otherwise, subgrade shall be compacted to 95 percent of AASHTO T 99, method C or D.

C. Suitable material for subgrade shall be granular material or fine compatible soil free of excess moisture, muck, frozen lumps, roots, sod, and other deleterious material. Remove all rock particles and hard earth clods larger than 3 inches in the longest dimension.

3.3 MIXING AND SPREADING

A. Mix the aggregate and adjust the moisture content to obtain uniform moisture. Spread and shape the mixture on the prepared surface in a uniform layer not to exceed 6 inches in compacted thickness.

B. Route hauling equipment uniformly over the full width of the surface to minimize rutting or uneven compaction.

3.4 COMPACTING

A. Compact each layer of aggregate full width. Compact each layer to a density of at least 95 percent of the maximum density as determined by AASHTO T 99 method C or D.

B. Testing shall be at intervals specified in tables shown in Section 014100 "Quality Control."

3.5 SURFACE AND CONSTRUCTION TOLERANCES

A. Shape the surface to the required template and as staked. Surface shall be graded and shaped smooth to within ½-inch in 10 feet.

B. Maintain the aggregate course to the correct lines, grade, and cross-section by blading, watering, and rolling until placement of the next course.

C. Upon completion of full placement and after haul trucks have completed their haul across section of the road, the road shall be finish bladed, watered, and rolled.

D. Aggregate shall be placed as shown on the drawings and as staked. Tolerance for thickness of aggregate shall be +/– ½-inch and for width shall be + 1-foot.

3.6 ACCEPTANCE

A. Aggregate shall be accepted following placement when shown to meet material quality, gradation, compaction requirements, required depth and width, and finish blading.

END OF SECTION 321204

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 321216 - ASPHALT CONCRETE PAVEMENT PATCHING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This work consists of repairing sawcut areas of asphalt concrete pavement by removing and patching the pavement and underlying material as required.

1.2 MEASUREMENT AND PAYMENT

A. Payment will be **square feet** of actual quantity of asphalt patching as authorized. Payment will be full compensation for the work prescribed in this Section.

PART 2 - PRODUCTS

2.1 Asphalt, and tack coat information see specification section 321200 Hot Mix Asphalt Paving.

2.2 Crushed aggregate base see specification section 321204 Crushed Aggregate Base Or Surface Course, grading D.

PART 3 - EXECUTION

3.1 FULL DEPTH PATCH

A. Patch areas: Extend the repair area 12 inches beyond the distressed area. If patch limits are within 24 inches of the pavement edge, extend the patch limit to the pavement edge. Make the minimum length and width of the patch 36 inches.

B. Pavement removal: Mill completely through the pavement or saw cut and remove the pavement. When saw cutting, cut through the existing pavement and around the perimeter of the patch area. Make saw cuts perpendicular to the roadway surface and at right angles to each other. Remove the pavement, base and subgrade to a depth of 6-inches.

C. Patching. Apply a tack coat to the edges of the patch area. Place and compact asphalt concrete pavement so the patched surface matches the same grade as the adjacent surface.

3.2 SKIN PATCH

A. Clean the patch area by sweeping or other acceptable methods.

B. Patching. Apply a tack coat to asphalt concrete surfaces within the patch area. Place the asphalt material either by hand, with a blade, or other approved method. Compact the asphalt concrete pavement patch to match the grade of the adjacent surface.

3.3 ACCEPTANCE

A. Acceptance is based on visual inspection of the work by the C.O.R. for compliance with the contract and prevailing industry standards.

END OF SECTION 321212

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 322705 - PAVEMENT SAWING

PART 1 - GENERAL

1.1 SUMMARY

A. This item consists of sawing pavements as required to provide a smooth surface to match existing grades.

1.2 MEASUREMENT AND PAYMENT

A. No separate payment shall be made for pavement sawing.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PROCEDURE

A. Make a vertical cut through the full depth of surface in a straight line.

B. Where the edge of the existing surface is cracked, broken, or deteriorated, make the cut so the defective surface can be removed.

C. Do not allow traffic or construction equipment to cross the cut edge.

D. Apply a tack coat, to the cut edge before placing hot mix asphalt surfacing.

END OF SECTION

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 329206 - SEEDING

PART 1 - GENERAL

1.1 SUMMARY

A. This item shall consist of broadcast seeding designated areas using specified seed mixtures with fertilizer.

B. The areas to be seeded shall be all cut slopes, fill slopes and other disturbed areas.

C. Related Specifications include the following:

1. Federal Specifications JJJ-S-181

1.2 METHOD OF MEASUREMENT

A. Measurement shall be lump sum for "Seeding."

PART 2 - PRODUCTS

2.1 SEED AND FERTILIZER

A. The seed mix shall be as follows:

1. 70 pounds of seed/acre: Creeping Red Fescue - 20#, Annual Rye - 20#, Winter Wheat: 20#, Ladino Clover - 5# (inoculated), Medium Red Clover - 5# (inoculated). In addition, apply lime at the rate of 2000#/acre, and fertilizer at 1000#/acre - "triple 19"

    a. If seeding is to occur in the Spring, winter wheat shall be removed and creeping red fescue shall be applied at 40#.

B. All seed shall conform to the requirements of Federal Specifications JJJ-S-181; State Laws; and U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act; in effect on the date of invitation of bids. Seed which has become wet, moldy or otherwise damaged in transit or storage will not be accepted.

C. Contractor shall supply seed either separately or in mixture in standard containers clearly marked or labeled with (1) Seed name, (2) Lot number, (3) Net weight, (4) Percentage of purity and of germination and hard seed, (5) Percentage of weed seed content, and (6) all seed shall be certified as noxious weed-free seed. The Contractor shall furnish the Contracting Officer’s Representative duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within 6 months of date of delivery. This statement shall include: (1) Name and address of laboratory, (2) Date of test, (3) Lot number of each kind of seed, and (4) Results of tests as to name percentages of purity and of germination, and percentage of weed content,

for each kind of seed furnished, and in case of a mixture, the proportions of each kind of seed.

PART 3 - EXECUTION

3.1 GENERAL

A. The specified seed mixture, with fertilizer, shall be uniformly spread on the designated areas to the density in pounds of live seed per acre as specified.

B. Each area or suitable section of the area to be seeded shall be seeded as soon as the grading and finishing work have been completed and the area prepared and approved for seeding by the COR. Seeding shall follow the finishing work as closely as feasible and if possible before the ground has become packed or hardened. No regard shall be given to the season of the year except that no seeding shall be done during windy weather or when the ground is excessively wet or deeply frozen.

3.2 PREPARATION OF SEEDING AREA

A. Cut slopes, fill slopes, embankments or other areas to be seeded shall be shaped and finished as specified under the Sections involved. The area, where necessary, shall then be hand raked or otherwise worked such that the surface is loose to a depth of at least one inch. Each area shall be approved for seeding by the Contracting Officer's Representative before seed is applied.

3.3 SEEDING

A. The seed or seed mixtures, with or without fertilizer, shall be accurately proportioned as stipulated and thoroughly mixed. They shall be remixed as necessary so that a uniform mixture will result as each loading of the seeder is made.

B. Seed, with fertilizer, shall be applied with a rotary hand seeder or other approved type commercial seeder or by an agreed upon method. All portions of the area shall be uniformly covered to the required density.

C. Immediately after seeding the contractor shall rake, power-sew, or light-tillin the seed such that the seed becomes integrated with the soil.

D. Weed free straw shall be added at a uniform thickness on top of any seeding/fertilizing as mulch.

3.4 MAINTENANCE OF SEEDED AREA

A. The Contractor will not be required to maintain an area which has been satisfactorily seeded except that he shall protect the area against traffic by warning signs or barricades or other methods approved by the Contracting Officer's Representative.

B. When a seeded area has become damaged by storm or otherwise prior to final acceptance of the project, the Contracting Officer's Representative may order the area reworked. The damage shall then be repaired as directed and the area reseeded.

END OF SECTION 329206

USDA FOREST SERVICE, R8
Sherando Recreation Area Water System Replacement

SECTION 330523 - UTILITY HORIZONTAL DIRECTIONAL DRILLING

PART 1 - GENERAL

1.1 SUMMARY

A. The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to complete directional drilling, testing and other work, as required in these specifications, on the drawings, and as otherwise deemed necessary to complete the work.

B. Related Sections include the following:

1. Section 221100 “Water Distribution System.”
2. Section 312000 “Earthwork.”

1.2 COORDINATION

A. Selection of the exact procedure to be used and equipment to be used is subject to the approval of the Contracting Officer’s Representative.

B. The Contractor is responsible for obtaining all necessary permits

1.3 QUALITY

A. It is not the intent of this specification to limit or restrict initiative in developing drilling, tunneling and jacking procedures, but it is intended to describe generally acceptable procedures.

1.4 SUBMITTALS

A. Provide written drilling plan outlining proposed equipment and construction methods, including the following:

1. Detailed description of the procedures including construction techniques to provide the access required to install the pipeline.
2. Literature describing in detail the drilling system to be used, including drill steering and locating system.
3. Certification by the machine manufacturer that the drilling equipment has been successful in installing similar size pipe in similar soil and groundwater conditions.
4. Drilling fluid generation and management.

B. Within 48 hours of completing the hole for each run of pipe, provide the log of the drilling operation and guidance system records documenting the line and grade of that hole to the COR . Note the location of any utilities or difficult drilling that was encountered.

1.5 MEASUREMENT AND PAYMENT

A. Payment will be paid per linear feet (LF) for the Underground Boring job, including utility piping and pipe sleeve/casing. This pay item shall also include all material for waterline including but not limited to HDPE pipe, welding, excavation of boring pits on each side, connections, and dewatering for the boring pits only. The length of each job will be shown on the Drawings.

PART 2 - PRODUCTS

2.1 PIPE, SLEEVE OR CASING

A. Casing is required but sizing shall be determined by the contractor.

B. According to Section 221100 “Water Distribution System.

2.2 END SEALS

A. Design: With ASTM C443 compliant gaskets.

B. Model: Link-Seal, as manufactured by Pipeline Seal & Insulator, Inc. or an approved equal.

2.3 DRILLING FLUID

A. ANSI/NSF 60 (Drinking Water Treatment Chemicals – Health Effects) certified bentonite-based drilling fluid.

PART 3 - EXECUTION

3.1 GENERAL

A. The pipe to be placed by drilling, tunneling, jacking or boring procedures may be used as a casing or transmission pipe, as shown on the Drawings. Pressure pipelines may vary slightly from line and grade, as approved in writing by the Contracting Officer’s Representative. When casing pipe is used, it will be advanced from a prepared jacking pit at one end of the penetration, by drilling, tunneling, and jacking methods.

B. Locate all known utilities located adjacent to or crossing the utility line being installed. Excavate to expose utilities prior to initiating drilling and verify applicable clearances. Clearance shall meet applicable code requirements and the requirements of the directional drilling process.

3.2 PIT

A. Excavate insertion and receiving pits.

B. The pit shall be kept dewatered at all times.

3.3 DRILLING PROCEDURES AND PRECAUTIONS

A. Drilling methods shall generally consist of drilling a pilot hole the length of the bore, followed by reaming and pullback of the pipeline. Ream borehole multiple times, as necessary. The equipment and methods used to complete the bore and install piping shall be determined by the Contractor.

B. The drill staging area shall be kept neat and orderly and disturb as little area as possible. The pipe staging area shall disturb as little area as needed to accommodate workers and equipment, and to string, fuse, and inspect the pipe.

C. Install all pulleys, rollers, bumpers, alignment control devices and other equipment required to support and protect the new pipe from damage during installation.

D. Utilize a drilling fluid cleaning/recycling system. Entry and exit pits shall be sized and constructed to completely contain drilling fluid.

E. Install boring to line and grade shown on drawings. Alignment shall be within tolerances specified in applicable utility specification sections.

F. Borehole survey instrumentation shall be used to monitor line and grade of the pilot hole. Contractor shall maintain records documenting the line and grade of the pilot hole.

G. Contractor shall notify the COR upon completion of the pilot hole to observe alignment prior to reaming and pullback.

3.4 REAM AND PULLBACK

A. Pilot hole shall be back-reamed to accommodate pipe. Contractor shall select the reamer size and number of passes required.

B. Pull pipe back using swivel to prevent torsion of pipe.

C. Monitor tension forces on pipe during pullback. Do not exceed maximum stresses recommended by the pipe supplier.

D. Support pipeline during pullback operations. Provide supports/rollers in accordance with manufacturer’s recommendations. Supports and rollers shall allow for free movement of the pipeline and prevent damage to the pipe.

E. Use a drilling fluid in conjunction with the installation of the pipe to fill the annular space around the installed pipeline. The Contractor shall be responsible for determining the type of fluid to use, and for properly disposing of all excess drilling fluid and slurry material recovered from the hole during drilling operations and displaced by the pipe during installation.

F. Allow the manufacturer’s recommended amount of time for cooling and relaxation due to tensile stressing prior to connecting pipe to adjacent pipe sections, fittings, or structures, or backfilling of the insertion pit. Provide sufficient excess length of new pipe at insertion pits to allow for cooling and relaxation.

3.5 SAFETY, SHORING, AND PROTECTION

A. According to Section 312000 “Earthwork.”

B. All supports shall be removed after construction is completed and shall be withdrawn in a manner that will prevent the caving of the sides of the excavation. All openings in the ground, caused by the removal of supports, shall be filled with suitable material and properly compacted.

3.6 END SEALS

A. If electrical conduit and/or pipe to convey a liquid is installed inside a sleeve or casing, the annular space between the sleeve or casing and the installed conduit or pipe shall be plugged with an end seal to provide a positive seal against a hydrostatic head and prevent soil from entering the space.

3.7 CLEANUP AND BACKFILL

A. When work has been completed, all bracing, shoring, and other timber shall be removed from the pit. The pit shall be filled in and graded to near original grade. Final grading will be approved by the Contracting Officer's Representative. Debris and excess material shall be removed from the site.

B. Depending on site repairs of existing infrastructure may be required and may include, but not limited to, asphalt and concrete pavement, curb and gutter, signs, and sidewalk.

END OF SECTION 330523