Section C - Description/Specifications/Statement of Work

GENERAL SPECIFICATIONS
DUCK CREEK CAMPGROUND DUMPSTATION REHABILITATION

1.1 SCOPE OF CONTRACT

A. This project includes the rehabilitation of the Duck Creek Campground Dump Station as shown on the drawings.

B. The work includes the demolition of the existing dump station including the concrete island and pull through, drains, plumbing for potable and non-potable connections, water towers and signs. Work also includes saw cutting the existing asphalt, construction of new island and pull through, catch basin and box, reinstallation of existing water towers, installation of new sign and all plumbing connections for a complete operation dump station as shown on the drawings.

1.2 PROJECT LOCATION

A. The project is located in the Duck Creek Campground on the Cedar City Ranger District of the Dixie National Forest, Kane County, Utah, in Section 12, T 38S, R 8W. It is located approximately 28 miles east of Cedar City, Utah. The project may be accessed from State Highway 14.

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. Construction sites will be closed to the public during construction. The Forest Service will issue a closure order to the public. The Contractor will be responsible for signing and limiting public access. The existing isolation gates at the dump station may be used.
2. Contractor will provide all materials and labor necessary to protect streams, wet or dry, during construction activities. The Contractor will be required to submit a stream protection plan and receive approval from the COR, in writing, prior to the beginning of construction.
3. All construction equipment shall be pressure washed before entering National Forest System lands. The removal of mud and debris from treds, tracks and undercarriage, with emphasis on axles, frame, cross-members, motor mounts, and underneath steps, running boards, and front bumper/brushguard assemblies will be required. The purpose is to reduce or eliminate the transportation of noxious weeds, which is required by Federal and State regulations.
4. Contractor will coordinate the location of all utilities prior to commencement of any demolition or construction work. The contractor will be responsible for any unscheduled interruption of utilities in the project area.

5. Water is available at the site for construction purposes. Contractor shall obtain permission in writing prior to using water for construction purposes.
6. Toilet facilities are available at the site

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.

1.5 WORK CAMPS, STAGING AND STORAGE AREAS

A. Areas for staging operations and storage of materials shall be approved by the CO. The Contractor must request in writing for approval from the CO to stage trailers (work) on site.

B. Overnight camping will be allowed in the campground at the established rates.

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 START DATE

A. Estimated to be mid to late June.

1.8 CONTRACT TIME

A. Base Bid: 25 Calendar Days

1.9 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 011250 - Measurement And Payment

Section 011900 - Mobilization
Section 013300 - Submittal Procedures
Section 014100 - Quality Control
Section 015100 - Temporary Traffic Control
Section 017320 - Selective Demolition
Section 024100 - Waste Material Disposal
Section 033000 - Cast-In-Place Concrete
Section 101405 - Metal Sign Fabrication
Section 221100 - Water Distribution Systems
Section 221102 - Curb Valves And Boxes
Section 221103 - Plumbing Appurtenances
Section 221312 - Sanitary Dump Station
Section 321204 - Crushed Aggregate Base Or Surface Course

1.10 DRAWINGS

A. The following drawings are attached:

1. Cover Sheet
2. Vicinity Map
3. Site Layout
4. Existing Trailer Dump Station Layout
5. New Trailer Dump Station Layout
6. Trailer Dump Station Layout Section View
7. Water Line Schematic

END OF SECTION C
February 2014

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, netting 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 (CO), 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 CO, 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.

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. 50lb Bag: Measurement will be for the actual number of 50lb bags of standard bentonite grout.
3. 94lb Bag: Measurement will be for the actual number of 94lb bags of standard cement or grout.
4. 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.

5. Each (EA): One complete unit, which may consist of one or more parts.
6. Gallons (GAL): The quantity shall be measured by any of the following methods:

    a. Measured volume in container.
    b. Metered volume by approved metering system.
    c. Commercially package volume.

7. Hour (HR): Measurement will be for the actual number of hours (or fraction thereof) ordered by the Contracting Officer and performed by the contractor.
8. Linear Foot (LF): Measurement of work along its length from point-to-point; parallel to the base or foundation. Do not measure overlaps.
9. Lump Sum (LS): One complete unit.
10. Mile: Measured horizontally along the centerline of each roadway, approach, or ramp.
11. Pound (LB): For sacked or packaged material, measurement will be the net weight as packed by the manufacturer.
12. Square Foot (SF): Measured on a plane parallel to the surface being measured.
13. Square Yard (SY): Measured on a plane parallel to the surface being measured.
14. Ton: Measured as a short ton consisting of 2,000 pounds.

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 or 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 CO.
    b. As a result of the CO 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 CO 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.
4. STAKED QUANTITIES (SQ) - These quantities are determined from staked measurements prior to construction.
5. VEHICLE QUANTITIES (VQ) - These quantities are measured or weighed in hauling vehicles.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 011250
February 2014

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
February 2014

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 section within this package for additional requirements on submittal.

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 (CO) reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

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

1. Initial Review: Allow 14 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. CO 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 14 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.

C. 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 CO.
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 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.

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

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

F. Use for Construction: Use only final submittals with mark indicating action taken by CO 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 CO approval)

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

1. Number of Copies: Submit three copies of each submittal, unless otherwise indicated. CO will return two copies. Mark up and retain one returned copy as a Project Record Document.

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 CO, in accordance with the contract provisions within 5 day of 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 CO approval)

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

1. Number of Copies: Submit three copies of each submittal, unless otherwise indicated. CO will not return copies.
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.

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 approval stamp before submitting to CO.

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

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 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. All items in the above information shall be circled, tagged, or marked in some way to indicate all deviations or differences which the proposed item differs from 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 specific specifications:

TABLE 013000-1

Spec. Section	Section Title	Sub-sec-tion	Required Submittal
C	General Specifications	1.3A	Stream Protection Plan
C	General Specifications	1.4A	Traffic Control Plan
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
017320	Selective Demolition	1.4A	Proposed Control Measures
017320	Selective Demolition	1.4B	Schedule of Selective Demolition Activities
017320	Selective Demolition	1.4C	Pre-Demolition Photographs
017320	Selective Demolition	1.4D	Landfill Records
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	Material Test Reports
221100	Water Distribution Systems	1.3A	Product Data
221100	Water Distribution Systems	1.3B	Water Disposal Plan
221100	Water Distribution Systems	1.3C	Water System Operation and Maintenance Manual
221103	Plumbing Appurtenances	1.2A	Product Data
221103	Plumbing Appurtenances	1.2B	Operation and Maintenance Data
221312	Sanitary Dump Station	1.4A	Product Data
221312	Sanitary Dump Station	1.4B	Shop Drawings
221312	Sanitary Dump Station	1.4C	Certificate for Holding Tank
321204	Crushed Aggregate Base or Surface Course	3.4A	Material Test Reports

END OF SECTION 013300
February 2014

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.
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 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 on 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.

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	2.12	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	3.2N	HDPE Pipe - Bent Strap Test	Once Daily
221100	3.6A	Hydrostatic Testing of Water System	See Spec.
221100	3.6B	Pressure and Leakage Test – Water Line	See Spec.

TABLE 014100-1			
Item	Subsection	Certification or Test Required	Frequency
221100	3.7A	Bacteriological Examination	After disinfection, before use
321204	3.4A	Compaction / Density Test	2 tests per dump station

END OF SECTION 014100
February 2014

SECTION 015100 - TEMPORARY TRAFFIC CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. This work consists of furnishing, maintaining, relocating, and removing temporary traffic control and safety devices and services for the control and protection of public traffic near the project site. Prior to beginning construction the Contractor shall submit a traffic control and safety plan to the Contracting Officer for review and approval. As a minimum the traffic control and safety plan shall address signing in and near the project site and at all road and highway junctions that will be used as access to the project site, material sources, water sources and disposal sites as well as any other areas where the Contractor will be performing work under this contract.

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 TRAFFIC CONTROL

A. Traffic control and safety device (barricades, cones, tubular markers, vertical panels, drums, portable barriers and so forth) designs and configurations shall conform to the MUTCD. When interpreting the requirements in the applicable MUTCD sections, replace the word should with the word shall.

PART 3 - EXECUTION

3.1 GENERAL

A. All signs shall be constructed to comply with the requirements of MUTCD for the construction operations. Install and maintain temporary traffic control and safety devices adjacent to and within the project as shown on the approved traffic control and safety plan and MUTCD. Install and maintain traffic control and safety devices as follows:

1. Furnish and install traffic control and safety devices before the start of construction operations.
2. Install only those traffic control and safety devices needed for each stage or phase.
3. Relocate temporary traffic control devices as necessary.
4. Immediately replace any device that is lost, stolen, destroyed, or inoperative.

5. Keep temporary traffic control and safety devices clean.
6. Remove all temporary traffic control devices upon contract completion or when approved.

B. Barricades

1. Perform the work described under MUTCD Part VI. Use type III or IV reflective sheeting. Use wood, metal, or plastic barricades. When type II barricades are used, use barricades that collapse when tipped over.

C. Construction Signs

1. Use type III or IV reflective sheeting. Use wood, metal, fiberglass, or other approved posts.

END OF SECTION 015100
February 2014

SECTION 017320 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes demolition and removal of the following:

1. Selected site elements.
2. Repair procedures for selective demolition operations.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Government.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Government property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.4 MEASUREMENT AND PAYMENT

A. Measurement and payment shall be one lump sum item. Item shall include all work necessary to remove the existing dump station including all plumbing and concrete.

1.5 SUBMITTALS

A. Proposed Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate. Include measures for the following:

1. Dust control.
2. Noise control.

B. Schedule of Selective Demolition Activities: Indicate detailed sequence of selective demolition and removal work, with starting and ending dates for each activity, interruption of utility services, use of elevator and stairs, and locations of temporary partitions and means of egress.

C. Predemolition Photographs or Videotape: Show existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.

D. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Standards: Comply with ANSI A10.6 and NFPA 241.

D. Predemolition Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

A. Forest Visitors will occupy portions of the campground adjacent to the selective demolition area. Conduct selective demolition so that visitor access will not be disrupted. Provide not less than 72 hours' notice to CO of activities that will affect operations.

B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.

C. Government assumes no responsibility for condition of areas to be selectively demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Government as far as practical.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Government before start of the Work.
2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Contracting Officer (CO). Hazardous materials will be removed by Government under a separate contract.

E. Storage or sale of removed items or materials on-site will not be permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.8 WARRANTY

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

1. If possible, retain original Installer or fabricator to patch the exposed Work listed below that is damaged during selective demolition. If it is impossible to engage original Installer or fabricator, engage another recognized experienced and specialized firm.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

A. Use repair materials identical to existing materials.

1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
2. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to CO.

E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

3.2 UTILITY SERVICES

A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.

B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by CO and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to CO and to authorities having jurisdiction.

   1. Provide at least 72 hours' notice to CO if shutdown of service is required during changeover.

C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.

   1. Arrange to shut off indicated utilities with utility companies.
   2. If utility services are required to be removed, relocated, or abandoned, provide temporary utilities before proceeding with selective demolition that bypass area of selective demolition and that maintain continuity of service to other parts of building.
   3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

D. Utility Requirements: Refer to Division 15 and 16 Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

   1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from CO and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
   2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
   3. Protect existing site improvements, appurtenances, and landscaping to remain.

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

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

D. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

E. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of construction to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

3.4 POLLUTION CONTROLS

A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.

1. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.

B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.5 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations.

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Existing Facilities: Comply with CO's requirements for using and protecting elevators, stairs, walkways, loading docks, building entries, and other building facilities during selective demolition operations.

C. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Government.
4. Transport items to Government storage area designated by CO.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by CO, items may be removed to a suitable, protected storage location during selective demolition [and cleaned] and reinstalled in their original locations after selective demolition operations are complete.

3.6 PATCHING AND REPAIRS

A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.

B. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

C. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Government property and legally disposes of them.

END OF SECTION 017320
February 2014

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. 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 – NOT APPLICABLE

PART 3 - EXECUTION

3.1 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 of 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
February 2014

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. Cast-in-Place Concrete: Number of Cubic Yards of material supplied and installed measured in place to the lines and grades shown on the Drawings. Cast-in-Place Concrete shall be used for the construction of dump station and other items as shown on the Drawings.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. 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.

B. 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. Delete or revise three subparagraphs below to suit Project.

2. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
3. 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 (25 mm) 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. 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 (0.25 mm) 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 (9.5-mm) sieve, 10 to 30 percent passing a No. 100 (0.15-mm) sieve, and at least 5 percent passing No. 200 (0.075-mm) sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

C. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

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 (3.2 mm) 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 (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than [**4100 psi (29 MPa)**] 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 (3.2 mm) 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 (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than [**5000 psi (34.5 MPa)**] at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXTURES, GENERAL

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

1. Minimum Compressive Strength: 4500 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, but not less than 1.5 lb/cu. yd.

B. Sign Base: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4500 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.50.
3. Slump Limit: 4 inches (75-125 mm), plus or minus 1 inch.
4. Air Content: 4 percent, plus or minus 1 percent at point of delivery for 1-inch nominal maximum aggregate size.

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

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

2.11 FABRICATING REINFORCEMENT

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

2.12 CONCRETE MIXING

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

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), 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. (0.76 cu. m) 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. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
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 (3.2 mm) for smooth-formed finished surfaces.
2. Class B, 1/4 inch (6 mm) 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 (10 deg C) 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.

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 (150 mm) 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.

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. 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 (3.2 mm). 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- (3.2-mm-) 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. Do not add water to concrete during delivery, at Project site, or during placement unless approved by the Contracting Officer.

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

D. 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 (150 mm) 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.

E. 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.

F. 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 (4.4 deg C) 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.

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

1. Maintain concrete temperature below 90 deg F (32 deg C) 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, restraightening, 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 restraightening 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- (3.05-m-) long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/8 inch (3.2 mm)

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, 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.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

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 (1 kg/sq. m 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 (300-mm) 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 (300 mm), 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. 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 (1.18-mm) 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 (13 mm) in any dimension in solid concrete, but not less than 1 inch (25 mm) 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.

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 (0.25 mm) 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 (6 mm) 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 (25 mm) 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 (19-mm) 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 (25 mm) 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 approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Contracting Officer'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 3.6 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. Compression Test Specimens: ASTM C 31/C 31M. Cast and laboratory cure one set of three standard cylinder specimens for each composite sample.

   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 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
February 2014

SECTION 101405 - METAL SIGN FABRICATION

PART 1 - GENERAL

1.1 This item shall consist of fabricating metal signs, in accordance with these specifications and details shown on the drawings.

1.2 METHOD OF MEASUREMENT

A. The quantity to be measured shall be the number of each type of sign shown in the Schedule of Items.

1.3 REFERENCE SPECIFICATIONS

A. The publication listed below form a part of this specification to the extent referenced. The publication is referred to in the text by the basic designation only.

1. EM 7100-15 Sign and Poster Guidelines for the Forest Service.
2. Manual of Uniform Traffic Control Devices (MUTCD).

1.4 QUALITY ASSURANCE

A. The Fabricator shall have sufficient covered shop space, tooling and equipment to properly fabricate, inspect, store and handle the signs. Raw materials shall be stored in a covered warehouse or similar cool, dry storage area so that it protects the raw materials from environmental factors.

B. The fabricator shall be regularly engaged in the design and manufacture of aluminum signs and shall have at least 5 years experience. References with contacts shall be provided if requested by the Contracting Officer.

PART 2 - PRODUCTS

2.1 SUBMITTALS

A. Provide 2 sets of the following:

1. Computer assisted drawings (CAD) for each type and size of sign for review and approval.
2. Samples of the fonts, both upper and lower case and numerals, not less than 18 font size, produced on paper for review and approval.
3. Sheeting Manufacturer's "cut sheets".
4. Film Manufacturer's "cut sheets".
5. Manufacturer's "cut sheet" for the aluminum substrate and detailed explanation of the aluminum alodized coating/treatment process. List the etching type alkaline

cleaner, deoxider chemical conversion treatment and other chemicals used in the process.

B. Prior to fabrication, the Contractor shall submit a mock-up of each sign type. This sample must include enough detail, including materials, layout, font, color, size and shape to show consistency with the drawings and be in accordance with EM 7100-15. The submittal shall be combined into a single, neatly organized, complete package and submitted to the Contracting Officer for review and approval. Fabrication of the signs shall not begin until the complete submittal package has been approved by the government.

C. Types of signs to be fabricated include:

1. Regulatory Signs

2.2 MATERIALS

A. SUBSTRATE

1. Aluminum Panels: All sheets and plates shall meet the requirements of ASTM B 209, alloy 6061-T6, or 5052-H38.
2. Fabricate sign panels that are 30 by 30 inches or smaller from 0.080-inch thick aluminum sheets. Fabricate larger sign panels from 0.125-inch thick aluminum sheets. Sign blanks shall be free from laminations, blisters, open seams, pits, holes, or other defects that may affect their appearance or use. The thickness shall be uniform and the blank commercially flat. Perform shearing, cutting, and punching before preparing the blanks for application of reflective material.
3. Substrate shall have an alodine or anodize oxide protective coating with Alodine 1200F or approved equal to improve resistance to the rain and sun and to provide a surface with superior adhesive qualities to which the sheeting is applied. The coating shall be applied pursuant to U.S. Specification MIL-C-5541B or ASTM B449-67, Class I or II. All excess chemicals shall be properly disposed pursuant to local, state and Federal environmental (EPA) regulations. Plastic, steel, sheet metal and other metals and thinner aluminum is not permitted.

B. SHEETING

1. Sheeting shall be enclosed cell reflective sheeting with pressure sensitive adhesive backing. Material shall meet ASTM 4956 Spec Type I, Class 1. 3M Scotchlite “Engineering Grade” retro-reflective sheeting with PSA or approved equal. Enamel. Powder coat, silk screening or any other paint is not acceptable.

C. FILM

1. Film shall be transparent acrylic color film with pressure sensitive adhesive backing and shall be used for all text, borders, graphics and symbols. 3M Scotchlite ElectroCut Film, or equivalent. Silk screening or any other painting method is not acceptable.

D. LOGOS

1. Logos including Agency symbols (FS Shield) shall be specified in the contract and shall comply with one of the following:

    a. If the Vendor is to provide Agency Logo (FS Shield) and similar artwork, the Vendor shall reproduce and attach vinyl and/or film logos from drawings or other artwork supplied by the government.

E. COLOR

1. Sign colors shall be standard Forest Service colors, Federal Standard 595, brown #20059 and white #23695.

2.3 FABRICATION

A. GENERAL

1. All signs shall be designed using computer assisted design (CAD) software.
2. All signs (symbols, size etc.) shall comply with Federal Highway Administration (FHWA / U.S. Department of Transportation) MUTCD standards.
3. Text font shall be Highway Font or Helvetica unless stated otherwise (Caledon medium, Rawlingson, Frutiger etc.)
4. All letters shall be uppercase, pursuant to MUTCD section 2 A-1, unless exceptions to the subsection apply or unless shown on the drawings.

PART 3 - EXECUTION

3.1 MANUFACTURING PROCESS

A. The corners of each Aluminum substrate shall be cut to the radii set forth in the FHWA standards or as shown on the drawings.

B. The substrate shall be cleaned by hand with denatured alcohol or other approved solvent to remove all foreign matter.

C. The sheeting shall be applied to the substrate using mechanical/hydraulic rollers. The use of hand rollers is not acceptable. The sheeting shall be pressed to the substrate at a pressure not less than 80 psi.

D. Excess sheeting, if any, shall be removed.

E. The film shall be cut with a razor blade plotter using the pre-designed CAD pattern.

F. The excess film shall be removed to achieve the desired boarders, symbols, lettering etc., or the lettering removed to produce a reverse image, as applicable.

G. The film shall be applied to the sheeting using mechanical/hydraulic rollers. The film shall be pressed to the sheeting at a pressure not less than 80 psi.

H. Logos, Forest service shield, shall be applied and pressed to the sheeting and/or film at a pressure not less than 80 psi.

I. The sign shall again be cleaned by hand in the above manner.

3.2 Upon completion of fabrication, signs shall be packaged, crated and protected in such a manner as to prevent damage in normal handling while in transit. Signs are to be stored on site until such time as a contract can be awarded for installation. Not to exceed 180 days. Dates and methods of transportation of completed signs to the Las Vegas area shall be negotiated with the installer.

END OF SECTION 101405
February 2014

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 and fittings.

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

C. Related Sections include the following:

1. Section 024100 “Waste Material Disposal.”
2. Section 221102 “Curb Valves and Boxes.”

1.2 DEFINITIONS

A. GSP: Galvanized Steel Pipe.

B. HDPE: High Density Polyethylene plastic.

C. NPWL: Non-potable waterline (includes sewerline).

D. PVC: Polyvinyl chloride plastic.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Pipe and fittings.

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

C. Water System Operations and Maintenance Manual.

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. NSF Compliance:

1. Comply with NSF 14 for plastic potable-water-service piping. Include marking "NSF-pw" on piping.
2. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.5 MINIMUM SYSTEM REQUIREMENTS

A. Unless otherwise noted, the minimum working pressure for piping and specialties shall be 160 psig.

1.6 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.

1.7 PROJECT CONDITIONS

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

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

1.8 COORDINATION

A. Coordinate connection to existing waterlines with Contracting Officer.

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

C. Coordinate other utility impacts.

1.9 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 GENERAL

A. 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. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

    a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. HDPE:

1. Pipe, AWWA C901:

    a. Material Designation: PE 3408 resin
    b. Material Classification: ASTM D1248
    c. Minimum Cell Classification: ASTM D 3350, 345434C
    d. Dimension Ratio and Minimum Pressure Rating: DR11, 160 psig

2. Fittings:

    a. Molded HDPE Fittings: ASTM D 3350, PE 3408 resin, butt-fusion type, made to match HDPE pipe dimensions and class.
    b. Insert Fittings: Not allowed.
    c. Transition Fittings to non-HDPE Pipe: Approved by HDPE pipe manufacturer. Compression-type fittings are not allowed.

3. Pipe Larger than 2-inch Diameter: Provide in 40-foot lengths rather than in rolls.

4. Pipe and Fittings 4-inch Diameter and Larger: Conform to AWWA C906 in addition to above requirements.

5. Pipe Insulation: Urethane foam, 2-inch thick, wrapped around pipe.

    a. Outer Jacket: 60-mil thick HDPE, ASTM D 3350, 345434C cell classification.

C. Galvanized Steel: ASTM A53, Schedule 40, threaded ends meeting ASME B1.20.1.

1. Fittings: Threaded, ASTM A 338.

D. Ductile-Iron Pipe and Fittings

1. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint, bell- and plain-spigot end unless grooved or flanged ends are indicated.

    a. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

        1) Gaskets: AWWA C111, rubber.

E. Copper Tube and Fittings

1. Hard Copper Tube: ASTN B88, Type K water tube, drawn temper.
2. Soft Copper Tube: ASTM B88, Type K, water tube, annealed temper.

3. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.3 PIPING SPECIALTIES

A. Flexible Connectors:

1. Nonferrous-Metal Piping: Bronze hose covered with bronze wire braid; with copper-tube, pressure-type, solder-joint ends or bronze flanged ends brazed to hose.
2. Ferrous Piping: Stainless-steel hose covered with stainless-steel wire braid; with ASME B1.20.1, threaded steel pipe nipples or ASME B16.5, steel pipe flanges welded to hose.

B. Dielectric Fittings: Combination of copper alloy and ferrous; threaded, solder, or plain end types; and matching piping system materials.

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 160- or 300-psig minimum working pressure to suit system pressures.
3. Dielectric-Flange Insulation Kits: Field-assembled companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

   a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure to suit system pressures.

4. Dielectric Couplings: Galvanized-steel couplings with inert and noncorrosive thermoplastic lining, with threaded ends and 300-psig minimum working pressure at 225 deg F).
5. Dielectric Nipples: Electroplated steel nipples with inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300-psig minimum working pressure at 225 deg F.

2.4 END SEALS FOR SLEEVES

A. Design: With ASTM C443 compliant gaskets.

B. Model: Link-Seal, as manufactured by Pipeline Seal & Insulator, Inc. or an approved equal.

2.5 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, parts list and parts order form, instructions for draining the system, etc. Coordinate water system manual with pump and electrical system manual in Section 221120 "Submersible Well Pumps."

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

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

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

C. All waterline shall be graded to drain.

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

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

F. 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 so that no trench water, rodents, earth, or other substance will enter the pipe or fittings.

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

H. Water and Non-Potable/Sewer Line Crossings

1. Potable and NPWL lines shall never be installed in the same trench.
2. If a new line crosses below an existing line, the existing line shall be supported to prevent settling.
3. Where waterlines intersect NPWLs or are within 10 horizontal feet of NPWLs, the following applies:

    a. At least one of the pipes (either the waterline or NPWL) shall be constructed or reconstructed with 200 psi pipe or encased in a continuous sleeve with same rating. At crossing, extend 200 psi pipe or sleeve for a distance of 10 feet perpendicular distance from each side of the waterline. The waterline and NPWL pipes or sleeves shall be centered at the crossing

so that the joints will be an equal distance and as far as possible from the crossing.

1) Sleeves: Nominal sleeve diameter to be at least 3 inches larger than nominal diameter of pipe to be encased. Install end seals in annular space at each end of sleeves.
2) In lieu of constructing or reconstructing the NPWL with pipe conforming to waterline requirements, the NPWL may be encased in concrete at least 6 inches thick around the pipe measured at the bell, for 10 feet each side of the waterline.

b. Construct according to applicable federal, state and local regulations, including Utah Division of Drinking Water, "Rules Governing Public Drinking Water Systems, R309-550." The Contractor is responsible for obtaining and following these regulations.
c. Where applicable, state and local regulations supersede the above requirements.

I. Bury piping with depth of cover over top at least 36 inches, with top at least 12 inches below level of maximum frost penetration.

J. Install underground piping with restrained joints at horizontal and vertical changes in direction as indicated on the Drawings. Use restrained-joint piping, anchors, tie-rods and clamps, and other supports.

K. 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 insure 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.

L. Laying Pipe

1. No pipe shall be placed in the trench until the Contracting Officer has approved the trench and bedding.
2. 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 2%. Waterlines not meeting this requirement shall be removed by the Contactor and replaced at no cost to the Government.
3. Each section of the pipe shall rest upon the pipe bed for the full length of its barrel.
4. 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.
5. When work is not in progress, securely close open ends of pipe and fittings.

6. 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.
7. High density polyethylene pipe shall be allowed to cool to within 20ºF of the shaded trench bottom temperature before backfilling.
8. When pipes are installed in a structure or utility box, they shall be adequately supported.
9. 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.
10. 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.
11. Bends that result in joint tension or permanent pipe deformation are prohibited.
12. Pipelines may be relocated slightly, if necessary, to avoid existing obstacles. However, the required slopes must be maintained.

M. 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.

N. 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. Use adapters compatible with both piping materials, outer diameters and system working pressure.

    a. For HDPE pipelines:

        1) Use HDPE/GSP transition fittings for connections to galvanized steel pipe.

    b. For other situations, use fittings to suit the actual conditions.
    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 tape or joint compound, and apply wrench to fitting and valve ends into which pipes are being threaded.

b. Exposed threaded pipe joints on galvanized steel pipe shall be painted with mastic following the manufacturer’s application procedures.
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 joining method shall be butt fusion method and shall be performed in accordance with the pipe manufacturer's recommendations. Butt fusion equipment used in the joining procedures shall be capable of meeting all conditions recommended by the pipe manufacturer, including but not limited to, temperature requirements, alignment, and fusion pressures.
c. Personnel trained in butt fusion techniques by the manufacturer of the pipe, shall supervise or perform butt fusion operations.
d. Butt fusion shall be performed 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.
e. Branch connections to the main shall be made with polyethylene fittings, and butt fused.
f. 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.

5. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

O. Install piping by directional boring, tunneling, jacking, or combination, under streets and other obstructions that cannot be disturbed.

3.2 IDENTIFICATION

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

3.3 PIPE SLEEVE INSTALLATION

A. Where waterline crosses road paving install waterline in pipe sleeve. Extend pipe sleeve a minimum of three feet beyond edge of pavement.

B. End Seals

1. The annular space between the sleeve or casing and the installed pipe shall be plugged with an end seal to provide a positive seal against a hydrostatic head and prevent soil from entering the space.

3.4 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 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.
5. The Contracting Officer 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% of the normal working pressure at the highest elevation of the test but not exceed 160 psi at any point being tested.
   b. Not exceed the thrust restraint design pressures.
   c. Not vary by more than +/- 5 psi from the established test pressure.
   d. Not exceed twice the rated pressure of valves when the test section includes closed valves.
   e. 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.
   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:

1) Increase pressure in 50-psig increments and inspect each joint between increments.
2) Hold at test pressure for 1 hour.
3) Decrease to 0 psig.
4) 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.
5) Leakage shall be verified by the Contractor and the Contracting Officer.
6) 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.

3. Results

a. The Contractor shall furnish a written report to the Contracting Officer 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.

3.5 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

1) After the pressure and leakage testing has been completed, all water pipes shall be thoroughly flushed.
2) 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.
3) 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.
4) 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.

5) Minimum velocities must be obtained in all mainlines, laterals and drainlines.

6) 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

1) 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.

2) 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.

1) 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.
2) Sodium hypochlorite is already a water mixture.
3) Table 2 gives the amount of chlorine-bearing compound to mix to obtain either a 1 percent or 5.25 percent solution.
4) 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.
5) 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

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.

e. Testing of Chlorine Residual: To ascertain the concentration, the chlorine residual shall be measured by the Contracting Officer 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:

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

2) 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. 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
February 2014

SECTION 221102 - CURB VALVES AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Curb Valves and Boxes.

1.2 QUALITY ASSURANCE

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

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.

PART 2 - PRODUCTS

2.1 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.

   a. Stationary Rods for Metal Valves: Steel, with adapter to fit valve, extend to within 12 inches of ground level.
   b. Valve Operating Extension for Poly Valves: Polyethylene or PVC, with adapter to fit valve, extend to within 4 inches of ground level.

2. Metal Valves

   a. 3/4-Inch Through 2-Inch Valves:

      1) Design: Minneapolis Top, Solid Tee Head, AWWA C 800.
      2) Model: “Mark II Oriseal” Valve, Mueller H-10287, as manufactured by Mueller Company, or an approved equal.

b. Valves Larger than 2-Inches:

1) Design: AWWA C 509, NSF 61, gate valves with iron body, "O" ring stem seals, nonrising stem, with 2-inch square wrench nut head.
2) Ends: Threaded, flanged, hub, spigot, mechanical joint or other as appropriate for connection to line in which they are installed.
3) Model: Mueller A-2360, as manufactured by Mueller Company, or an approved equal.

3. Poly Valves

a. NSF Approved (Potable water systems only)
b. Valves 4-Inch and Larger: AWWA C906.
c. Valves Smaller Than 4-inch: Similar quality to AWWA C906.

d. Opening (Bore): Full.
e. Dimension Ratio and Pressure Rating: Same as pipe in which the valve is installed
f. Model: Poly-Water Valves, as manufactured by Nordstrom Audco Inc., or an approved equal.

B. Curb Boxes:

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

a. For 3/4-Inch Through 2-Inch Valves: Extension type, Minneapolis pattern base. Models below as manufactured by Mueller Company or an approved equal.

1) 3/4-Inch and 1-Inch Valves: Mueller H-10302.
2) 1-1/4-Inch Through 2-Inch Valves: Mueller H-10304.
3) Outside roadways, a galvanized pipe and threaded cap may be used in lieu of a commercial curb box, as indicated on the Drawings.

b. For Valves Larger Than 2-Inches: Buffalo type, two piece, 5-1/4-Inch, Series 6855 as manufactured by Tyler Corporation, or an approved equal.

4. Curb Boxes for Poly Valves:

a. Design: Slider or screw type, Buffalo pattern.
b. Bottom Sections: Compatible with valve.
c. For 1-Inch Valves: 2-1/2-Inch shaft, Series 200 or 250 Plastic Boxes, with #002 bottom sections, as manufactured by Bingham and Taylor or an approved equal.
d. 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.

1) Bottom Sections for 2" or 3" Valves: #104

2) Bottom Sections for 4” Valves: #105
3) Bottom Sections for 6” Valves: #108

C. Gravel: Hard, durable, screened material, 1/4-inch to 1-inch in size, free of soil or clay lumps.

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, 12-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 shall not rest on the pipe, but shall be fully supported by the gravel base.

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

END OF SECTION 221102
February 2014

SECTION 221103 - PLUMBING APPURTENANCES

PART 1 - GENERAL

1.1 SUMMARY

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

B. Related sections include the following:

1. Section 221104 “Equipment Labeling for Water and Wastewater Systems.”

1.2 SUBMITTALS

A. Product Data: For the following:

1. Air and vacuum valves.
2. Pressure regulating valves.

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

1. Air and vacuum valves.
2. Pressure regulating valves.

1.3 MINIMUM SYSTEM REQUIREMENTS

A. Unless otherwise noted, the minimum working pressure for piping and specialty valves and devices shall be 160 psig.

1.4 QUALITY ASSURANCE

A. All products shall be suitable for use with potable water.

1.5 MEASUREMENT AND PAYMENT

A. There will be no separate measurement or payment for 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 show on the Drawings.

2.2 BALL VALVE

A. Description: Bronze, 400 psi.

B. Model: B6000 as manufactured by Watts Regulator, or an approved equal.

2.3 HOSE BIBB

A. Description: Rough brass finish, male inlet, 3/4-inch hose thread outlet.

B. Model: Manufactured by Arrowhead Brass Products, Chicago Faucet Company, or an approved equal.

1. Vacuum Breaker: Model #8A, as manufactured by Watts Regulator Company, or an approved equal.
2. Hose: Provide 10-foot length of 3/4-inch plastic hose for connection to vacuum breaker.

2.4 CHECK VALVE

A. Description: Bronze, AWWA C508, swing-check type with 125-psig working-pressure rating, threaded ends, screwed-in cap, renewable brass disc and resilient seat. Include interior coating according to AWWA C550 and ends to match piping.

B. Model: Figure No. 578 as manufactured by Powell Company, or an approved equal.

2.5 UNION

A. Description: Female type, malleable iron, 150 pound, with ground brass to iron seat.

B. Model: Manufactured by Crane Company, or an approved equal.

2.6 PIPE AND FITTINGS

A. Galvanized Steel: ASTM A53, Schedule 40, threaded ends meeting ASME B1.20.1.

1. Fittings: Threaded, ASTM A 338.

2.7 AIR/VACUUM VALVE FOR PIPELINES

A. Description: AWWA C512, hydromechanical device with large orifice to automatically release large quantities of accumulated air under pressure or to admit large quantities of air during filling of piping, with cast iron body, stainless steel float, 175-psig rated working pressure, and NPS 1 threaded inlet.

B. Model: No. 142 Air/Vacuum Valve as manufactured by the APCO Valve and Primer Corporation, or an approved equal.

2.8 SUPPORTS FOR PIPES AND APPURTENANCES

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

B. Manufacturer: Unistrut Corporation or an approved equal.

2.9 EQUIPMENT LABELING

A. According to Section 221104 “Equipment Labeling for Water and Wastewater Systems.”

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install piping, fittings, valves, and other plumbing devices within 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.

END OF SECTION 221103
February 2014

USDA FOREST SERVICE, R-4
DUCK CREEK CAMPGROUND DUMPSTATION REHABILITATION

SECTION 221312 - SANITARY DUMP STATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section shall consist of a sanitary dump station including water towers complete with hose and backflow preventers, all the pipe, fittings, and valves required to complete this item as shown on the drawings. This item shall also include a 3-inch steel pipe sign.

B. Related Sections include the following:

1. Section 024100 “Waste Material Disposal.”
2. Section 033000 “Cast-in-Place Concrete”
3. Section 221100 “Water Distribution.”

1.2 DEFINITIONS

A. GSP: Galvanized Steel Pipe

B. HDPE: High Density Polyethylene Pipe

1.3 SUBMITTALS

A. Product Data for the following:

1. Pipe and fittings.
2. Debris box with bar screen and lid.

B. Shop Drawings:

1. Bar screen.

1.4 QUALITY ASSURANCE

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

1.5 MEASUREMENT AND PAYMENT

A. Payment will be lump sum for each Sanitary Dump Station including all water piping, trenching, fittings, and valves within 5 feet of the cut lines in the asphalt for the new dump structure, water towers and warning sign.

PART 2 - PRODUCTS

2.1 CONCRETE AND REINFORCING STEEL

A. The concrete shall be as specified by Section 033000 “Cast-in-Place Concrete.” All reinforcement bars shall be deformed billet steel conforming to the requirement of ASTM A615, Grade 40.

2.2 PIPE AND FITTINGS

A. Pipe and fittings shall conform to the requirements of Section 221100 “Water Distribution Systems.”

2.3 CRUSHED AGGREGATE

A. Crushed aggregate base shall conform to the requirements of Section 321204 “Crushed Aggregate Base or Surface Course,” Grading E.

PART 3 - EXECUTION

3.1 CLEARING AND GRUBBING

A. Before starting any excavation operation, the Contractor shall have completed all necessary clearing and grubbing within the specified limits. Clearing shall be kept to a minimum and care exercised to minimize the damage to the root system of adjacent trees or shrubbery or to mar adjacent trees. All materials 2 inches or more in diameter shall be cut into 2-foot lengths and stacked in an area readily accessible for loading and hauling equipment, and where they will not interfere with the remainder of the work. All stumps and roots within the excavation area shall be removed completely. All clearing and grubbing debris shall be removed from the area and disposed of in accordance with Section 024100 “Waste Material Disposal.”

3.2 PIPING

A. All water piping construction shall conform to the requirement of Section 221100 “Water Distribution.”

3.3 CONCRETE

A. Placing, finishing, and curing of concrete shall be done in accordance with Section 033000 “Cast-in-Place Concrete.” Forms shall be accurately set at the correct finish elevation. They shall be such that the full concrete thickness will be provided. The anchor bolts for the tower base shall be cast in the concrete and not grouted in later. The reinforcing steel shall be placed as illustrated on the drawings. The reinforcing steel shall be placed as illustrated on the drawings. The concrete shall be tamped and spaded until mortar entirely covers the top and formed surfaces. After the concrete has set sufficiently, the edges shall be edged and all exposed surfaces shall be finished.

3.4 BACKFILLING

A. Backfill shall consist of crushed aggregate “Grading E” and select backfill taken from the area. Material placed within 2 feet of the tank shall not contain any rack larger than

3-inches in its greatest dimension, any trash, lumber, large earth clods, or other debris. Backfill within one foot of the tank shall be crushed aggregate. The balance of the backfill shall be reasonably free of large rocks, frozen earth and clods. Backfill shall be hand or mechanically tamped in 6-inch lifts to a density of 90 percent ASTM D-698 or AASHTO T-99. No heavy equipment shall be allowed on the tank or within 5 feet of the tank during backfilling operations.

B. Grading in the vicinity of the dump structure shall be as staked by the Contracting Officer and controlled so that the ground surface is properly sloped to prevent water from ponding on the surface of the holding tank slab.

3.5 INSTALLING WATER TOWERS

A. The water towers shall be installed as illustrated on the drawings and in accordance with the manufacturer's instructions. Any alterations, substitutions, or changes in the basic design as illustrated shall be approved by the Contracting Officer in writing. Pipe joints and bolts shall be tightened up snug but shall not be cinched. Upon completion of the installation, the towers and systems shall be tested for operational ability.

3.6 SIGN

A. All signs and sign posts shown on the drawings shall be furnished and installed by the Contractor.

1. The hole for the post shall be no larger than necessary for proper backfill and tamping. The post shall be set plumb to the specified depth and height as shown on the drawings and cast in the concrete footing.
2. The wording on the sign shall be oriented for visibility as directed by the Contracting Officer.

3.7 FINISH GRADING – CLEANUP

A. After the installation of the unit is completed, the area shall be finish graded to the desired contour to present a smooth appearance. The general area shall be cleaned up by removing all debris and material not utilized.

END OF SECTION 221312
February 2014

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, concrete pads (including dump station), 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.

1. Submit target values within the gradation ranges shown in Table 321204-1 and /or 321204-2 for the required grading. After reviewing the Contractor's proposed target values the CO will determine the final values for the gradation and notify the Contractor in writing.

B. Compaction density test results and proctor.

C. Material Properties

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 dump station and other items as shown on the Drawings.

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)…… 75% 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 (6)		80-100 (6)	100	
3/4-inch			60-94 (6)	86-100 (6)	100
1/2-inch	45-59 (7)				
3/8-inch			40-69 (6)	51-82 (6)	62-90 (6)
No. 4	28-42 (6)	40-60 (8)	31-54 (6)	36-64 (6)	36-74 (6)
No. 40	9-17 (4)			12-26 (4)	12-26 (4)
No. 200	4-8 (3)	4-12 (4)	4-7 (3)	4-7 (3)	4-7 (3)

() The value in the parentheses is the allowable deviation (+ / -) from the target values.
Liquid Limit, AASHTO T89 = 25 max. Plastic Limit, AASHTO T-90 = nonplastic.

Table 321204-2, Crushed Aggregate Grading Requirements for Surface Course.

Sieve	Percent Passing (AASHTO T27and T11) Grading F (Surface Course)	Grading G (Surface Course)
1-1/2-inch	100	
1-inch	97-100	100
3/4-inch	76-89 (6)	97-100
1/2-inch		
3/8-inch	56-68 (6)	70-80 (6)
No. 4	43-53 (7)	51-63 (7)
No. 8		
No. 16	23-32 (6)	28-39 (6)
No. 40	15-23 (5)	19-27 (5)
No. 200	10-16 (4)	10-16 (4)

() The value in the parentheses is the allowable deviation (+ / -) from the target values. Liquid Limit, AASHTO T 89 = 35 max, Plastic Index, AASHTO T90 = 2 to 9 if percent passing the No. 200 sieve is less than 12% and less than 2 if the percent passing the No. 200 sieve is greater than 12%.

If the plasticity index (PI) is greater than 0, the TV range for the No. 200 sieve size is 8-12 (4).

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 (CO).

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
February 2014