

## **SPECIFICATIONS TABLE OF CONTENTS**

The following Special Project Specifications are attached. Some sections in the Special Project Specifications refer to work in other sections not listed in the Schedule of Items. Work not listed in the Schedule of Items is considered subsidiary to, or is included in payment for other listed pay items in this contract. Items not listed in the Schedule of Items are considered incidental and no additional compensation will be made.

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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. CONTRACT QUANTITIES (CQ) - 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

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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  
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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 10 days of receipt of the Notice to Proceed, or before the commencement of work.
  - E. Samples: Prepare physical units of materials or products, including the following:
    - 1. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
- 2.2 INFORMATIONAL SUBMITTALS – (Submittals NOT requiring 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	Subsection	Required Submittal
014100	Quality Control	1.2 B	Contractor quality control plan
014100	Quality Control	1.2 C	Contractor's Quality Control Daily Reports
014100	Quality Control	1.2 D	Defective work/Corrective action logs
014100	Quality Control	1.2 E	Test Reports
014100	Quality Control	1.2 F	Off-Site Inspection Reports
014100	Quality Control	1.2 G	As-Built Drawings
014100	Quality Control	1.2 H	Permits, Licenses, and Certificates
033000	Cast-In-Place Concrete	1.4 A	Product Data
033000	Cast-In-Place Concrete	1.4 B	Design Mixtures
033000	Cast-In-Place Concrete	1.4 C	Steel Reinforcement Shop Drawings
033000	Cast-In-Place Concrete	1.4 D	Material Test Reports
033000	Cast-In-Place Concrete	1.4 E	Material Certificates
033000	Cast-In-Place Concrete	1.4 F	Field quality-control test reports
260500	Common Work Results for Electrical	1.2 A	Product Data
260533	Raceway and Boxes for Electrical System	1.3 A	Product Data
323113	Chain-Link Fences and Gates	1.3A	Product Data
323113	Chain-Link Fences and Gates	1.3B	Shop Drawings
323113	Chain-Link Fences and Gates	1.3C	Certificates
323113	Chain-Link Fences and Gates	1.3D	Qualification Data
323113	Chain-Link Fences and Gates		Operation & Maintenance Manuals

END OF SECTION 013300

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SECTION 014100 - QUALITY CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work of this section consists of preparing and executing a quality control program.
- B. This section includes administrative and procedural requirements for quality-control services.
- C. Quality-control services include inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by the Contracting Officer.
- D. Testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.
- E. Requirements of this section relate to customized fabrication and installation procedures, not production of standard products.
  - 1. Specific quality-control requirements for individual construction activities are specified in the sections that specify those activities. Requirements in those sections may also cover production of standard products.
  - 2. Specified inspections, tests, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-control services required by the Contracting Officer, or authorities having jurisdiction are not limited by provisions of this section.

1.2 SUBMITTALS

- A. As specified in specification 013300.
- B. Quality Control Plan:
  - 1. At the time of the preconstruction conference, submit for approval a written Contractor Quality Control (CQC) Plan.
  - 2. If the CQC Plan requires any revisions or corrections, the Contractor shall resubmit the plan within 10 days.
  - 3. The Government reserves the right to require changes in the CQC Plan during the contract period as necessary to obtain the quality specified.
  - 4. No change in the approved CQC Plan may be made without written concurrence by the Contracting Officer.
  - 5. The CQC Plan shall be a comprehensive document that addresses every aspect of the Contractor's activity in support of quality finished products. Each aspect of quality

control addressed by the contract documents shall be addressed. Mandatory items of the CQC Plan include, but are not limited to the following:

- a. A statement of the Contractor's quality control policy.
  - b. A list of personnel responsible for quality control and assigned duties. Include each person's qualifications.
  - c. A copy of a letter of direction to the Contractor's Quality Control Supervisor outlining assigned duties.
  - d. Names, qualifications, and descriptions of laboratories to perform sampling and testing, and samples of proposed report forms.
  - e. Methods of performing, documenting, and enforcing quality control of all work.
  - f. Methods of monitoring and controlling environmental pollution and contamination as required by regulations and laws.
  - g. Outline showing each Definable Feature of Work (DFW) (identified by specification section) describing the quality control activities that take place at each phase for each DFW.
  - h. Detailed description of the mechanisms to be used to track deficient work, notify responsible parties, ensure correction, and provide verification. Contractor shall maintain a log of defective work/corrective actions and shall provide a copy of new log entries to the Contracting Officer as deficiencies are identified. Provide a sample of the log.
  - i. Contractor's program of quality control for items fabricated off-site.
  - j. Detailed description of how record documents will be identified, collected, organized, and retained during the course of the project.
- C. Contractor's Quality Control Daily Reports: Submit showing all inspections and tests on the first work day following the date covered by the report.
- D. Defective work/corrective action logs.
- E. Test Reports:
1. Submit Daily Test Information Sheets with Quality Control Daily Reports.
  2. Submit failing test results and proposed remedial actions within four hours of noted deficiency.
  3. Submit three copies of complete test results not later than three calendar days after the test was performed.
  4. Testing and Inspection Reports shall include the following:
    - a. Date of issue.
    - b. Project title and number.
    - c. Name, address, and telephone number of testing agency.
    - d. Dates and locations of samples, tests, or inspections.
    - e. Names of individuals performing tests and inspections.
    - f. Reference Specification Section(s).
    - g. Complete test or inspection data.
    - h. Test and inspection results and an interpretation of test results.
    - i. Ambient conditions at time sample was taken, tested, or inspected.

- j. Comments or professional opinion on whether tested or inspected work complies with the Contract Document requirements.
  - k. Name and signature of laboratory inspector.
  - l. Recommendations on retesting and reinspecting.
- F. Off-Site Inspection Reports: Submit prior to shipment.
- G. As-Built Drawings
- H. Permits, Licenses, and Certificates
- I. If the CQC plan and Quality Control Daily Reports are not submitted as specified, the Contracting Officer may retain all payments until such time a plan is approved and implemented.

### 1.3 QUALITY ASSURANCE

#### A. General:

1. The quality of all work shall be the responsibility of the Contractor. Testing shall be the responsibility of an independent testing laboratory, the cost of which shall be borne by the Contractor.
2. Inspect and test all work often enough to ensure that the quality of materials, workmanship, construction, finish, and functional performance is in compliance with applicable specifications and drawings.
3. Quality Control Daily Reports shall be completed by the Quality Control Supervisor.
4. Test reports shall be completed by person performing the test.
5. The Contracting Officer may designate locations of tests.

#### B. Quality Control Staff:

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

#### C. Testing Laboratory and Equipment:

1. Employ certified independent laboratories to perform sampling and testing. The testing laboratory organization shall be certified for the type of testing work to be done.
2. All measuring devices, laboratory equipment, and instruments shall be calibrated at established intervals against certified standards in accordance with NBS requirements. Upon request, measuring and testing devices shall be made available for use by the Government for verification tests.

### 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 OFF-SITE CONTROL

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

### 3.2 ON-SITE CONTROL

- A. Notification:

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

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

1. Review control submittal requirements with personnel directly responsible for the quality control work. As a minimum, the Contractor's Quality Control Supervisor and the foreman responsible for the feature of work shall be in attendance.
2. Review all applicable specification sections and drawings related to the feature of work.
3. Ensure that copies of all referenced standards related to sampling, testing, and execution for the feature of work are available on site.
4. Ensure that provisions have been made for field control testing.
5. Examine the work area to ensure that all preliminary work has been completed.
6. Verify all field dimensions and advise the Contracting Officer of discrepancies with contract documents.
7. Ensure that necessary equipment and materials are at the project site and that they comply with approved shop drawings and submittals.
8. Review the Site Specific Health and Safety Plan. Note the hazards associated with the subject DFW, and discuss safety provisions. Identify any hazards that were overlooked in preparation of the SSHSP. Arrange for necessary safety equipment, controls, or monitoring.
9. Prepare a report on all preparatory phase activities and discussions. Attach report to Contractor's Quality Control Daily Report.

- C. Initial Phase:

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

4. Prepare a report on all initial phase activities and discussions. Attach report to Contractor's Quality Control Daily Report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.
- D. Follow-Up Phase: Inspect and test as work progresses to ensure compliance with contract requirements until completion of work.
  - E. Additional Preparatory and Initial Phases: Additional preparatory and initial phases may be required on the same feature of work for the following reasons:
    1. Quality of on-going work is unacceptable.
    2. Changes occur in the applicable quality control staff, on-site production supervision, or work crew.
    3. Work on a particular feature of work is resumed after a substantial period of inactivity.
- ### 3.3 DOCUMENTATION
- A. Maintain Quality Control Daily Reports and Daily Test Report Information Sheets of quality control activities and tests.
  - B. Quality Control Daily Reports may not be substituted for other written reports required under clauses of the contract, such as Disputes, Differing Site Conditions, or Changes.
  - C. Maintain itemized documentation of materials that have arrived on-site and provide for review when requested by the Contracting Officer. Review and verification will be required to process payment requests.
  - D. Record Documents.
  - E. Defective work/corrective action log shall be maintained daily and copies provided to the Contracting Officer at a minimum weekly, or as requested by the Contracting Officer.
- ### 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 ENFORCEMENT
- A. The Contractor shall stop work on any item or feature pending satisfactory correction of any deficiency noted by the quality control staff or the Contracting Officer.

3.7 REPAIR AND PROTECTION

- A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes.
- B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.
- C. Repair and protection is Contractor’s responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

3.8 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:

TABLE 014100-1			
Item	Subsection	Certification or Test Required	Frequency
033000	3.12	Concrete - Slump Test, Air Content, Temperature	1 composite per 25 CY delivered
033000	3.12 B. 5.	Concrete – Compression Test Specimens	See Spec.
312000	3.19	Compaction Test – at Pipe Zone	One per 750 Feet of Trench
312000	3.19	Compaction Test – at Pipe Zone	One test – at each road and parking area crossing
312000	3.19	Compaction Test – above Pipe Zone	One per 750 Feet of Trench
312000	3.19	Compaction Test – above Pipe Zone	One test every other lift – at each road & parking crossing
312000	3.19	Moisture-Density Relationship	One test for each soil type encountered
323113	3.6	Gate Operation Demonstration	See Spec.

END OF SECTION 014100  
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SECTION 024100 - WASTE MATERIAL DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the loading, handling, hauling, and disposal of construction debris.

1.2 MEASUREMENT AND PAYMENT

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

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION

3.1 Waste material to be removed:

- A. All demolition materials, excess excavation, garbage, and other refuse generated shall be hauled to a disposal area.

3.2 Disposal Site:

- A. All waste material shall be removed from the project site and legally disposed off of Government property in an approved landfill.
  - 1. The contractor is responsible for all costs and permits associated with landfill disposal.
  - 2. The Government is not responsible for waste material upon its departure from the project site.

END OF SECTION 024100

June 2015

USDA FOREST SERVICE, R-4  
D4 AUTOMATIC GATE & CONCRETE  
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. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
  - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- E. Material Certificates: For each of the following, signed by manufacturers:
  - 1. Cementitious materials.
  - 2. Admixtures.
  - 3. Form materials and form-release agents.
  - 4. Steel reinforcement and accessories.
  - 5. Waterstops.
  - 6. Curing compounds.
  - 7. Bonding agents.
  - 8. Adhesives.
  - 9. Joint-fillers
  - 10. Repair materials.
- F. Field quality-control test reports.

1.4 MEASUREMENT AND PAYMENT

- A. For site concrete work not identified in the Schedule of Items for direct payment, that work is considered incidental to other work and there will be no separate measurement or payment for that work.

## PART 2 - PRODUCTS

### 2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints or joint lines in concrete surfaces.
  - 1. Plywood, metal, or other approved panel materials.
  - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
    - a. Structural 1, B-B or better; mill oiled and edge sealed.
    - b. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
  - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
  - 2. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

### 2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Wire: ASTM A 82, as drawn.
- C. Deformed-Steel Wire: ASTM A 496.

### 2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
  - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

## 2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  - 1. Portland Cement: ASTM C 150, Type II.
- B. Normal-Weight Aggregates: ASTM C 33, graded, from a single source.
  - 1. Maximum Coarse-Aggregate Size: 1 inch nominal.
  - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.
- D. Fly ash, ground iron blast-furnace slag, or silica fume may partially replace cement in any mix as follows:
  - 1. Fly Ash:
    - a. Class F – Not more than 20 percent of the minimum mass of portland cement may be replaced with class F fly ash.
    - b. Class C – Not more than 25 percent of the minimum mass of portland cement may be replaced with class C fly ash.
  - 2. Ground Iron Blast-Furnace Slag: Not more than 25 percent of the minimum mass of portland cement may be replaced with ground iron blast-furnace slag.
  - 3. Silica Fume (microsilica): Not more than 10 percent of the minimum mass of portland cement may be replaced with silica fume.
  - 4. Additionally, fly ash, slag, and silica fume will constitute no more than 50 percent of the total replacement weight.

## 2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

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

- C. 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. Exterior Exposed Concrete: Apply 2 coats of Concrete Curing and Sealing Compound.

1. Manufacturers include, but are not limited to: Seal Cure, VOC by WR Meadows, ASTM C 309, Type I, Class B.

## 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. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- B. 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 Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than **5000 psi** at 28 days when tested according to ASTM C 109/C 109M.

#### 2.10 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
  1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.

#### 2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Gate Opener and Remote Access Keypad Footings: Proportion normal-weight concrete mixture as follows:
  1. Minimum Compressive Strength: 3500 psi.
  2. Maximum Water-Cementitious Materials Ratio: 0.45.
  3. Minimum Cementitious Materials Content: 540 lb/cu. yd.
  4. Slump Limit: 4 inches plus or minus 1 inch
  5. Air Content: 6 percent, plus or minus 1 percent at point of delivery for 1-inch nominal maximum aggregate size.
  6. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
  7. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd

#### 2.12 FABRICATING REINFORCEMENT

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

#### 2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.
  1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

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

## PART 3 - EXECUTION

### 3.1 PRE-CONCRETE PLACEMENT CONFERENCE

- A. At least two weeks prior to the start of concrete formwork and concrete placement operations, arrange a pre-concrete placement conference. Coordinate attendance with the Contracting Officer and any applicable subcontractors. Be prepared to discuss and/or submit the following:
  1. Proposed concrete placement schedule.
  2. Review approved concrete mix design.
  3. Discuss planned formwork materials and contract requirements, including form ties.
  4. Discuss Contractor's Quality Control plan and frequency of sampling and testing.
  5. Discuss batching, mixing, placing, concrete finishing, and curing requirements.
  6. Discuss applicable hot or cold weather temperature concerns and means of protecting concrete from adverse effects of cold or hot weather during placing, finishing, and curing.

### 3.2 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
  1. Class A, 1/8 inch for smooth-formed finished surfaces.
  2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  1. Install keyways, reglets, recesses, and the like, for easy removal.

2. Do not use rust-stained steel form-facing material.

- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer or round exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.3 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."
  - 2. Anchors for Gate Motor Controllers can be embedded in concrete at time of casting, or can be Epoxy Anchors drilled and installed after slab pour. Epoxy Anchors shall be Hilti HIT-RE-500-SD, or approved equal.

### 3.4 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 48 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
  - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Contracting Officer.

### 3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
- 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 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 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. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- F. Hot-Weather Placement: Comply with ACI 301 and as follows:
  - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

### 3.7 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 above ground line 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 including form tie depressions. 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.

### 3.8 FINISHING DRIVEWAYS 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. Finish and measure surface so gap at any point between concrete surface and an unveled, freestanding, 10-foot-long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/8 inch
- D. Broom Finish: Apply a broom finish to exterior concrete driveway aprons and sidewalks.
  - 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.

### 3.9 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. 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.

### 3.10 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
    - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
  - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
    - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

### 3.11 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 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
  2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
  3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Contracting Officer.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  2. After concrete has cured at least 14 days, correct high areas by grinding.
  3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
  4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
  5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
  7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and

finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

- E. Perform structural repairs of concrete, subject to Contracting Officer's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Contracting Officer's approval.

### 3.12 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Contractor will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
  - 1. Testing Frequency: See Table 014100-1 in Section 014100. A composite sample set consists of one slump test, one air entrainment test, and one temperature test.
  - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample. Perform additional tests when concrete consistency appears to change or water is added.
  - 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample.
  - 4. Concrete Temperature: ASTM C 1064/C 1064M; one test for each composite sample.
  - 5. Compression Test Specimens: ASTM C 31/C 31M. Cast and laboratory cure one set of three 6" dia. by 12" high standard cylinder specimens for each composite sample, or four 4" dia. by 8" high standard cylinder specimens for each composite sample. For multiple loads of concrete delivered on the same day, frequency of sampling for compression Test cylinders can be scaled back at discretion of CO to one sample every third truck provided that the concrete consistency remains within specification tolerances.
    - a. Compressive-Strength Tests: ASTM C 39/C 39M; test one laboratory-cured specimens at 7 days and one 6" dia. by 12" specimen or two 4" dia. by 8" high specimens at 28 days. Average the test results of the two 4" dia. by 8" specimens to determine the 28-day strength for the 4" dia. specimens. If either of the previous tests fail, test remaining specimen at 28 days.
    - b. Strength of each batch delivered will be satisfactory if 28-day compressive-strength tests equal or exceed 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.

### 3.13 LOADS ON NEW CONCRETE STRUCTURES

- A. Do not place structural backfill against concrete less than seven days old or until 80 percent of the design strength is achieved, whichever comes later.

END OF SECTION 033000

July 2015

USDA FOREST SERVICE, R-4  
D4 AUTOMATIC GATE & CONCRETE

SECTION 033540 - CONCRETE SIDEWALK AND PADS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. This work shall consist of constructing concrete sidewalks, driveway aprons, and pads in accordance with the requirements of this specification and to the lines and dimensions as shown on the drawings and as staked in the field.

B. Related Sections include the following:

1. Section 321204 "Crushed Aggregate Base" for preparing subgrade.
2. Section 033000 "Cast-In-Place Concrete" for concrete and reinforcing.
3. Section 312000 "Earthwork" for construction of subgrade.

1.2 MEASUREMENT AND PAYMENT

A. Sidewalks and Driveway Apron Slabs – The quantity to be measured shall be the number of square feet of concrete sidewalks and apron slabs of the thickness(es) listed in the Schedule of Items. Payment shall include the aggregate base under the concrete sidewalks and apron slabs, and reinforcement where specified or SHOWN ON THE DRAWINGS.

PART 2 - PRODUCTS

2.1 COMPACTION

A. Fill material and natural ground upon which the concrete will be placed shall be in accordance with Section 312000 "Earthwork."

2.2 CONCRETE

A. Placement, Finishing, Curing, and Protection shall be in accordance with Section 033000 "Cast-in-Place Concrete."

2.3 JOINTS

A. Sidewalks and Aprons shall be divided into sections by control joints formed by a jointing tool. The control joints shall extend into the concrete at least 1/4 of the slab thickness. Joints shall match as nearly as possible adjacent joints in curb or pavements, be equally spaced, and not be spaced more than 10 feet. Spacing of expansion joints with 1/2 inch thick premolded joint filler extending the full depth of the sidewalk shall not exceed 50 feet unless otherwise shown on the drawings.

B. Construction joints shall be formed around all appurtenances, such as manholes, utility poles, etc., which extend into and through the sidewalks. Premolded expansion joint filler 1/2 inch thick shall be installed in these joints. Expansion joint filler shall be installed between concrete

sidewalks and any fixed structure such as a building or bridge. This expansion joint material shall extend to the full depth of the walk.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. The subgrade for the sidewalk shall be graded and shaped to required elevations for construction of the base course and concrete sidewalk. Construction and compaction of subgrade shall be in accordance with specification section 312000 "Earthwork."
- B. The aggregate base course shall be constructed and compacted to the thickness shown on the drawings and in accordance with specifications section 321204 "Crushed Aggregate Base and Surface Course." Minimum thickness shall be 4 inches compacted depth unless noted otherwise.
- C. Concrete shall be placed to the dimensions shown on the drawings and in accordance with specification section 033000 "Cast in Place Concrete."

### 3.2 FINISH GRADING AND CLEANUP

- A. Backfill and finish grade around sidewalk. Finish grading shall be native soil material placed next to sidewalk from top of sidewalk unless shown otherwise on drawings and graded away for a minimum of 2 feet at a 2 to 5 percent slope. Blend into adjacent area beyond 2 feet.
- B. When the installation has been completed, all debris and material not utilized shall be removed.

END OF SECTION 033540

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SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Electrical equipment coordination and installation.
  2. Common electrical installation requirements.

1.2 SUBMITTALS

- A. Product Data:
1. For any substitutions for equipment referred to by name.

1.3 QUALITY ASSURANCE

- A. The installation shall conform to the 2011 Edition of the National Electrical Code (NFPA 70) and to the requirements specified herein.
- B. The Contractor shall perform all work necessary and required to accomplish the task as detailed on the drawings and discussed in the installation notes. All work shall be done by a state licensed electrician.

1.4 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
1. To provide for ease of disconnecting the equipment with minimum interference to other installations.

1.5 MEASUREMENT AND PAYMENT

- A. The work in this section, including all telecommunications wiring and incidentals in other electrical sections, shall be measured and paid for by the following methods as shown in the Schedule of Items:
1. All Electrical work between the building Electrical service panel and the Automatic Gate Master Controller unit, shall be measured and paid for as a Lump Sum pay item under this Section. Lump Sum payment shall include full compensation for all labor, materials, and incidentals necessary to complete the work as shown on the drawings including all wiring, trenching, bedding, backfill, and all other incidentals necessary for a functional system.
  2. All related electric utility connection fees and city or state electrical inspection fee shall be included in the lump sum payment for this Section.
  3. Automatic Gates Electrical Circuit & Accessories – All electrical work for the Automatic Gates system beyond the Gate Master Controller, including circuits, conduit, and trenching for remote access keypads, Slave Controller units, and remote sensing loops, shall not be measured for separate payment. All electrical work for the Automatic Gates installation is

considered incidental to the installation of the Gates system and is compensated as part of the payment for the Gates installation.

## PART 2 - PRODUCTS

### 2.1 PRODUCTS REFERRED TO BY NAME

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

### 2.2 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

## PART 3 - EXECUTION

### 3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

### 3.2 ELECTRICAL PENETRATIONS

- A. Abandoned Wall Penetration: Fill annular space in concrete penetrations with grout and waterproof exterior if below grade.
- B. Concrete Slabs and Walls: Core-drilled holes.
- C. Aboveground, Exterior-Wall Penetrations: Seal exterior opening around the raceway or cable, using a flexible, waterproofing, joint sealant appropriate for size, depth, and color to closely match the surrounding surface. Finish interior openings, filling opening and matching the exiting surface with appropriate materials and finish quality for the space.

END OF SECTION 260500

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SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
  - 1. Building wires and cables rated 600 V and less.
  - 2. Connectors, splices, and terminations rated 600 V and less.

1.2 QUALITY ASSURANCE

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

1.3 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Copper Conductors: Comply with NEMA WC 70.
- B. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.
- C. Insulation shall be "Sunlight Resistant" where exposed to direct sunlight.

2.2 CONNECTORS AND SPLICES

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

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Typical: Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Control Wiring: Solid or stranded for No. 10 AWG and smaller.

3.2 CONDUCTOR INSULATION APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.

- B. Feeders Above Grade: Type THHN-THWN, single conductors in raceway.
- C. Feeders Underground: Type THHN-THWN, single conductors in raceway.

### 3.3 INSTALLATION OF CONDUCTORS

- A. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- B. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

### 3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

### 3.5 FIELD QUALITY CONTROL

- A. Remove and replace malfunctioning or damaged units.

END OF SECTION 260519

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SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment.

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

1.3 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Stranded Conductors: ASTM B 8.

2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
  - 1. Pipe Connectors: Clamp type, sized for pipe.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet in diameter.

PART 3 - EXECUTION

### 3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.
- B. Underground Grounding Conductors: Bury at least 24 inches below grade.
- C. Conductor Terminations and Connections:
  - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  - 2. Connections to Ground Rods: Bolted connectors.
  - 3. Connections to Structural Steel: Bolted connectors.

### 3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits. Where not otherwise shown in the drawings size per NEC 250.122 minimum.

### 3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
  - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
  - 2. For the service grounding electrode system, install at least two rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Grounding and Bonding for Piping:
  - 1. Metal Water Service Pipe: Install copper grounding conductors from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting and bond across the fitting.

END OF SECTION 260526

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SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

- A. IMC: Intermediate metal conduit.
- B. LFMC: Liquidtight flexible metal conduit.
- C. LFNC: Liquidtight flexible nonmetallic conduit.
- D. RNC: Rigid nonmetallic conduit.

1.3 SUBMITTALS

- A. Product Data: For handholes and boxes for exterior underground wiring and any substitutions for equipment called out on the drawings.

1.4 QUALITY ASSURANCE

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

1.5 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1.
- B. IMC: ANSI C80.6.
- C. PVC-Coated Steel Conduit: PVC-coated IMC.
  - 1. Comply with NEMA RN 1.
  - 2. Coating Thickness: 0.040 inch minimum.
- D. LFMC: Flexible steel conduit with PVC jacket.
- E. Fittings for Conduit (Including all Types and Flexible and Liquidtight): NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch with overlapping sleeves protecting threaded joints.

## 2.2 NONMETALLIC CONDUIT

- A. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.
- B. LFNC: UL 1660.
- C. Fittings for RNC: NEMA TC 3; match to conduit type and material.
- D. Fittings for LFNC: UL 514B.

## 2.3 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. Description: Comply with SCTE 77.
  1. Color of Frame and Cover: Gray or green.
  2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
  3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
  4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  5. Cover Legend: Molded lettering, "ELECTRIC" or "TELEPHONE" based on usage.
- B. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with covers of fiberglass.

## PART 3 - EXECUTION

### 3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
  1. Exposed Conduit: Rigid steel conduit or IMC.
  2. Underground Conduit: PVC coated or wrapped rigid steel conduit or IMC is required for the first 5-ft beyond grade penetration at which point RNC, Type EPC-40-PVC, direct buried may be substituted. 24-inch minimum burial depth unless otherwise indicated on the drawings.
    - a. Feed From Disconnect to Under Mobile Building Skirting: Burial Depth may be decreased to 6-inch minimum burial depth where conduit will not pass under axles.
  3. Final Connection Concealed Under Mobile Building Skirting: LFMC or LFNC.
  4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
  5. Application of Handholes and Boxes for Underground Wiring:
    - a. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf) vertical loading.
- B. Raceway Fittings: Compatible with raceways and suitable for use and location.
  1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

### 3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Flexible Conduit Connections: Above grade length under skirting not limited.

### 3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
  1. Excavate trench bottom to provide firm and uniform support for conduit.
  2. Backfill material within 4" of the conduit shall be 3/4 inch) minus soil or sand based material. Backfill in the remainder of the trench shall be free of rocks larger than 4 inches) in diameter.
  3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.
  4. Install with a maximum of four 90-degree bends or equivalent for each length of raceway and a maximum of 250 feet) wire length, or, with a maximum of two 90-degree bends or equivalent for each length of raceway and a maximum of 500 feet wire length unless drawings show stricter requirements.
  5. Underground-Line Warning Tape: Install according to specification 260553-Identification for Electrical Systems.

### 3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch) sieve to No. 4) sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: Set covers of enclosures 1 inch above finished grade.

### 3.5 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
  1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

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SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
  - 1. Warning labels and signs.

1.2 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with 29 CFR 1910.145.

1.3 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 UNDERGROUND-LINE WARNING TAPE

- A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.
  - 1. Not less than 3 inches wide by 4 mils thick.
  - 2. Compounded for permanent direct-burial service.
  - 3. Printed legend shall indicate type of underground line.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.

3.2 INSTALLATION

- A. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches) overall.

END OF SECTION 260553  
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SECTION 312000 - EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Excavating and backfilling for buildings, structures, and/or footings.
2. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.

1.2 DEFINITIONS

- A. Backfill: Soil materials used to fill an excavation.
- B. Borrow or Select Borrow: Satisfactory soil material used for embankment, backfill, or fill construction that is either imported from off-site or excavated from designated locations at the site.
- C. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
1. Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Contracting Officer. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
  2. Bulk Excavation: Excavations more than 10 feet (3m) in width and pits more than 30 feet (9m) in either length or width.
  3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction of the Contracting Officer. Unauthorized excavation, as well as remedial work directed by Contracting Officer, shall be without additional compensation.
  4. Unclassified Excavation: Excavation to subgrade elevation and to lines and dimensions indicated regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.
- D. Fill: Soil materials used to raise existing grades.
- E. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- F. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, aggregate base, drainage fill, initial or subsequent backfill, or topsoil materials.
- G. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building.

1.3 SUBMITTALS

- A. Contractor shall submit to the Contracting Officer for approval source of aggregates and backfill materials and certified sieve analysis. Materials from Government Sources are exempt from this requirement.

#### 1.4 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Government or others unless permitted in writing by Contracting Officer and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Contracting Officer not less than two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Contracting Officer's written permission.
  - 3. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

#### 1.5 MEASUREMENT AND PAYMENT

- A. Payment will be as follows:
  - 1. Trenching: There will be no separate measurement or payment for trenching or placing and compacting backfill. Trenching is included in the lump sum measurement of the Electrical circuit wiring & Accessories Pay Item, except for the following.
    - a. Special Bedding and Pipe Zone Material – Imported (Electrical Lines): The number of cubic yards of material excavated, processed, hauled and installed. The volume will be calculated using the trench configuration shown on the Drawings.
    - b. Above Pipe Zone Material - Imported: The number of cubic yards of material excavated, process hauled and installed. The volume will be calculated using the trench configuration shown on the Drawings.
    - c. Use and location of imported material shall be approved by the Contracting Officer prior to delivery.
  - 2. All Other Work: There will be no separate measurement or payment for other work in this Section. Payment will be included in the contract unit price as shown on the Schedule of Items for the automatic gate controllers and appurtenances.

### PART 2 - PRODUCTS

#### 2.1 BACKFILL MATERIALS, GENERAL

- A. Excavated material may be processed and used for backfill if the Contractor can show compliance with the material specified herein to the satisfaction of the Contracting Officer. If excavated material is not sufficient to meet requirements, Contractor shall import needed material.
- B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols. Soils meeting these classifications are unsuitable for use as structural backfills under buildings pads, and sidewalks. Consult with Contracting Officer before using soils meeting these classifications for site restoration or roadway obliteration.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Backfill and Fill: Satisfactory soil materials.

1. Remove rocks over 8 inches in maximum dimension, ice or frozen earth, muck, debris, and earth with high void content.
2. Remove rocks over 4 inches in maximum dimension for backfill placed within 12 inches of foundation.

## 2.2 BACKFILL MATERIALS, UTILITY TRENCHES

A. Pipe Zone Material (Electrical)

1. Backfill material for electrical cable and all types of pipe, except ductile iron pipe and galvanized steel pipe, shall consist of soil, sand, or fine granular material free of  $\frac{3}{4}$  inch or larger stones, and free of organic material.
2. Backfill material for all ductile iron or galvanized steel pipe shall consist of soil, sand, or rock smaller than two inches in largest dimension and free of organic material.
3. Frozen material will not be allowed.
4. Backfill material shall be trench-excavated material whenever it meets specification requirements. Whenever material meeting the requirements for pipe zone backfill is not readily available from trench excavation, the Contractor will be required to import pipe zone material from a designated or approved source. Imported pipe zone material shall be paid for as such.

B. Above-Pipe-Zone Material

1. Backfill material shall be free from brush, perishable material, trash, rocks, or boulders larger than 6 inches in greatest dimension, or frozen material.
2. Backfill material shall be trench-excavated material whenever it meets specification requirements. Whenever trench excavated material contains less than 10 percent of oversized material, the Contractor will be required to remove rocks larger than 6 inches from the trench excavated material at no additional compensation and utilize it as backfill material. If, after all suitable trench excavated material has been used as backfill, the trench is not filled to the required grade, the Contractor shall delay his backfill operations until the Contracting Officer can obtain profile elevations of the top of the partially filled trench. These elevations shall be used in computing the cubic yards for which payment will be made for imported material. Whenever material meeting the specification requirements for backfill above the pipe zone is not available from trench excavation, the Contractor will be required to import material from a designated or approved source. Imported above-pipe-zone material shall be paid for as such.

C. Special Bedding – Imported (Electrical)

1. Special bedding material shall consist of rounded river gravel or crushed, free-draining material, meeting the following graduation, as determined by ASTM C 136 and ASTM C 117.

SPECIAL BEDDING GRADATION	
Sieve Designation Square Openings	Percentage by Weight Passing Sieve
1"	100
3/4"	90 – 100
1/2"	20 – 55
3/8"	0 – 15
No. 4	0 - 5

## 2.3 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
  1. Red: Electric.
  2. Yellow: Gas, oil, steam, and dangerous materials.
  3. Orange: Telephone and other communications.
  4. Blue: Water systems.
  5. Green: Sewer systems.
- B. Tracer Wire: #14 copper wire, covered.

## PART 3 - EXECUTION

### 3.1 LOCATION, ALIGNMENT AND GRADE

- A. The location of all structures shall be staked out and grades established by the Contractor. Locations shall be approved by the Contracting Officer before excavation is started.

### 3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.
- B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

### 3.3 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
  - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
  - 2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

### 3.4 EXPLOSIVES

- A. Do not use explosives.

### 3.5 EXCAVATION SUPPORT AND PROTECTION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation.
- B. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and resisting soil and hydrostatic pressures and superimposed and construction loads.
- C. The contractor shall meet State General Safety Orders and the provisions of the Occupational Safety and Health Administration (OSHA) pertaining to excavation support and protection, including 29 CFR 1926 Subpart P.
- D. Walls of excavations 4 feet or more in depth shall be supported by shoring and bracing methods or the walls shall be sloped at a minimum of one and a half to one.
- E. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

### 3.6 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
- B. Topsoil shall be removed from the area to be excavated and from the area where excavated material will be piled, prior to excavation. Topsoil shall be stored as specified below.
- C. Maintain the excavations to guard against and prevent injury to employees and the public. Provide adequate shoring and bracing as required by OSHA and other local governing regulations.
- D. Excavations left open at the end of the working day shall be fenced to protect the public.

### 3.7 EXCAVATION FOR UTILITY TRENCHES

- A. All trench excavation shall conform, as near as possible, to the lines and grades illustrated on the drawings.
- B. Classification of Excavation Material - Excavation will be unclassified as to materials and shall include all materials which are encountered in the required excavation. Any information that has been obtained by the USDA Forest Service concerning possible ground conditions is available at the Supervisor's Office for the Forest where the project is located to interested parties upon request.
- C. Unsatisfactory Material - During excavation, if material which does not meet the backfill requirements of Article 2 (such as structurally unstable material, solid rock, over-sized rock, angular or sharp rock), as determined by the Contracting Officer, is encountered at the grade line for the pipe or cable, the unsatisfactory material shall be removed to a minimum depth of 6 inches below the utility line. Trenching shall be performed by any acceptable method, , as permitted by the Contract General Provisions
- D. Trenching by Machine or by Hand - The use of trench digging machines will be permitted except in places where machines may cause damage to existing structures, utilities, or trees, in which case hand methods shall be employed. Areas specifically to be trenched by hand will be as indicated on the drawings and paid for separately. Machines shall be of the proper size to operate within the specified working limits. In areas being excavated by machine, any hand digging necessary to locate or cross utilities will not be paid for as hand trenching.
- E. Depth - Trench excavation shall provide a uniform (for all utilities) or gently changing (for all utilities except gravity flow sewer lines) flow line.
- F. Width of Trenches - The bottom width that will be used in arriving at pay quantities that are paid on the basis of volume shall be the design bottom width, as shown on the Schedule of Items, or as shown on the trench cross-section detail on the drawings. The width of trench allowed when computing excavation and/or backfill quantities shall be vertical lines for trenches less than 4 feet and for trenches greater than 4 feet shall be computed on 3/4 to 1 side slopes. In circumstances where trench sides will not stand or are not considered safe when sloped at 3/4 to 1, a slope will be determined in the field by the Contracting Officer for which pay quantities will be computed, and the slopes shall be laid back to the stable slope determined.
- G. The Contractor may excavate the trench narrower or wider than the design width shown on the drawings; however, the design width of the trench will be used to calculate the number of cubic yards of all excavated volume and volume of imported material that is paid for by unit volume.
- H. Any over excavation (width) performed by the Contractor for his convenience shall be at his own expense.
- I. Alignment and Grade - The location of all pipelines and structures will be staked out and grades established by the Contracting Officer before excavation is started. All trenches shall conform with the lines and grades illustrated on the drawings or staked on the ground. The Contractor shall set batter boards and shall establish grade lines and levels necessary for the work from dimensions and elevations shown on the drawings and as established in the field. Any shifting or change from the indicated alignment and grade must receive prior approval by the Contracting Officer in writing. Alignment and grade shall also meet the requirements of Sections governing the utilities which are being installed in the trench.

### 3.8 APPROVAL OF SUBGRADE

- A. Notify Contracting Officer when excavations have reached required subgrade.
- B. If Contracting Officer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Contracting Officer.

### 3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Contracting Officer.
  - 1. Fill unauthorized excavations under other construction or utility pipe as directed by Contracting Officer.

### 3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile, borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
- B. Topsoil shall be kept separate from trench-excavated material by either stockpiling or by windrowing on the opposite side of the trench from which the trench excavated material will be placed. Topsoil will be reused after backfilling on those areas from which it came.

### 3.11 UTILITY TRENCH BACKFILL

- A. Backfilling will be permitted only after all inspections of piping and/or cable have been performed and tests completed and the work to be covered has been approved by the Contracting Officer. Backfill which has been improperly placed and/or compacted shall be corrected, if directed by the Contracting Officer, by reopening the trench to the depth required to obtain proper compaction. Then the trench shall be refilled and compacted according to specifications.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.
- C. Backfill at Pipe Zone
  - 1. Any backfill in trench bottom where over excavation was performed by the Contractor for his convenience, shall be brought back to the pipe grade indicated at his own expense. If the trench bottom is prepared in wet conditions, special bedding conforming to Article 2 shall be used if determined necessary by the Contracting Officer.
  - 2. The bottom of trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe along its entire length, except for portions of the pipe sections where it is necessary to excavate for pipe joints. Depressions for joints shall be made in

accordance with the recommendations of the manufacturers for the particular joint used. The bedding shall be a minimum of 4 inches in depth under the pipe and be of either special bedding or pipe zone material as conditions dictate. Trench bottom preparation shall be such that when final placement of pipe has been made, pipe will be true to line and grade. All adjustment to line and grade shall be made by scraping away or filling in with pipe zone material or special bedding material, as conditions dictate, under the body of the pipe and not by wedging or blocking.

3. After pipe is placed as called for in applicable Sections governing the utilities being placed in the trench, pipe zone material shall be deposited in the trench uniformly on both sides of the pipe for the full width of the trench in 6-inch horizontal layers (loose measurement) and compacted from the bottom of the trench to a depth of 1 foot over the top of the pipe.
4. An exception to this is on water lines and sewer lines where the Contractor elects to hydrostatically pressure test the pipe. Joints, couplings, fittings, and valves shall then be left uncovered until after the pipe has been tested. After testing proves the pipe installation to be satisfactory, pipe zone material shall then be placed carefully and compacted around the joints, couplings, fittings, and valves to a depth of 1 foot above the pipe, after which the remainder of the trench shall be backfilled. On gravity flow sewer lines, the Contractor may elect to pressure test the pipe with air. In this case, the entire trench is to be properly backfilled prior to the acceptance test.
5. Where electrical conduit is buried in the same trench as the waterline or sewer line, the backfill procedure for the conduit shall be performed as outlined in the preceding paragraphs. Location with respect to other utilities in a trench shall be as indicated on the trench cross-section detail as shown on the drawings.
6. When an electrical conduit is buried singly in a trench, or if only conduit is buried in a trench, the bedding shall be a minimum of 2 inches in depth under the conduit. After the conduit is placed, pipe zone material shall be deposited in the trench uniformly for the full width of the trench and compacted from the bottom of the trench to a depth of 4 inches over the top of the conduit.
7. **Compaction and Testing:** All compaction within the pipe zone (electrical conduit area is considered as pipe zone), shall meet the following: Material shall be compacted to not less than 95 percent of the maximum dry unit weight, as determined by AASHTO T 99, Method D, or ASTM D 698, Method D. Ascertain adequate compaction during the backfill operation by performing in-place density tests in accordance with one or more of the following standard test procedures: ASTM D 1556, D 2167, or D 2922, or AASHTO T 191, or T 205.

#### D. Backfill Above-Pipe-Zone

1. When shown on the drawings as being required, marking tape shall be installed eight inches below the ground surface and shall run the full length of the trenches.
2. Backfill in trenches in areas other than under roadways and parking areas shall be placed in horizontal layers 12 inches thick or less (loose measurement). Layers shall be compacted before the succeeding lift is placed with at least three passes of an approved mechanical compaction device.
3. **Compaction and Testing:** Backfill in trenches under roadways and parking areas shall be maintained, wetted, or dried to optimum moisture for maximum compaction, placed in the trench in horizontal layers not to exceed 6 inches in thickness (loose measurement), and compacted to not less than 95 percent of maximum dry unit weight, as determined by AASHTO T 99, Method D, of ASTM D 698, Method D. Ascertain adequate compaction during the backfill operation by performing in-place density tests in accordance with one or

more of the following standard test procedures: ASTM D 1556, D 2167, or D 2922, or AASHTO T 191, or T 205.

E. Special Bedding – Imported

1. Special bedding shall be placed, as directed by the Contracting Officer, in trenches, as necessary, to provide a minimum of 4 inches firm bedding on which to set the pipe in areas where relatively unstable conditions exist, due to seeping ground water or mud caused by ground water, or by water from any other source which cannot be diverted. After the material is placed in the trench, leveled, and consolidated, it shall be trimmed to proper sub grade and shaped to receive the pipe.
2. The Contractor shall construct restrictive sections (dams) in the special bedding material at least every 200 feet to minimize the possibility of excessive ground water flows undercutting the pipe. The dam shall extend across the entire width of the trench, be a minimum of 3 feet long, and shall extend to the top of the pipe zone material.

F. Imported Material

1. Any trench excavated material that can be transported less than 300 feet to other areas along the trench and used, in accordance with specifications, shall not be considered as imported material. When the Contractor is required to import material, it shall be from a designated or approved source.

G. Trenches in Embankments

1. When pipelines are to be placed in trenches excavated in embankments, the excavation of each trench shall be performed after the embankment has been constructed to an elevation at least 3 feet over the pipe or to finish grade, whichever is least.

H. Surface Restoration in Areas Other Than Roads

1. All surfaces shall be restored to the required grade (usually original ground line), mounded over or smoothed off as directed, and left in a uniform and neat condition, to the satisfaction of the Contracting Officer. Surface drainage shall be diverted so that it will not flow along a trench.

I. Warning Tape and Tracer Wire:

1. Warning Tape: Install directly above utilities, as shown on the Drawings.
2. Tracer Wire: Wrap all buried, non-metallic, nonperforated piping with tracer wire.
  - a. Conductivity Testing: Conductivity to be tested before and maintained while backfilling trench. After backfilling, the contractor shall perform a continuity test to the satisfaction of the Contracting Officer.
  - b. Access: Extend tracer wire at least 12-inches above grade at junctions, valves, hydrants and ends of new lines. Attach tracer wire to object or structure where possible. Fold or wrap remaining wire so it is accessible to owner, but not generally visible to the public.

3.12 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

### 3.13 COMPACTION OF BACKFILLS AND FILLS

- A. The minimum degree of compaction required shall be a percent of the maximum laboratory density obtained by the standard proctor test AASHTO T99 or ASTM D698. The in-place field density shall be determined by AASHTO T238 or ASTM D2922. The minimum compaction requirements are:
  1. For Utility Trenches, see “Utility Trench Backfill” article above.

### 3.14 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified independent geotechnical engineering testing agency to perform field quality control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work complies with requirements.
- C. Testing agency will test compaction of soils in place according to ASTM D 2922. Tests will be performed at the following locations and frequencies:
  1. See Specification section 014100 “Quality Control” for required testing intervals.
  2. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq ft or less of paved area or building slab, but in no case fewer than three tests. Does not match with Table 014100-1 in Section 014100 which calls out 1 test per lift for Backfill/Fills and subgrade under Buildings foundations and slab.
- D. When testing agency reports that subgrades, fills or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.
- E. Excessive settlement or other evidence of improper backfill shall be corrected by reopening the trench or excavation to the depth required for proper compaction and then shall be refilled and satisfactorily compacted.
- F. The correction and retesting of unacceptable work shall be paid by the Contractor at no expense to the Government.

### 3.15 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specify tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
  1. Scarify or remove and replace soil material to depth as directed by Contracting Officer, reshape and recompact.

- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

### 3.16 SURFACE FINISH

- A. In unpaved areas all surfaces shall be restored to the original ground line or elevations shown on the drawings and left in a uniform and neat condition. Any stockpiled topsoil shall be smoothly distributed over disturbed areas to elevations shown on the drawings.
- B. In paved areas, apply surface treatment as specified and shown on the drawings.

### 3.17 WASTE MATERIAL

- A. All excavated material not used in the construction of embankments or backfilling of trenches, other excess material resulting from trench excavation, demolition materials, garbage, and other refuse generated shall be removed from the project site and legally disposed of off of Government property in an approved landfill. See Section 024100.
- 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 312000  
July 2015

USDA FOREST SERVICE, R-4  
D4 AUTOMATIC GATE & CONCRETE

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 material on under concrete driveway aprons and walkways. In addition, may include furnishing, hauling, and placing crushed aggregate for bedding and backfill.

1.2 SUBMITTALS

- A. Aggregate source, gradation, and material properties.
- B. Compaction density test results and proctor.

1.3 MEASUREMENT AND PAYMENT

- A. 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 AGGREGATES

- A. General: Furnish aggregate Subbase, Base, Pads and Path Surfacing 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 commercial source. Material at the pit requires crushing and processing.
- C. 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, FLH T 507 ..... 50% min
  - 5. Free from organic matter and lumps or balls of clay.
- D. 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)
3-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 (3)	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.

Plasticity Index, AASHTO T 90, If the percent passing the No. 200 sieve is less than 12%

PI = 2 to 9

Plasticity Index, AASHTO T 90, If the percent passing the No. 200 sieve is greater than 12%

PI = 0

\*Crusher Fines shall be well graded 3/8” minus crushed aggregate.

\*\*Plasticity Index, AASHTO T90, For **Paths** PI = 2 to 6

For Aggregate Base Grading Type 1, Class B, the following Project Control Tests shall apply:

Plasticity Index Table	
Percentage by Mass (No. 200 Sieve)	Plasticity Index maximum
0.1 to 3.0	15
3.1 to 4.0	12
4.1 to 5.0	9
5.1 to 8.0	6
8.1 to 11.0	4
11.1 to 15	3

## 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 Specification 312000 for pads, sidewalks and paths, roads, spurs and parking areas.
- 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. 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. Determine the optimum moisture content according to AASHTO T99, method D. Mix the aggregate and adjust the moisture content to obtain uniform moisture content within 2 percent of the optimum. 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. Roll from the sides to the center, parallel to the centerline of the road. Along curbs, headers, walls, and all places not accessible to the roller, compact the material with approved tampers or compactors.
  - 1. Road/Parking Base Course, Picnic and Group Site Base Course, Building Base Course, and Concrete Sidewalks and Paths Testing – Compact each layer to a density of at least 95 percent of the maximum density as determined by AASHTO T 99 method D.

### 3.5 CONSTRUCTION TOLERANCES

- A. Maintain the aggregate course to the correct lines, grade, and cross-section by blading, watering, and rolling until placement of the next course.
- B. 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.
- C. Aggregate shall be placed as shown on the drawings and as staked. Tolerance for thickness of aggregate shall be  $\pm 1/2$ -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 2015

USDA FOREST SERVICE, R-4  
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SECTION 321713 - BOLLARDS

PART 1 - GENERAL

- 1.1 This item shall consist of a pipe bollard, cast in place concrete, paint, and excavation. This bollard shall be constructed as SHOWN ON THE DRAWINGS at the location (s) and grades staked in the field.
- 1.2 MEASUREMENT AND PAYMENT
- A. The quantity to be measured shall be the number of bollards constructed in place and accepted. Payment shall include the excavation, steel pipe, paint, concrete, and finish grading.

PART 2 - PRODUCTS

- 2.1 CONCRETE - Concrete shall be in accordance with Section 033000.
- 2.2 PIPE – Pipe used to fabricate the posts and gates shall be standard weight black steel conforming to the requirements of ASTM A53. The entire gate shall be painted as shown on the drawings. Steel Tubing shall be A53, 4” diameter, schedule 40 pipe.
- 2.3 FINISH – Install UV-resistant, yellow colored High-Density polyethylene Bollard sleeve over each bollard once concrete has cured. One source of supply for Bollard sleeves meeting Contract requirements is ULINE, 2950 Jurapa St., Ontario, CA 91761, telephone 1-800-295-5510, Internet address [www.uline.com](http://www.uline.com) .

PART 3 - EXECUTION

- 3.1 ERECTION
- A. Neat excavation shall be made to receive the concrete base and socket or post. In boulder formation, individual rocks may intrude into the neat excavation, but they shall be firmly imbedded. Protruding rock surfaces shall be cleaned and dampened to improve bonding to the concrete.
- B. The concrete shall be thoroughly tamped while being placed to insure a firm bearing against the sides of the excavation. The top-exposed portion of each concrete base shall be formed so that the base will appear relatively circular. The top surface of the concrete shall be wood float finished and conical shaped for drainage. The concrete shall be covered with suitable material and kept moist for 3 days or a liquid membrane of approved curing material may be applied.
- C. The bollards shall be plumb, level, and in line.
- 3.2 CONCRETE PLACEMENT AND FINISH – Placement of the concrete shall be in accordance with Section 033000 to the configuration and dimensions shown on the drawings. The finish shall be as specified in Section 033000.

3.3 CLEANUP AND FINISH GRADE APPLICATION – After the bollard has been placed and the initial set has occurred, the site shall be cleaned up by removing all forms of debris, false work and unutilized materials.

END OF SECTION

June 2015

USDA FOREST SERVICE, R-4  
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SECTION 323113 - CHAIN-LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Galvanized steel framework.
2. Galvanized horizontal swing gates.

B. Related Sections include the following:

1. Section 260500 "Common Work Results for Electrical"
2. Section 312000 "Earthwork" for filling and for grading work.
3. Section 033000 "Cast-In-Place Concrete" for concrete equipment bases/pads for gate operators, drives, and controls and footings.

1.2 DEFINITIONS

A. CLFMI: Chain Link Fence Manufacturers Institute.

1.3 SUBMITTALS

A. Product Data: Material descriptions, construction details, dimensions of individual components and profiles, and finishes for the following:

1. Fence and gate posts, rails and fittings.
2. Gate Operators and associated hardware.

B. Shop Drawings: Show locations of Gate Operating Controllers, extension arms, gate swing, or other operation, hardware, and accessories including remote sensing loop and remote access keypad. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, elevations, sections, gate swing and other required installation and operational clearances, and details of post anchorage and attachment and bracing. Approval of the Contracting Officer must be received before ordering products.

C. Product Certificates: Signed by manufacturers of chain-link gates and Gate operating equipment certifying that products furnished comply with requirements.

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

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

- B. Source Limitations for Chain-Link Fences and Gates: Obtain each color, grade, finish, type, and variety of component for chain-link fences and gates from one source with resources to provide chain-link fences and gates of consistent quality in appearance and physical properties.

## 1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

## 1.6 OPERATION AND MAINTENANCE MANUALS

- A. Contractor shall turn over to Owner all Installation, Operation, and Maintenance manuals for Gate Motor Controllers, Remote Access Keypad, and all other accessories. All initial settings for equipment shall be highlighted in the manuals.

## 1.7 MEASUREMENT AND PAYMENT

- A. Measurement and payment will be made as follows:
  1. Automatic Gate Opening System – Measurement and payment will be Lump Sum and will include the excavation and backfill; trenching; concrete supports; posts; fencing; gate(s); hinges; motors; all electrical wiring and conduit from the Master Gate Controller to all other gate accessories including slave controller units, remote access keypads, and sensor loops; plus all equipment, material, work and incidentals required to complete the item. Payment will be included at the contract unit price for items shown on the Schedule of Items.
  2. All electrical work (wiring, conduit, trenching, and accessories) from the building Electrical service panel to the Master Gate Controller will be measured and paid for under Section 260500.

## PART 2 - PRODUCTS

### 2.1 CHAIN-LINK FENCE FABRIC

- A. Steel Chain-Link Fence Fabric: Height indicated on Drawings. Provide fabric fabricated in one-piece widths for fencing in height of 12 feet and less. Comply with CLFMI's "Product Manual" and with requirements indicated below:
  1. Mesh and Wire Size: 1-3/4-inch mesh, 0.148-inch diameter Zinc-Coated Fabric: ASTM A 392, with zinc coating applied to steel wire, Type II, zinc coated (galvanized)] mesh fabric after weaving with the following minimum coating weight:
    - a. Class 2: Not less than 2 oz./sq. ft. of uncoated wire surface.

- B. Selvage: Knuckled at both selvages.

### 2.2 INDUSTRIAL FENCE FRAMING

- A. Round Steel Pipe: Heavy Industrial Strength, Schedule 40, galvanized steel pipe complying with ASTM F 1083. Comply with ASTM F 1043, Material Design Group IA, external and internal coating Type A, consisting of not less than 1.8-oz./sq. ft. zinc; and the following strength and stiffness requirements:

1. Fence Height: for Security Fence 72" high plus barbed wire; for storage area fence 72" with screening slats.
2. End, Corner, and Gate Posts: for security fence 4" diameter.
3. Line, Pull Posts and Top Rail: 2.375" diameter.

B. Roll-Formed Steel Shapes: C-sections or other shape, produced from structural steel. Comply with ASTM F 1043, Material Design Group II, with minimum yield strength of 45,000 psi; and the following coating and strength and stiffness requirements:

1. Coating: Type A, consisting of not less than minimum 2.0-oz./sq. ft. average zinc coating per ASTM A 123/A 123M.

C. Post Brace Rails: Match top rail for coating and strength and stiffness requirements. Provide brace rail with truss rod assembly for each gate, end, and pull post. Provide two brace rails extending in opposing directions, each with truss rod assembly, for each corner post and for pull posts. Provide rail ends and clamps for attaching rails to posts. Post brace rails shall comply with ASTM 1043.

D. Top Rails: Fabricate top rails 10 feet in length, with swedged-end or fabricated for expansion-type coupling, forming a continuous rail along top of chain-link fabric. Top rails shall comply with ASTM 1043.

## 2.3 FITTINGS

A. General: Provide fittings for a complete fence installation, including special fittings for corners. Comply with ASTM F 626.

B. Post and Line Caps: Hot-dip galvanized pressed steel or hot-dip galvanized cast iron. Provide weathertight closure cap for each post.

C. Rail and Brace Ends: Hot-dip galvanized pressed steel or hot-dip galvanized cast iron. Provide rail ends or other means for attaching rails securely to each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:

1. Top Rail Sleeves: Hot-dip galvanized pressed steel or round steel tubing. Not less than 6 inches long.
2. Rail Clamps: Hot-dip galvanized pressed

E. Tension and Brace Bands: Hot-dip galvanized pressed steel.

F. Tension Bars: Hot-dip galvanized steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.

G. Pipe Sleeves: For posts set into concrete, provide preset hot-dip galvanized steel pipe sleeves complying with ASTM A 53, not less than 6 inches long with inside dimensions not less than 1/2 inch more than outside dimension of post, and flat steel plate forming bottom closure.

H. Truss Rod Assemblies: Hot-dip galvanized steel after threading rod and turnbuckle or other means of adjustment.

I. Barbed Wire Arms: Hot-dip galvanized steel, with clips, slots, or other means for attaching strands of barbed wire, integral with post cap; for each post unless otherwise indicated, and as follows:

1. Provide line posts with arms that accommodate top rail or tension wire.
2. Provide corner arms at fence corner posts, unless extended posts are indicated.
3. Type I, single slanted arm.

## 2.4 TENSION WIRE

- A. Metallic-Coated Steel Wire: 0.177-inch diameter, marcelled tension wire complying with ASTM A 817 and ASTM A 824, with the following metallic coating:
1. Type II, zinc coated (galvanized) by hot-dip process, with the following minimum coating weight:
    - a. Matching chain-link fabric coating weight.

## 2.5 SWING GATES

- A. General: Comply with ASTM F 900 for gate posts and single swing gate types.
1. Gate Leaf Width: As indicated on the drawings.
  2. Gate Fabric Height: 72" high.
- B. Gate Operators Salient Characteristics:
1. Power: 120 Volts ac, 60 Hz, with 24 Volts dc battery backup.
  2. Circuit Breaker: 15 amp breaker on dedicated circuit.
  3. Operational Temperature: -30°C to 60°C (-22°F to 140°F).
  4. Dual Gate operations.
  5. Maximum Travel Range: 115 degrees each gate.
  6. 90-degree travel time: 15 – 20 seconds.
  7. Accessory terminals compatible with loop detectors and remote access keypad.
  8. Moisture-resistant housing.
- C. Pipe and Tubing:
1. Zinc-Coated Steel: Comply with ASTM F 1043 and ASTM F 1083; manufacturer's standard protective coating and finish.
  2. Gate Posts: Round tubular steel.
  3. Gate Frames and Bracing: Round tubular steel.
- D. Frame Corner Construction: Welded.
- E. Extended Gate Posts and Frame Members: Extend gate posts and frame end members above top of chain-link fabric at both ends of gate frame 12 inches to attach barbed wire assemblies.
- F. Hardware:
1. Hinges: 360-degree inward and outward swing.
  2. Latches permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.
  3. Closer: Manufacturer's standard.

## 2.6 CONCRETE

- A. According to Section 033000 "Cast-In-Place Concrete".

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance.
  - 1. Do not begin installation before final grading is completed, unless otherwise permitted by Contracting Officer's Representative.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Stake locations of gates, remote sensing loop, and remote access keypad. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

### 3.3 GENERAL INSTALLATION

- A. General: Install Gate operating equipment in accordance with the manufacturer's instructions and supplied Installation Manuals.

### 3.4 GATE MODIFICATIONS

- A. General: Remove gate leafs from existing hinges in a manner that does not damage the hinges. Dis-assemble gate leafs only as necessary to modify the position of the bottom rail. Raise Bottom rail of gates to provide a 1'-0" gap between the Gate bottom rail and the ground surface. Trim chain-link mesh at the re-positioned bottom rail. Raise bottom hinges of gate leafs by 1'-0" in addition to the gate leaf modifications.
- B. Re-Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Adjust hardware for smooth operation and lubricate where necessary. If necessary for connection of gate opening hardware, install additional horizontal brace rail at the height required by the gate opening hardware.

### 3.5 ADJUSTING

- A. Gate: Adjust gate to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding. Hang Manufacturer's warning signs as specified in Manufacturer's Installation Manual for the Gate operating equipment.

### 3.6 FIELD QUALITY CONTROL

- A. Perform demonstration of Gate operations in presence of Contracting Officer once adjustments are complete.

END OF SECTION 323113

February 2015