Black Canyon of The Gunnison National Park
Montrose County, Colorado

Entrance Road (Route 010) Roadway and Parking Areas
Rehabilitation
BLCA
PMIS NO. 216374

PROJECT SPECIFICATIONS
(100% Submission)

NATIONAL PARK SERVICE
DENVER SERVICE CENTER
03/31/2022

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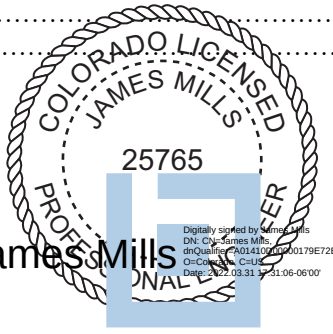
TABLE OF CONTENTS



SECTION 01 11 00 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Contractor use of premises.
3. Public use of site.
4. Conduct of operations.
5. Work restrictions.
6. Special construction requirements.
7. Soils Investigation Report.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Location: South Rim Drive, the Visitor Center Parking Area, and Tomichi Parking Area, within Black Canyon of the Gunnison National Park. Black Canyon of the Gunnison National Park is located northwest of Montrose, Colorado.

B. Work consists of:

1. The Work includes improvements to and along South Rim Drive within Black Canyon of the Gunnison National Park, including removal of the existing asphalt and subbase and replacement with new asphalt and aggregate base; drop inlet and culvert replacement; concrete pavement; replacement of concrete curbs and gutters; replacement of existing MUTCD signs; addition of a pedestrian crosswalk signal and crossing warning speed humps; replacement of a cattleguard and fence; and striping of pavement. Work on the Visitor Parking Area and Tomichi Parking Area includes removal of the existing asphalt and subbase and replacement with new asphalt and aggregate base; replacement of curb and gutters; drop inlet and culvert replacements; riprap; ABA signs; and striping of pavement. A new paved by-pass will be added at the Entrance Station.

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

1.3 GOVERNMENT-FURNISHED MATERIALS

A. In case of Government -furnished materials:

1. Government will arrange and pay for delivery of Government-furnished items according to Contractor's Construction Schedule.
2. Contractor is responsible for initial inspection, receiving, unloading, and handling Government-furnished items at Project site.
3. Government will inspect delivered items for damage after delivery. Contractor shall be present for and assist in Government's inspection.

4. Government will arrange for replacement if Government-furnished items are damaged, defective, or missing.
5. Contractor is responsible for protecting Government-furnished items from damage during storage and handling, including damage from exposure to the elements.
6. If Government-furnished items are damaged as a result of Contractor's operations, Contractor shall repair or replace them.
7. Contractor shall install and otherwise incorporate Government-furnished items into Work.

B. Government-Furnished Materials:

1. Existing boulders from the park shall be relocated per plans.

1.4 CONTRACTOR USE OF SITE

A. General: Contractor shall have full use of the site for construction operations during the construction period except that one lane shall be kept open for public and emergency traffic and connecting access roads and trails shall be kept open. Fifteen-minute delays are allowed. A closure of half of the Visitor Center Parking Area shall be allowed for construction operations with access to the Visitor Center being maintained at all times. Contractor's use of the site is limited only by the Government's right to perform work or to retain other contractors on portions of Project.

A. General: Contractor shall have limited use of site for construction operations. Limit use of premises to South Rim Drive, Tomichi Overlook parking lot, and Visitor parking lot as indicated on drawings. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine constructions operations to 2'-5' from edge of pavement or paved ditch unless otherwise shown on plans.

B. Storage of Materials/Parking/Stockpiling: Confine storage of materials to location on South Rim Campground Road near campsites as shown on plans, NPS to relocate dumpsters prior to project start. Limited use of existing pullouts may be allowed with approval and coordination with the Contracting Officer.

C. Preservation of Natural Features:

1. Prevent damage to natural surroundings. No work shall be allowed in natural terrain areas except as necessary for the culvert extensions, riprap additions, culvert cleaning, culvert replacements, by-pass lane, paved ditch replacements, and road shouldering. Restore damaged areas, repairing or replacing damaged trees and plants, at no additional expense to the Government.
2. Provide temporary barriers to protect existing trees and plants and root zones.
3. Do not remove, injure, or destroy trees or other plants without prior approval. Consult with Contracting Officer (CO) and remove agreed-on roots and branches that interfere with construction.
4. Do not fasten ropes, cables, or guys to existing trees.
5. Carefully supervise excavating, grading, filling, and other construction operations near trees to prevent damage.

D. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Government, Government's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

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

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

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

1.5 PUBLIC USE OF SITE

A. Contractor shall conduct their operations to ensure the least inconvenience to the public. Contractor to provide traffic control plans to Contracting Officer before any work commences. Provide a certified Traffic Control Design Specialist to verify the traffic control plan.

B. Road closures will be permitted, when required, upon specific approval of Contracting Officer for a maximum of fifteen minutes except when detours and other means of access to public and government facilities are provided.

1.6 CONDUCT OF OPERATIONS

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

B. Work on Saturdays, Sundays, Federal holidays, or at night shall not be performed unless stated in the Work Restrictions below or without prior consent from the Contracting Officer. Submit requests 5 days in advance of the work to the Contracting Officer for approval.

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

1.7 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed during normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, except when otherwise indicated. Work hours may be adjusted by the CO based on time of year and visitation rates.

1. Weekend and NPS Holiday Hours: No work shall be performed on the weekends or NPS Holidays without prior approval.

2. Early Morning Hours: No work shall be performed before 7 a.m. unless approved by the Contracting Officer.
3. Quiet hours 10:00 p.m. to 7:00 a.m. for campground.

B. Existing Utilities

1. Do not impact existing utilities.
2. Existing Utilities: Notify Contracting Officer and utility companies of proposed locations and times for excavation.
    a. Existing utilities in the area include:
        1) Potable Water
        2) Underground Power
        3) Underground Communications
3. Contractor shall be responsible for locating and preventing damage to known utilities. If damage occurs, repair utility at no additional expense to the Government.
4. If damage occurs to an unknown utility, repair utility. An equitable adjustment will be made in accordance with the Changes clause of the contract.

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

1. Notify Contracting Officer not less than 48 hours in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Contracting Officer's written permission.
3. Disruptions to facilities outside the project limits shall be prevented by investigation of existing utilities and protection during construction. Contractor shall be responsible for all costs associated with remedy of accidental disruptions to facilities outside the project limits.

D. Nonsmoking Areas Onsite: Smoking is not permitted within buildings or within 25 feet of entrances, operable windows, outdoor air intakes, or at locations where smoking would be a nuisance to park visitors as determined by CO.

1.8 SPECIAL CONSTRUCTION REQUIREMENTS

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

1. See Section 01 31 00 "Project Management and Coordination" for requirements on using the Project Website.

1.9 SOILS INVESTIGATION REPORT

A. A soils investigation report entitled Pavement Design Report, Black Canyon of the Gunnison National Monument, dated February 2022 has been prepared by Shannon & Wilson Inc.

B. A copy of the report is available to all plan holders with this package.

C. If conflicts occur between the report and drawings or specifications, the drawings and specifications govern.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 11 00

SECTION 01 26 01 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

1.1 DEFINITIONS AND ALLOWANCES

A. Home Office Overhead: Costs incurred in support of all of a contractor's projects and not attributable to a specific job. The cost for home office overhead is only allowed as a percentage of all direct work excluding profit. The following items represent allowable home office overhead costs identified in Part 31 of the Federal Acquisition Regulation (FAR):
   1. Rent
   2. Utilities
   3. Furnishings
   4. Office equipment
   5. Executive and management staff not exclusively assigned to the project
   6. Support, accounting, and administrative staff
   7. Preparation of cost proposals, estimating, and schedule analyses connected with Modifications
   8. Estimating and preconstruction services
   9. Mortgage costs
   10. Real estate and corporate taxes
   11. Automobile maintenance and travel costs for home office personnel
   12. Home office insurances i.e. structure, automotive, umbrella, flood, etc.
   13. Depreciation of equipment and other assets
   14. Home office supplies (paper, staples, etc.)
   15. Legal services
   16. Accounting and data processing
   17. Professional fees/registration

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

4. Engineers
5. Travel, lodging, and per diem (as established by Federal Travel Regulations)
6. Scheduling
7. Field Office Trailers and associated temporary utilities
8. Field office supplies
    a. Mailing and couriers
    b. Reproduction costs
    c. Storage
    d. Phones
    e. Computers
    f. Copiers
9. Personal vehicles i.e. Superintendent Pickup trucks

C. General Requirements: Costs directly associated with the project and are necessary to perform the actual work of the modification. These costs shall be shown as direct costs in the estimate. The following items, if applicable, are considered allowable costs for calculating General Requirements:
    1. Hoisting
    2. Material handling
    3. Temporary fencing
    4. Port-a-lets
    5. Trash removal, dumpsters
    6. Barricades
    7. Small tools
    8. Safety supplies
    9. Scaffolding
    10. Daily cleaning
    11. Traffic control
    12. Temporary signage
    13. Temporary heating and power

D. Personnel Costs: Costs included in the modification must only be for General Conditions staff and workers actually present and working on project site. Modification costs for salaried workers are only allowed within the structure of a 40-hour week and no overtime or holiday pay will be allowed.
    1. Worker Hourly Rates are costs directly associated with the individual worker and consist of the following:
        a. Base Rate: The hourly rate paid directly to the worker
        b. Labor Burden: Employer payments of all applicable burdens; includes insurance and taxes the business must pay on behalf of the worker to government entities and educational forums, such as:
            1) Social Security
            2) Medicare
            3) Workers Compensation – Policy and company calculation to be made available.

4) Federal Unemployment Tax Act (FUTA) - Cap Rate and percentage to be proportionally allocated over one year.
5) State Unemployment Tax Act (SUTA) - Cap Rate and percentage to be proportionally allocated over one year.
6) Union agreement costs - Other costs required under an enforceable collective bargaining agreement.

c. Fringe Benefits: Various non-wage compensations provided to employees such as:
1) Health Care Insurance Premiums
2) Cell Phone
3) Clothing
4) 401K and Pensions
5) Vehicle allowances
6) Gas allowance
7) Life insurance premiums
8) Disability insurance
9) Other Fringe Benefits required under an enforceable collective bargaining agreement

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

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

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

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

1.2 MODIFICATION PROPOSAL PRICING REQUIREMENTS

A. General:
1. Proposal must be received in the format and within the time frame specified in the Request for Proposal (RFP) letter. Costs or delays resulting from failure of contractor to submit within the time frame specified will not be compensable.

2. Proposal shall be detailed with itemized lists of equipment, materials, labor, production rates, overhead, profit, and bond markup for each item. Labor costs must be itemized by craft and hourly rate, including Fringe Benefits and Labor Burden. If the costs of Fringe Benefits and Labor Burden are not itemized, it is assumed they are included in the hourly rate shown, or contractor is not requesting reimbursement. Contractor may utilize the government provided Contractor Estimate Form, or their own form, provided that it contains the same information and level of detail as the Government's form.
3. Requests for extensions of contract time as a result of change must be justified with a Time Impact Analysis (TIA). Refer to Section 01 32 16 "Construction Schedule", for time impact analysis requirements. TIA and associated costs shall be received with the proposal by the date shown within the Request for Proposal letter. Contractor's failure to submit within the specified time frame will be construed as the Contractor waiving right for additional time and no time extension will be allowed.
4. All supporting documentation used to justify the proposed modification will be made available to the Contracting Officer (CO) upon request.
5. Contractor shall review and approve all subcontractor/supplier pricing in detail for proper format, scope, production rates, and pricing prior to submission to NPS. All delay costs associated with not reviewing and approving subcontractor/supplier pricing will be borne by the Contractor.
6. All pricing and production rates within the estimate must be based on fair and reasonable pricing and cannot include built-in contingency.

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

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

D. Equipment:
1. Equipment used for the project must be appropriately sized for work being performed.

2. Do not include costs for “miscellaneous tools and equipment”, in your proposal for a replacement value of $500 or less. Costs shown in excess of $500 must be broken out separately.
3. Regardless of ownership, rates to be used in determining equipment rental costs shall be the lowest cost from one of the following sources:
    a. United States (U.S.) Army Corps of Engineers, Ownership and Operating Expense Schedule (use latest edition and applicable region)
    b. Construction Blue Book
    c. Local equipment rental rates, documented by actual invoice charges, or itemized vendor quotes.
4. Estimated equipment rates shall include operating costs of all fuel, oil, lubrication, supplies, small tools, necessary attachments, ground engaging components, tires and tracks, routine repairs and maintenance (cost of major repair and overhaul is not allowed per Federal Acquisition Regulation (FAR) 31.105(d)(2)), depreciation, storage, insurance, and all incidentals. Mobilization, if applicable, may be included for equipment solely used on the modification work but must be listed separately.
5. Estimate full rate for equipment only for duration that equipment will be utilized to accomplish work of the modification.
6. Standby unit rates used in accordance with paragraph 1.3, D, 2, above. If the U.S. Army Corp of Engineers is utilized then their standby rates prevail. If Bluebook or local equipment pricing is accepted, then 1/2 of equipment costs minus any operating costs, major repair and overhaul will be accepted.
7. If equipment is in standby mode due solely to a documented NPS delay, established standby rate shall apply from the first day of the delay.
8. Equipment not used and on job site for up to five consecutive days may be classified at standby rates, provided the equipment is or has been used solely to perform work on the modification and will be necessary to complete additional modification work. Equipment still on the jobsite but not in use after five consecutive days will not be considered in the modification pricing.
9. Requests for compensation for equipment stand by time must be justified, documented and itemized separately.
10. The estimated timeframe (daily, weekly, monthly) for use of the equipment must reflect the lowest cost to the Government.

E. Establishment and Application of Overhead and Profit Percentages:
1. Home Office Overhead and Profit (OH&P) shall be applied to direct costs only. Profit shall not be applied to overhead amounts; and overhead shall not be applied to profit. Home office overhead shall contain only allowable, allocable, and reasonable costs per the contract documents and FAR Part 31. Profit percentages are based on risk factors found in FAR Part 31which have been applied to the specific type of work included in this project. Negotiated rates shall not exceed the following percentages for OH&P for contractor self-performed work:

Overhead……10%
Profit……...10%

2. Total aggregate limit of markup (OH&P) for Contractor and Subcontractors on modification work shall not exceed 25%. The NPS will not be responsible for allocation of percentages between contractor and subcontractors at any tier.
3. If Contractors form a partnership, partnership may only receive home office overhead and profit in same amount as an individual Contractor (refer to paragraph 1.3,E,1 above). It is the responsibility of the partners to decide on division of revenue.
4. Combined Increases and Decreases: On proposals involving both increases and decreases in the Contract Price, overhead and profit mark-ups are required on net increases and deducted on net decreases.
5. At no time can profit be calculated on Overhead or itself, it must be calculated on direct costs of work only.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION (Not used)

END OF SECTION 01 26 01

SECTION 01 27 00 – DEFINITION OF CONTRACT LINE ITEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section explains in general, what is and what is not included in a contract line item, and limits or cut-off points where one item ends and another begins.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF CONTRACT LINE ITEMS

A. Contract Line Item No. 0001 Temporary Traffic Control
   1. This item consists of placing temporary traffic control devices and signs as well as flagging traffic though the work zone during construction.
   2. Price includes the cost of traffic cones, construction signs, flaggers, temporary pavement markings, and the design of a detailed traffic plan meeting current MUTCD and CDOT requirements.
   3. Quantities included in the cost of Temporary Traffic Control assume one work zone at approximately 1000 feet in length.
   4. Payment will be made at the contract price as LUMPSUM.

B. Contract Line Item No. 0002 Removals
   1. This item consists of removal of pipe culvert, inlet, concrete flatwork, concrete curb and gutter, asphalt concrete pavement, and sign systems.
   2. The work to remove the culvert consists of removing pipe, end sections, and attached appurtenances as well as trenching and backfilling.
   3. The work to remove the inlets consists of removing inlet, rebuild, and properly reconnect live sewers connected within them.
   4. The work to remove the concrete flatwork consists of removing concrete, steel reinforcing, and aggregate base.
   5. The work to remove concrete curb and gutter consists of removing curb, gutter, and foundation excavation and backfill.
   6. The work to remove the asphalt concrete pavement includes saw cutting, excavation of asphalt and aggregate including loading onto trucks, haul waste, and waste disposal.
   7. The work to remove sign systems consists of removing sign panel, signpost, and sign foundation and restoring ground to match existing conditions.
   8. Measurement for payment will be by quantity and will include visual acceptance by the Contracting Officer.
   9. Payment will be made at the contract price as LUMPSUM.

C. Contract Line Item No. 0003 Concrete

1. This item consists of concrete curb and gutter, roll over curbs, riprap at curb cut areas, concrete pads for removable speed bumps, concrete pad for entrance station, concrete pads for ABA parking, and concrete for ABA ramps.
2. The work for installing concrete curb and gutter consists of foundation excavation and preparation; special construction required at curb ramps; for placing, finishing, protecting, and curing; for sawing joints; and for restoring the site.
3. The work for installing roll over curbs consists of foundation excavation and preparation; for placing, finishing, protecting, and curing; for sawing joints; and for restoring the site.
4. The work for installing rip rap at curb cut areas as noted in the plans per Specification Section 334300.
5. The work for installing concrete pads for removable speed bumps includes installing aggregate base; for placing, finishing, protecting, and curing concrete; installing reinforcement within concrete; and for restoring the site.
6. The work for installing concrete pads for entrance station and ABA parking includes grading per plans; installing aggregate base; for placing, finishing, protecting, and curing concrete; and for sawing joints expansion joins every 14', typical.
7. The work for installing concrete for ABA ramps includes coloring concrete and broom-finishing in addition to excavation and backfilling around installed concrete. Remove and reset fence to facilitate construction.
8. Measurement for payment will be according to location and quantities shown in the plans.
9. Payment will be made at the contract price as LUMPSUM.

D. Contract Line Item No. 0004 Permanent Traffic Control

1. This item consists of installing sign systems, a rectangular rapid flash beacon, and delineators as well as removing and resetting a traffic counter.
2. The work for installing sign systems includes sign panels, sign posts, and sign foundations using materials designated in the plans.
3. The work for the rectangular rapid flash beacon consists of installing the proposed sign system with flashing beacon including electrical connections to existing utilities, solar panels, lighting material, and connections to traffic devices.
4. The work for delineators consists of installing CDOT delineators for identifying hazards or marking culverts.
5. The work for the traffic counter consists of removing the existing loops, sawcut and installing new loops into the new pavement, and reconnect the loops to the existing undisturbed box.
6. Measurement for payment will be according to location and quantities shown in the plans.
7. Payment will be made at the contract price as LUMPSUM.

E. Contract Line Item No. 0005 Pavement Improvements

1. This item consists of hot mix asphalt surface course, fog seal, tack coat, prime coat, and roadway aggregate. The area of the pavement work is assumed to be 36,118 square yards for the project.
2. The work for hot mix asphalt surface course consists of installing a surface course of one or more layers of hot mix asphalt comprised of aggregate, asphalt binder, hydrated lime, and other additives.
3. The work for fog seal consists of applying an emulsified asphalt fog seal.
4. The work for tack coat consists of applying an emulsified asphalt tack coat.
5. The work for prime coat consists of applying an emulsified prime coat.
6. The work for roadway aggregate consists of aggregate used for shouldering and base course.

7. Measurement for payment will be according to location and quantities shown in the plans.
8. Payment will be made at the contract price as LUMPSUM.

F. Contract Line Item No. 0006 Pavement Markings
1. This item consists of laying out and installing pavement markings, symbols on roadways and parking areas, and rumble strips.
2. Measurement for payment will be according to location and quantities shown in the plans.
3. Payment will be made at the contract price as LUMPSUM.

G. Contract Line Item No. 0007 Clean Out Culverts

1. This item consists of cleaning existing drainage structures by removing debris, vegetation, and earthen material that impedes inlet and outlet channel flow to the structure. This work also includes regrading inlet and outlet channels at structures to provide positive drainage and reshape inlets to direct flows to the inlet entrance.
2. Measurement for payment will be by each culvert and will include visual inspection acceptance by the Contracting Officer.
3. Payment will be made at the contract price as LUMPSUM.

H. Contract Line Item No. 0008 Culvert Improvements
1. This item consists of polymer coated culverts, painted or powder coated steel end sections, drop inlets, and inlet tops.
2. The work for installing an 18” polymer coated (inside and outside) CMP Culvert (or Elliptical Equivalent) with painted or powder coated Flared Steel End Section consists of installing corrugated metal pipe culverts and end sections to convey surface water and stormwater by gravity flow.
3. The work for installing a 24” polymer coated (inside and outside) CMP Culvert (or Elliptical Equivalent) with painted or powder coated Flared Steel End Section consists of installing corrugated metal pipe culverts and end sections to convey surface water and stormwater by gravity flow.
4. The work for placing Riprap at Culvert Outlets noted in the plans per Specification Section 334300.
5. The work for placing drop inlets consists of excavation, cast-in-place or precast unit with reinforcing bars, install grates and frames, and for restoring the site.
6. The work for placing inlet tops consists of placing new metal frame and grate.
7. Measurement for payment will be according to location and quantities shown in the plans in accordance with the Contracting Officer’s acceptance.
8. Payment will be made at the contract price as LUMPSUM.

I. Contract Line Item No. 0009 Clearing and Grubbing
1. Clearing consists of removing and disposing of all unwanted surface material, such as trees, brush, grass, weeds, downed trees, and other material.
2. Grubbing consists of removing and disposing of all unwanted vegetative matter from underground, such as stumps, roots, buried logs, and other debris.
3. Measurements for payment will be according to location and quantities shown in the plans in accordance with the Contracting Officer’s acceptance.
4. Payment will be made at the contract price as LUMPSUM.

J. Contract Line Item No. 0010 Cattle Guard
1. This item consists of removing and replacing the cattle guard.

2. The work to remove the cattle guard consists of removing footings and metal units, and remove and reset fence and gate to tie in.
3. The work to replace the cattle guard consists of trenching, installing footings and installing metal units.
4. Measurements for payment will be according to the location and quantities shown in the plans.
5. Payment will be made at the contract price as LUMPSUM.

K. Contract Line Item No. 0011 Boulders
1. This item consists of placing boulders along roadway or paved ditch edge as shown on plans.
2. Measurements for payment will be according to the location and quantities shown in the plans.
3. Payment will be made at the contract price as LUMPSUM.

L. Contract Line Item No. 0012 Asphalt Ditch
1. This item consists of repaving existing asphalt ditches and new asphalt ditches.
2. The work to repave existing asphalt ditches consists of matching existing shape and limits.
3. The work to install a new asphalt ditch consists of grading as shown on the plans and using a V-ditch section as shown on the plans or as specified by the engineer.
4. Measurements for payment will be according to the location and quantities shown in the plans.
5. Payment will be made at the contract price as LUMPSUM.

END OF SECTION 01 27 00

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

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

1. Definitions
2. Construction Coordination.
3. Submittals
4. Requests for Information (RFIs).
5. NPS/DSC SharePoint Project Website.
6. Project meetings.
7. Permits

B. Related Requirements:

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

1.2 DEFINITIONS

A. Agency with Jurisdiction

B. Construction Permits – Contractor Provided

C. Government Furnished Permits

1.3 CONSTRUCTION COORDINATION

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

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

4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
5. Properly plan construction operations to include permit requirements. Allow enough time to execute permit provisions to maintain work schedule, site visits, inspections, and reporting deadline.

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

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

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

1.4 SUBMITTALS

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

1. Letter designating Project Superintendent.
2. Construction Schedule.
3. A comprehensive breakdown of the Schedule of Values.
4. Accident Prevention Plan.
5. A list of Subcontractors for this project.
6. Written statements from subcontractors certifying compliance with applicable labor standard clauses.
7. Satisfactory evidence of liability insurance coverage and worker’s compensation for the Contactor and all subcontractors.
8. Waste Management Plan.
9. Quality Control Plan.
10. Temporary Storm Water Pollution Prevention Plan (SWPP or UPPP).
11. List of Required Construction Permits: none. Include the following information for each permit:

    a. Name of Permit.
    b. The Agency(ies) with Jurisdiction issuing the permit.
    c. Information required from the Government to complete the permit application.

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

1.5 REQUESTS FOR INFORMATION (RFIs)

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

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

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

1. RFI number, numbered sequentially.
2. Date.
3. RFI subject.
4. Specification Section number and title and related paragraphs, as appropriate.
5. Drawing number and detail references, as appropriate.
6. Field dimensions and conditions, as appropriate.
7. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
8. Contractor's signature.
9. Requested date for response.
10. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Form: Complete the RFI Form on the NPS/DSC Project website as follows:

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

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

1. The following are not considered to be RFIs and will receive no action:

a. Requests for approval of submittals.
b. Requests for approval of substitutions.
c. Requests for approval of Contractor's means and methods.
d. Requests for coordination information already indicated in the Contract Documents.
e. Requests for adjustments in the Contract Time or the Contract Sum.
f. Requests for interpretation of Architect's actions on submittals.
g. Incomplete RFIs or inaccurately prepared RFIs.

2. Contracting Officer's action may include a request for additional information; time for response will date from time of receipt of additional information.
3. Contracting Officer's action on RFIs may result in need for a change to Contract Time or Contract Sum. All contract changes will be processed following terms and conditions of contract.

1.6 PROJECT WEB SITE

A. Use NPS/DSC Project website or other tracking software/website as directed by NPS for communication throughout the contract period on:

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

B. Some documents are not suitable to be shared using the NPS/DSC project website. Documents containing Personal Identifying Information (PII) (i.e. certified payrolls) shall not be shared using the NPS/DSC project website and shall be coordinated with the project team as appropriate.

C. Submit to Contracting Officer a list of employees who will need access to the website. Users will receive an invitation to register from Department of Interior (DOI). Once registered on DOI website, user will be given access to NPS/DSC management software website.

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

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

1.7 PROJECT MEETINGS

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

1. Roles & Responsibilities/ Lines of Authority.
2. Park rules and regulations.
3. Jobsite Safety.
4. Resolution of comments on required Division 01 documents.
5. Coordination of Subcontractors.
6. Labor law application.
7. Modifications.
8. Payments to Contractor.
9. Payroll reports.
10. Contract time.
11. Liquidated damages.
12. Contractor Performance Evaluation.
13. Display of Hotline posters.
14. Notice to proceed.
15. Correspondence procedures.
16. NPS/DSC SharePoint Project website.
17. Acceptance/rejection of work.
18. Progress meetings.
19. Submittal procedures.
20. NPS Final Accessibility Inspection.
21. Environmental requirements.
22. Permit requirements.
23. As-constructed drawings/operation and maintenance (O&M) manuals.
24. Saturday, Sunday, holiday and night work.
25. Reference materials.
26. Value engineering.
27. Schedule of Values.

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

1. Attendees: In addition to Government Representatives, each Contractor, Subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented. Participants at meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Meeting agenda will include:

    a. Approval of minutes of previous meetings.
    b. Submittal status.
    c. Review of off-site fabrication and delivery schedules.
    d. Requests for information (RFI) and other issues.
    e. Modifications.
    f. Work in progress and projected.

1) Status of required inspections (Special Inspections, Accessibility, etc.)

g. Inspections of work in progress and projected (Special inspections,
h. Construction Schedule update (provide updated CPM).
i. Status of Project Record Drawings and O&M manuals.
j. Other business relating to work.
k. Permit requirements.

1.8 PERMITS

A. General:

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

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

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

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

D. Administrative Procedures:

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

Request for Information (RFI) Form

National Park Service (NPS) - Denver Service Center (DSC) | 2-18-20

RFI Number:	
Project:	
Contract Number:	
Date:	
To:	
Carbon Copy (CC):	
From:	
Subject:	
Please provide the following information or clarification:	
Response Required By:	

Date:	
To:	
From:	
Subject:	Response to RFI Number:
Response:	

SECTION 01 32 16 – CONSTRUCTION SCHEDULE

PART 1 - GENERAL

1.1 SUMMARY

A. Section consists of Construction Schedule requirements including:

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

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

1.2 DEFINITIONS

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

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

B. Cost Loading: Allocation of the Schedule of Values for completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by the Contracting Officer.

C. Critical Path Method (CPM): Method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

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

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

1. Float: Float is not for the exclusive use or benefit of either the Government or the Contractor but is jointly owned.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Resource Loading: The allocation of labor and equipment necessary for the completion of an activity as scheduled.

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

1.3 SUBMITTALS

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

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

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

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

1.4 QUALITY ASSURANCE

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

1. Review software limitations, content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing, work stages, area separations, and interim milestones.
    a. This includes maintaining access to driveways and businesses at all times during construction
4. Review delivery dates for Government-furnished products.
5. Review schedule for work of separate Government contracts.
6. Review time required for review of submittals and re-submittals.
7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for completion and startup procedures.
9. Review time required for obtaining and activating permits.
10. Review and finalize list of construction activities to be included in schedule.
11. Review baseline schedule comments, resolve issues and progress on incorporating them
12. Review procedures for updating schedule.

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

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

1.5 COORDINATION

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

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

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

PART 2 - PRODUCTS

2.1 SCHEDULE OF VALUES

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

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

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

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

2.2 CONSTRUCTION SCHEDULE REQUIREMENTS

A. Construction Baseline Schedule: Prepare Construction Baseline Schedule using a computerized, cost, and resource-loaded**,** time-scaled CPM network analysis diagram for the Work.

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

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

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

1. Activities: Indicate the estimated duration, sequence requirements, and relationship of each activity in relation to other activities.
2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. The Construction Baseline Schedule as developed shall show the sequence and interdependence of activities required for complete performance of the work. Ensure all work sequences are logical and the Construction Baseline Schedule shows a coordinated plan of the work.
5. Resource loading of each activity shall include all personnel by labor category and equipment type and capacity proposed to complete the activity in the duration shown.
6. Consider seasonal weather conditions in planning and scheduling all work influenced by high and low ambient temperatures, wind, or precipitation to ensure completion of all work within the contract time.
7. Time Frame: Proposed duration assigned to each activity shall be the Contractor's best estimate of time required to complete the activity considering the scope and resources planned for the activity.
   a. An early finish date may be shown but the late finish date must be the same date as the last day of the contract period. An early completion schedule must contain the following:

      1) Insert an activity titled “Project Float” as a successor to the last activity in the early project completion schedule network.
      2) Add a milestone titled “Contract End Date” as a successor to the activity “Project Float”.
      3) Add duration to the activity “Project Float” as required so the milestone “Contract End Date” equals the last day of the Contract Period.

b. Contract completion date shall not be changed by submission of a schedule that shows an early completion date.
c. The Contractor shall limit use of lead or lag duration's between schedule activities.
d. Project Calendars: Develop and incorporate the following calendars:

1) Administrative Calendar: Include a calendar that is based on a 7 day week to be used on any activities that are based on calendar days. Apply this calendar to administrative tasks or any other tasks that are not affected by non-working days (Federal Holidays, weather, etc.).
2) Project Calendar: Include a calendar that is based on the planned work week for the project. Include Federal Holidays, weekends, and any other non-work days indicated in the contract documents. Apply this calendar to activities which are not anticipated to be affected by weather.
3) Weather Calendar: Utilize the Project Calendar and show anticipated normal downtime related to weather as non-working time. Weather days shall be based on data for the local area from a reliable source like the National Oceanic and Atmospheric Administration (NOAA), National Park Service records, or source acceptable to the Contracting Officer. Apply this calendar to activities that are anticipated to be affected by weather.

e. Activity Duration: Define activities so no activity is longer than 15 days, except for non-construction activities including mobilization, shop drawings and submittals, fabrication and delivery of materials and equipment.
f. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 calendar days, as separate activities in the schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
g. Submittal Review Time: Include review and re-submittal times indicated. Coordinate submittal review times in Construction Baseline Schedule.
h. Substantial Completion: Allow time for Government administrative procedures necessary for certification of Substantial Completion. (For more information, refer to Division 01 Specification 01 77 00 "Closeout Procedures".)

8. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
a. Phasing: Arrange list of activities on schedule by phase.
b. Work under More Than One Contract: Include a separate activity for each contract.
c. Work Restrictions: Show the effect of the following items on the schedule:

1) Coordination with existing construction.
2) Uninterruptible services.
3) Use of premises restrictions.
4) Provisions for future construction.
5) Seasonal variations.
6) Environmental control.

d. Work Stages: Indicate important stages of construction for each major portion of the Work.

1) Subcontract awards.
2) Submittals.
3) Purchases.
4) Sample testing.

5) Deliveries.
6) Installation.
7) Tests and inspections.
8) Adjusting.
9) Curing.

9. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion and Final Completion.

C. Joint Review, Revision, and Acceptance:

1. Within seven calendar days of receipt of the Contractor's proposed Construction Baseline Schedule, Contracting Officer and Contractor shall meet for joint review, correction, or adjustment of the initial Construction Baseline Schedule. Any areas which, in the opinion of the Contracting Officer, conflict with timely completion of the project shall be subject to revision by the Contractor.
2. Within seven calendar days after the joint review between the Contractor and Contracting Officer, the Contractor shall revise and resubmit the Construction Baseline Schedule in accordance with agreements reached during the joint review.
3. In the event the Contractor fails to define any element of work, activity, or logic, and the Contracting Officer review does not detect this omission or error, such omission or error, when discovered by the Contractor or Contracting Officer, shall be corrected by the Contractor within seven calendar days and shall not affect the contract period.
4. Upon acceptance of the Construction Baseline Schedule by the Contracting Officer, save the schedule as a baseline and update on a monthly basis. The construction schedule update will be used to evaluate the Contractor's monthly applications for payment based upon information developed at the monthly Construction Schedule update meeting.

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

E. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

1. Use Microsoft Project or Primavera, for current Windows operating system.

PART 3 - EXECUTION

3.1 CONSTRUCTION SCHEDULE LIMITATIONS

A. Provide a week’s notice prior to construction to allow the NPS to survey areas of disturbance for nesting birds. No work for 21 days if a nest is located.

B. 15-minute project delays to public traffic are allowed.

C. Park fees can be collected at the Visitor Center by the Government during construction around the Entrance booth to reduce delays and queuing in the construction area.

D. Rigid concrete pavement construction along South Rim Drive at the Entrance booth shall be done on Monday or Tuesday when average traffic volumes are lower.

E. Visitor Center Parking lot shall be kept fully open during construction of the bypass lane and any work around the Entrance booth.

F. Visitor Center Parking lot shall be constructed in two phases to allow visitor parking in at least half of the spaces during construction. Provide temporary ABA spaces and access to the Visitor Center at all times.

G. Tomichi Parking lot may be closed for construction.

3.2 CONSTRUCTION SCHEDULE UPDATES

A. Progress Meeting Updates: Provide updated schedule information before each weekly progress meeting.
   1. Issue updated schedule concurrently with the report of each such meeting. Incorporate construction progress into the currently accepted schedule in a timely manner.

B. Monthly Schedule Updates:

   1. General: Update the Construction Schedule on a monthly basis to reflect actual construction progress and activities throughout the entire contract period and until project substantial completion. The status date of each schedule update shall be the 7th day preceding the progress payment request date.
   2. Procedure: The Contractor shall meet with the Contracting Officer each month at a Construction Schedule update meeting to review actual progress made through the status date of the Construction Schedule update, including dates activities were started and/or completed and the percentage of work completed on each activity started and/or completed.
   3. Narrative: The report shall include a brief description of the actual progress made during the update period; actual and potential delaying activities; any impediments to progress; issues related to inclement weather; progress toward established milestones and project float. The report shall include a brief description of the work anticipated to be performed in the next month. Any minor revisions to the schedule should be identified so they can be evaluated and accepted or rejected.
   4. As the Work progresses, indicate Actual Completion percentage for each activity.
   5. If the schedule update shows a late finish date after the contract completion date, at a minimum, include the following in the narrative with your submission:
      a. Any known delays.
      b. Actions that will be taken to get back on schedule.
      c. Pending modifications.
      d. Impediments or constraints affecting progress.

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

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

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

D. Construction Schedule Revisions:

1. Required Revisions: If, as a result of the monthly schedule update, it appears the currently accepted Construction Schedule no longer represents the actual prosecution and progress of the work, the Contracting Officer will request, and the Contractor shall submit, a revision to the Construction Schedule. The Contractor may also request reasonable revisions to the currently accepted Construction Schedule in the event the Contractor's planning for the work is revised. If the Contractor desires to make changes, the Contractor shall notify the Contracting Officer in writing, stating the reason for the proposed revision. Accepted revisions will be incorporated into the currently accepted Construction Schedule for the next monthly schedule update.
2. Procedure: If revision to the currently accepted Construction Schedule is contemplated, the Contractor or Contracting Officer shall so advise the other in writing at least seven calendar days prior to the next monthly schedule update meeting, describing the revision and reasons for the revision. Government-requested revisions will be presented in writing to the Contractor, who shall respond in writing within seven calendar days.
3. Reports: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
    a. Identification of activities that have changed.
    b. Changes in early and late start dates.
    c. Changes in early and late finish dates.
    d. Changes in activity durations in workdays.
    e. Changes in the critical path.
    f. Changes in total float or slack time.

END OF SECTION 01 32 16

SECTION 01 33 23 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

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

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

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

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

1.3 GENERAL SUBMITTAL PROCEDURES

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

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

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

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

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

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

D. Processing Time: Allow time for submittal review, including time for re-submittals, as follows. Time for review shall commence when an e-mail notification is received by Contracting Officer (or designee) indicating the submittal has been posted on the NPS/DSC Project website and is ready for review. When Contracting Officer has completed their review, e-mail notification will be sent to the Contractor indicating the submittal has been processed. No extension of Contract Time will be authorized because of failure to transmit submittals in advance of Work to permit processing, including re-submittals.

1. Action Submittals

    a. Initial Review: Allow 10 calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required.
    b. Re-submittal Review: Allow 10 calendar days for review of each re-submittal.
    c. Owner can elect to back-charge the contractor for any submittals being reviewed for the third time to account for the additional review time not previously anticipated.

2. Informational submittals

    a. Review: Allow 10 calendar days for review of each submittal.

E. Approved Equals:

1. For each item proposed as an “approved equal,” submit supporting data, including:

    a. Drawings and samples as appropriate.
    b. Line by line comparison of the characteristics of the proposed item with that specified.
    c. Changes required in other elements of the work because of the substitution.
    d. Name, address, and telephone number of vendor.
    e. Manufacturer’s literature regarding installation, operation, and maintenance, including schematics for electrical and hydraulic systems, lubrication requirements, and parts lists. Describe availability of maintenance service, and state source of replacement materials.

2. A request for approval constitutes a representation that Contractor:

    a. Has investigated the proposed item and determined that it is equal or superior in all respects to that specified.
    b. Will provide the same warranties for the proposed item as for the item specified.
    c. Has determined that the proposed item is compatible with interfacing items.
    d. Will coordinate the installation of an approved item and make all changes required in other elements of the work because of the substitution.
    e. Waives all claims for additional expenses that may be incurred as a result of the substitution.

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

1. Transmittal Form (CM-16): All submittals shall be transmitted using National Park Service Transmittal Form (CM-16). The form can be downloaded from the DSC Workflows website's Submittal Review page and completed on the NPS/DSC management software website. No action will be taken on a submittal item unless accompanied by this Transmittal Form.

   a. Complete the general information at the top of form.
   b. Provide all required information based on submittal type
   c. Attach all related documents.
   d. Sign the Contractor section at bottom of the Transmittal Form (CM-16).

2. Physical samples: Complete Transmittal Form (CM-16) on the NPS/DSC management software website as described above. Deliver physical sample to the Contracting Officer (or designee) on site for processing. All comments and actions will be documented on the Transmittal Form (CM-16) on the NPS/DSC management software website.

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

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

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

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

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

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

1.4 CONTRACTOR’S USE OF CAD/BIM FILES

A. General: At Contractor’s written request, copies of AutoCAD 2017 files will be provided to Contractor for Contractor’s use in connection with Project, subject to:

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

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

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

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

a. Manufacturer's product specifications.
b. Manufacturer's installation instructions: When Contract Documents require compliance with manufacturer's printed instructions, provide one complete set of instructions to Contracting Officer and keep another complete set of instructions at the project site until substantial completion.
c. Manufacturer's catalog cuts: Submit only pertinent pages; mark each page of standard printed data to identify specific products proposed for use.
d. Wiring diagrams showing factory-installed wiring.
e. Printed performance curves.
f. Operational range diagrams.
g. Compliance with specified referenced standards.
h. Testing by recognized testing agency.

4. Submit product data in PDF file format before or concurrent with samples.

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

1. Preparation: Fully illustrate requirements in Contract Documents. As applicable, include:

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

2. Submit shop drawings as a PDF electronic file.

C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Complete and post the Transmittal Form (CM-16) on the NPS/DSC management software website for processing and documentation of action on submitted samples.
3. Identification: Attach label on unexposed side of Samples that includes:

    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Submittal Number and title of appropriate Specification Section.

4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

    a. Number of Samples: Submit two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Contracting Officer will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

    a. Number of Samples: Submit four sets of Samples. Contracting Officer will retain three Sample sets; remainder will be returned.

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

2.2 INFORMATIONAL SUBMITTALS

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

1. Post informational submittals as PDF electronic files directly to the NPS/DSC SharePoint website.
2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

3. Informational submittals that do not comply with the requirements specified in the Contract Documents will be rejected and one copy will be returned.

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

C. Contractors Construction Schedule: Comply with the requirements specified in Section 01 32 16 “Construction Schedule.”

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

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

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

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

H. Storm Water Pollution Prevention Plan: Comply with the requirements specified in Section 01 57 23 “Temporary Storm Water Pollution Prevention” and any storm water permit requirements identified in Section 01 31 00.

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

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

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

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

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

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

O. 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 the requirements in the Contract Documents.

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

Q. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

R. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

S. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with the requirements in the Contract Documents.

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

U. 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.

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

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

W. Permit Compliance Products: Prepare required information for compliance with permit provisions. Products include written notification of project startup, suspension, and completion of work; photo documentation of site conditions; reports; and drawings.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

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

3.2 CONTRACTING OFFICER'S ACTION

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

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

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

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

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

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

END OF SECTION 01 33 23

SUBMITTAL LIST

Park Acronym/Project Management Information System (PMIS) Number:	**BLCA - 216374**
Project Title:	**BLCA 216374 Entrance road, Route 010, Roadway Rehabilitation**

SUBMITTAL			REQUIREMENTS (Indicate with **X**)							
			INFORMATIONAL				ACTION			
SPECIFICATION SECTION	PARAGRAPH NUMBER	DESCRIPTION	CERTIFICATIONS OR LABORATORY TESTS	REPORTS OR CALCULATIONS OR PLAN	MANUFACTURER DATA AND INSTRUCTIONS	OTHER	SAMPLES	SHOP DRAWINGS	MANUFACTURER DATA AND INSTRUCTIONS	OTHER
01 31 00	1.4	Project Superintendent Letter	X							
01 31 00	1.4	Construction Schedule		X						
01 31 00	1.4	Schedule of Values		X						
01 31 00	1.4	Accident Prevention Plan		X						
01 31 00	1.4	List of Subcontractors				X				
01 31 00	1.4	Subcontractor Labor Compliance Statements	X							
01 31 00	1.4	Evidence of Insurance	X							
01 31 00	1.4	Waste Management Plan		X						
01 31 00	1.4	Quality Control Plan		X						
01 31 00	1.4	Temporary Storm Water Pollution Prevention Plan		X						
01 31 00	1.4	List of Required Construction Permits				X				
01 32 16	1.3	Schedule of Values				X				
01 32 16	1.3	Construction Baseline Schedule				X				
01 32 16	1.3	Construction Schedule Updates				X				
01 35 23	1.2	Accident Prevention Plan (APP)		X						
01 40 00	1.4	Contractor Quality Control Plan (CQC)		X						
01 40 00	1.4	Qualification Data	X							
01 40 00	1.4	Contractor Quality Control (CQC) Daily Reports		X						
01 40 00	1.4	Test Reports		X						
01 40 00	1.4	Accessibility Inspection Report		X						
01 40 00	1.4	Off-Site Inspection Reports		X						
01 40 00	1.4	Permits, Licenses, and Certificates				X				
01 57 23	1.3	SWPPP				X				
01 57 23	1.3	Inspection Schedule for monitoring SWPPP measures		X						
01 57 23	1.3	Erosion Control Plan		X						
01 57 23	1.3	Erosion Control Products			X				X	
01 57 23	1.3	Certification of BioPreferred or biobased designated rolled erosion control products	X							
01 73 40	1.2	Land Surveyor Certificate	X							
01 73 40	1.2	Landfill Receipts				X				
01 73 40	1.2	Quantity Surveys		X						
01 74 19	1.4	Waste Management Plan Progress Documentation		X						
01 74 19	1.4	Waste Reduction Calculations	X							
01 74 19	1.4	Records of Donations		X						
01 74 19	1.4	Records of Sales of Salvage		X						
01 74 19	1.4	Recycling and Processing Facility Records		X						
01 74 19	1.4	Landfill and incinerator Disposal Records		X						
01 74 19	1.4	Waste Management Coordinator Qualification Data	X							
03 10 00	1.2	Certifications of certified wood for forms	X							
03 10 00	1.2	Certification of BioPreferred or biobased designated form release agent	X							
03 20 00	1.2	Field bending procedure of concrete reinforcing						X		
03 20 00	1.2	Mechanical butt splice of concrete reinforcing					X	X		
03 20 00	1.2	Certificate of Compliance for concrete reinforcing	X							

SUBMITTAL LIST

Park Acronym/Project Management Information System (PMIS) Number:	**BLCA - 216374**
Project Title:	**BLCA 216374 Entrance road, Route 010, Roadway Rehabilitation**

SUBMITTAL			REQUIREMENTS (Indicate with **X**)							
			INFORMATIONAL				ACTION			
SPECIFICATION SECTION	PARAGRAPH NUMBER	DESCRIPTION	CERTIFICATIONS OR LABORATORY TESTS	REPORTS OR CALCULATIONS OR PLAN	MANUFACTURER DATA AND INSTRUCTIONS	OTHER	SAMPLES	SHOP DRAWINGS	MANUFACTURER DATA AND INSTRUCTIONS	OTHER
03 20 00	1.2	Epoxy adhesive data sheet and recommended installation instructions			X					
03 20 00	1.2	Samples for verification testing					X			
03 30 00	1.2	Concrete Mix Design	X		X		X		X	
03 30 00	1.2	Cold and Hot Weather Concreting Plan		X						
03 30 00	1.2	Concrete Colorant					X			
10 14 26	1.2	Delineator Flexible Post	X				X			
10 14 26	1.2	Retroreflective Panels Product Data			X				X	
10 14 26	1.2	Certifications of certified wood for plywood backing	X							
10 14 26	3.1	Brown color sample for signs					X			
10 14 26	3.1	Traffic loops and counter test	X							
10 14 26	3.1	RRFB manufacturers certificate of compliance	X							
32 11 23	1.4	Report for approval for each aggregate class and source		X						
32 11 23	3.5	In-Place Density Test	X				X			
32 12 13.13	1.1	Prime Coat	X							
32 12 13.13	1.1	Tack Coat	X							
32 12 16.2	1.4	Job Mix Formula		X			X			
32 12 16.2	1.4	Control Test Section		X			X			
32 12 16.2	1.4	Certificate of Compliance for aggregates	X							
32 12 16.2	1.4	Certificate of Compliance for PGAB	X							
32 12 16.2	1.4	Statistical Analysis of Test Reports		X						
32 17 23	1.2	Pavement parking paint			X		X		X	
32 17 23	2.1	Glass spheres (beads)	X				X			
32 31 29	1.2	Certifications of certified wood for fences and gates	X							
32 32 53	1.2	Certifications of certified wood for cattle guard wings	X							
33 42 00	1.2	Certificate of compliance for Stormwater Conveyances			X				X	
33 42 00	1.2	Data sheets and installation instructions			X				X	
33 43 00	1.2	Rock for riprap		X			X			
33 43 00	1.2	Geotextile data sheets			X				X	

SECTION 01 35 23 - SAFETY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

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

B. Qualifications of Employees:

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

1.4 ACCIDENT REPORTING

A. Reportable Accidents: Defined as: death, occupational disease, and/or traumatic injury to employees or the public; fires; and/or property damage by accident in excess of $100.
1. Notify Contracting Officer immediately in the event of a reportable accident.
2. Fill out and forward an Accident/Property Damage Report Form (CM-22) to Contracting Officer within 7 days of a reportable accident. Obtain form from Contracting Officer.

1.5 RESOURCES

A. COVID-19 (Coronavirus Disease 2019) information provided below is not intended to provide a complete analysis of requirements for Contractor and is provided as a courtesy.
   1. Coronoavirus.gov
   2. Occupational Safety and Health Administration (United States Department of Labor) - COVID-19
   3. Center for Disease Control (CDC)
      a. Get the Facts About Coronavirus
      b. What Construction Workers Need to Know about COVID-19
   4. Federal Emergency Management Agency (FEMA) - Coronavirus (COVID-19) Response
   5. National Park Service (NPS) - NPS Public Health Update

PART 2 - PRODUCTS

2.1 ACCIDENT PREVENTION PLAN (APP)

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

   1. Name of responsible supervisor to carry out the program.
   2. Weekly and monthly safety meetings shall be documented with topic and attendees.
   3. First aid and rescue procedures.
   4. Job Hazard Analysis (JHA) for each major phase. List of hazards associated and methods proposed to provide for property protection and safety of the public, National Park Service personnel, and Contractor's employees. Include initial and continuing training.
   5. Planning for possible emergency situations, as detailed in Article 1.2. Such planning shall take nature of construction, site conditions, and degree of exposure of persons and property into consideration.
   6. Infectious Disease Preparedness:
      a. Contractors are responsible for their employees' safety and the safety of job site visitors during the performance of this contract. We encourage Contractors to follow guidance from the Department of Labor (DOL), Occupational Safety and Health Administration (OSHA), the Centers for Disease Control and Prevention (CDC), and all other applicable local, city, and state mandates. We encourage Contractors to develop policies for infection prevention and an Infectious Disease Preparedness and Response Plan.
      b. To the extent appropriate, Contractors should include the protective health and safety measures they intend to implement in any accident prevention or safety submittals required under this contract. These plans should contain preventive measures the Contractor intends to follow while performing work on government property as well as responsive and corrective actions to be taken if an employee exhibits symptoms or tests positive for contagion.
      c. Upon contract award, Contractors should communicate with Contracting Officer regarding Contractor decisions and actions to protect the health and safety of workers for the duration of contract performance under which pandemic conditions exist.

2.2 FIRST AID FACILITIES

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

2.3 PERSONNEL PROTECTIVE EQUIPMENT (PPE)

A. Selection shall conform to OSHA Subpart E.

PART 3 - EXECUTION

3.1 DAILY SAFETY INSPECTIONS

A. Conduct daily safety inspections and maintain daily safety reports which include:
   1. Area/operation inspected
   2. Date of inspection
   3. Identified hazards
   4. Corrective actions taken

3.2 EMERGENCY INSTRUCTIONS

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

3.3 FIRE AND LIFE SAFETY

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

3.4 HAZARDOUS MATERIALS

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

B. Store hazardous materials in accordance with manufacturer's and OSHA Subpart D requirements. Maintain Safety Data Sheets (SDS) for each chemical readily available on site.
   1. Immediately report spills of hazardous materials to the Park.
   2. Maintain a spill emergency response kit.
   3. Train employees how to respond to a spill and use emergency response kit.

3.5 PROTECTIVE EQUIPMENT

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

3.6 SAFETY MEETINGS

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

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

3.7 HARD HATS AND PROTECTIVE EQUIPMENT AREAS

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

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

3.8 TRAINING

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

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

END OF SECTION 01 35 23

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

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

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

C. See Divisions 02 through 49 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

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

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

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

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

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

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

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

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

1. Using a term such as “carpentry” does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as “carpenter.” It also does not imply that requirements specified apply exclusively to trades people of the corresponding generic name.

1.3 CONFLICTING REQUIREMENTS

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

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

1.4 SUBMITTALS

A. Quality Control Plan:

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

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

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

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

D. Test Reports

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

E. Accessibility Inspection Report:

1. Fill out the applicable sections of the Accessibility Inspection Report and attach to the Quality Control Daily Report.

2. Utilize the attached Accessibility Inspection form to document compliance with the Architectural Barriers Act Accessibility Standards (ABAAS).
3. Inspect at various stages of construction as needed to ensure the finished product meets the standards.
4. Submit report not later than one calendar day after the inspection was performed.

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

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

H. Permits, Licenses, and Certificates: For NPS records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the work.

1.5 QUALITY ASSURANCE

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

B. Contractors Quality Control Staff:

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

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

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

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

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

G. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for activities indicated.

1. Requirement for specialists shall not supersede building codes and regulations governing work.

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

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
3. Measuring devices, laboratory equipment, and instruments shall be calibrated at established intervals against certified standards in accordance with NIST requirements. Measuring and testing devices shall be made available for use by Government for verification tests.

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

PART 2 - PRODUCTS

2.1 QUALITY CONTROL PLAN

A. The Quality Control Plan shall include:

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

PART 3 - EXECUTION

3.1 OFF-SITE CONTROL

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

3.2 ON-SITE CONTROL

A. Notification:

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

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

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

C. Initial Phase:

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

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

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

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

3.3 DOCUMENTATION

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

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

3.4 ENFORCEMENT

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

3.5 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Comply with the Contract Document requirements for Division 01 Section “Cutting and Patching.”

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

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 42 00 – REFERENCE STANDARDS

PART 1 - GENERAL

1.1 ENVIRONMENTAL DEFINITIONS

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

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

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

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

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

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

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

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

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

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

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

1.2 QUALITY ASSURANCE

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

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

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

1.3 INDUSTRY STANDARDS

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

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

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

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

1.4 ABBREVIATIONS AND ACRONYMS

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

XX EXAMPLE Association (The)
www.EXAMPLE.org

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

DIN	Deutsches Institut fur Normung e.V. www.din.de	49 30 2601-3003
IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICC	International Code Council www.iccsafe.org	(888) 422-7233
ICC-ES	ICC Evaluation Service, Inc. www.icc-es.org	(800) 423-6587 (562) 699-0543

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

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

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

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and

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

ABAAS	Architectural Barriers Act Accessibility Standards www.access-board.gov
CFR	Code of Federal Regulations Available from Government Printing Office www.govinfo.gov/app/collection/cfr
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point www.dsp.dla.mil/Specs-Standards/
DSCC	Defense Supply Center Columbus (See FS (Federal Specification))
FED-STD	Federal Standard (See FS)
FS	Federal Specification Available from Department of Defense Single Stock Point www.dsp.dla.mil/Specs-Standards/ Available from General Services Administration www.gsa.gov Available from National Institute of Building Sciences www.nibs.org
FTMS	Federal Test Method Standard (See FS)
MIL	(See MILSPEC (Military Specification and Standards))
MIL-STD	(See MILSPEC)
MILSPEC	Military Specification and Standards Available from Department of Defense Single Stock Point www.dsp.dla.mil/Specs-Standards/
UFAS	Uniform Federal Accessibility Standards Available from Access Board www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-aba-standards/ufas *(UFAS is **only** for housing projects per Fair Housing Act. See also the Fair Housing Act Design Manual, www.huduser.gov/portal/publications/destech/fairhousing)*

1.5 ENVIRONMENTAL REFERENCE STANDARDS

A. American Forest and Paper Association:

1. Sustainable Forestry Initiative

B. American Association of State Highway and Transportation Officials (AASHTO):
- M288 Geotextile Specification for Highway Applications
- MP009-06 Standard Specification for Compost for Erosion/Sediment Control (Filter Berms and Filter Socks)
- MP010-03 Standard Specification for Compost for Erosion/Sediment Control (Compost Blankets)

C. American Society for Testing and Materials International (ASTM):
- A478 Standard Specification for Chromium-Nickel Stainless Steel Weaving and Knitting Wire
- A580/A580M Standard Specification for Stainless Steel Wire
- A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- B813 Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
- C1240 Standard Specification for Silica Fume Used in Cementitious Mixtures
- C128 Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate
- C131 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- C1319 Standard Specification for Concrete Grid Paving Units
- C1338 Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings
- C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
- C1371 Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers
- C1386 Standard Specification for Precast Autoclaved AERATED Concrete (PAAC) Wall Construction Units
- C1483 Standard Specification for Exterior Solar Radiation Control Coatings on Buildings
- C1549 Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer
- C1601 Standard Test Method for Field Determination of Water Penetration of Masonry Wall Surfaces
- C289 Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
- C311 Test Methods for Sampling and Testing Fly Ash or Natural Possolans for Use as a Mineral Admixture in Portland-Cement Concrete
- C33 Standard Specification for Concrete Aggregates
- C593 Standard Specification for Fly Ash and Other Pozzolans for Use With Lime
- C595 Standard Specification for Blended Hydraulic Cements
- C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
- C67 Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile

- C739 Standard Specification for Cellulosic Fiber (Wood-Base) Loose-Fill Thermal Insulation
- C936 Standard Specification for Interlocking Concrete Paver Units
- C989 Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
- D1435 Standard Practice for Outdoor Weathering of Plastics
- D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3(2,700 kN-m/m3))
- D1972 Standard Practice for Generic Marking of Plastic Products
- D198 Standard Test Methods of Static Tests of Lumber in Structural Sizes
- D2103 Standard Specification for Polyethylene Film and Sheeting
- D217 Standard Test Methods for Cone Penetration of Lubricating Grease
- D2369 Standard Test Method for Volatile Content of Coatings
- D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
- D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method
- D3792 Standard Test Method for Water Content of Coatings by Direct Injection Into a Gas Chromatograph
- D3864 Standard Guide for Continual On-Line Monitoring Systems for Water Analysis
- D3960 Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
- D4017 Standard Test Method for Water in Paints and Paint Materials by Karl Fischer Method
- D4263 Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
- D4444 Standard Test Methods for Use and Calibration of Hand-Held Moisture Meters
- D4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity
- D4552 Standard Practice for Classifying Hot-Mix Recycling Agents
- D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
- D4716 Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
- D4833 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Product
- D4840 Standard Guide for Sampling Chain-of-Custody Procedures
- D4887 Standard Test Method for Preparation of Viscosity Blends for Hot Recycled Bituminous Materials
- D5106 Standard Specification for Steel Slag Aggregates for Bituminous Paving Mixtures
- D5116 Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products
- D5199 Standard Test Method for Measuring the Nominal Thickness of Geosynthetics
- D5261 Standard Test Method for Measuring Mass per Unit Area of Geotextiles
- D5268 Standard Specification for Topsoil Used for Landscaping Purposes
- D5359 Standard Specification for Glass Cullet Recovered from Waste for Use in Manufacture of Glass Fiber
- D5505 Standard Practice for Classifying Emulsified Recycling Agents
- D5509 Standard Practice for Exposing Plastics to a Simulated Compost Environment
- D5512 Standard Practice for Exposing Plastics to a Simulated Compost Environment Using an Externally Heated Reactor

- D5539 Standard Specification for Seed Starter Mix
- D5957 Standard Guide for Flood Testing Horizontal Waterproofing Installations
- D5603 Standard Classification for Rubber Compounding Materials—Recycled Vulcanizate Particulate Rubber
- D5663 Standard Guide for Validating Recycled Content in Packaging Paper and Paperboard
- D5759 Standard Guide for Characterization of Coal Fly Ash and Clean Coal Combustion Fly Ash for Potential Uses
- D5792 Standard Practice for Generation of Environmental Data Related to Waste Management Activities: Development of Data Quality Objectives
- D5834 Standard Guide for Source Reduction Reuse, Recycling, and Disposal of Solid and Corrugated Fiberboard (Cardboard)
- D5851 Standard Guide for Planning and Implementing a Water Monitoring Program
- D5852 Standard Test Method for Erodibility Determination of Soil in the Field or in the Laboratory by the Jet Index Method
- D6002 Standard Guide for Assessing the Compostability of Environmentally Degradable Plastics
- D6006 Standard Guide for Assessing Biodegradability of Hydraulic Fluid
- D6007 Standard Test Method for Determining Formaldehyde Concentration in Air from Wood Products Using a Small Scale Chamber
- D6046 Standard Classification of Hydraulic Fluids for Environmental Impact
- D6081 Standard Practice for Aquatic Toxicity Testing of Lubricants: Sample Preparation and Results Interpretation
- D6108 Standard Test Method for Compressive Properties of Plastic Lumber and Shapes
- D6109 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastic Lumber
- D6112 Standard Test Methods for Compressive and Flexural creep and Creep-Rupture of Plastic Lumber and Shapes
- D6117 Standard Test Methods for Mechanical Fasteners In Plastic Lumber and Shapes
- D6155 Standard Specification for Nontraditional Coarse Aggregates for Bituminous Paving Mixtures
- D6245 Standard Guide for Using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation
- D6261 Standard Specification for Extruded and Compression Molded Basic Shapes Made from Thermoplastic Polyester (TPES)
- D6262 Standard Specification for Extruded, Compression Molded, and Injection Molded Basic Shapes of Poly(aryl ether ketone) (PAEK)
- D6270 Standard Practice for Use of Scrap Tires in Civil Engineering Applications
- D6329 Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers
- D6330 Standard Practice for Determination of Volatile Organic Compounds (Excluding Formaldehyde) Emissions from Wood-Based Panels Using Small Environmental Chambers Under Defined Test Conditions
- D6345 Standard Guide for Selection of Methods for Active, Integrative Sampling of Volatile Organic Compounds in Air
- D6400 Standard Specification for Compostable Plastics
- D6435 Standard Test Method for Shear Properties of Plastic Lumber and Plastic Lumber Shapes
- D6629 Standard Guide for Selection of Methods for Estimating Soil Loss by Erosion

- D6662 Standard Specification for Polyolefin-Based Plastic Lumber Decking Boards
- D6712 Standard Specification for Ultra-High-Molecular-Weight Polyethylene (UHMW-PE) Solid Plastic Shapes
- D6886 Standard Test Method for Speciation of the Volatile Organic Compounds (VOCs) in Low VOC Content Waterborne Air-Dry Coatings by Gas Chromatography
- D692 Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures
- D696 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer
- D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3))
- D7186 Standard Practice for Quality Assurance Observation of Roof Construction and Repair
- E1021 Standard Test Methods for Measuring Spectral Response of Photovoltaic Cells
- E1038 Standard Test Method for Determining Resistance of Photovoltaic Modules to Hail by Impact with Propelled Ice Balls
- E1039 Standard Test Method for Calibration of Silicon Non-Concentrator Photovoltaic Primary Reference Cells Under Global Irradiation
- E1040 Standard Specification for Physical Characteristics of Nonconcentrator Terrestrial Photovoltaic Reference Cells
- E1105 Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference
- E1171 Standard Test Method for Photovoltaic Modules in Cyclic Temperature and Humidity Environments
- E1333 Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Under Defined Test Conditions Using a Large Chamber
- E1362 Standard Test Method for Calibration of Non-Concentrator Photovoltaic Secondary Reference Cells
- E1433 Standard Guide for Selection of Standards on Environmental Acoustics
- E1462 Standard Test Methods for Insulation Integrity and Ground Path Continuity of Photovoltaic Modules
- E1596 Standard Test Methods for Solar Radiation Weathering of Photovoltaic Modules
- E1597 Standard Test Method for Saltwater Pressure Immersion and Temperature Testing of Photovoltaic Modules for Marine Environments
- E1609 Standard Guide for Development and Implementation of a Pollution Prevention Program
- E1686 Standard Guide for Selection of Environmental Noise Measurements and Criteria
- E1690 Standard Test Method for Determination of Ethanol Extractives in Biomass
- E1721 Standard Test Method for Determination of Acid-Insoluble Residue in Biomass
- E1755 Standard Test Method for Ash in Biomass
- E1758 Standard Test Method for Determination of Carbohydrates in Biomass by High Performance Liquid Chromatography
- E1780 Standard Guide for Measuring Outdoor Sound Received from a Nearby Fixed Source
- E1799 Standard Practice for Visual Inspections of Photovoltaic Modules
- E1802 Standard Test Methods for Wet Insulation Integrity Testing of Photovoltaic Modules

- E1821 Standard Test Method for Determination of Carbohydrates in Biomass by Gas Chromatography
- E1827 Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door
- E1830 Standard Test Methods for Determining Mechanical Integrity of Photovoltaic Modules
- E1861 Standard Guide for Use of Coal Combustion By-Products in Structural Fills
- E1918 Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field
- E1971 Standard Guide for Stewardship for the Cleaning of Commercial and Institutional Buildings
- E1980 Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces
- E1991 Standard Guide for Environmental Life Cycle Assessment of Building Materials/Products
- E2047 Standard Test Method for Wet Insulation Integrity Testing of Photovoltaic Arrays
- E2114 Standard Terminology for Sustainability Relative to the Performance of Buildings
- E2128 Standard Guide for Evaluating Water Leakage of Building Walls
- E2129 Standard Practice for Data Collection for Sustainability Assessment of Building Products
- E2397 Standard Practice for Determination of Dead Loads and Live Loads associated with Green Roof Systems
- E2398 Standard Test Method for Water Capture and Media Retention of Geocomposite Drain Layers for Green Roof Systems
- E2399 Standard Test Method for Maximum Media Density for Dead Load Analysis of Green Roof Systems
- E2400 Standard Guide for Selection, Installation, and Maintenance of Plants for Green Roof Systems
- E241 Standard Guide for Limiting Water-Induced Damage to Buildings
- E2432 Standard Guide for General Principles of Sustainability Relative to Buildings
- E408 Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques
- E413 Standard Classification for Rating Sound Insulation
- E477 Standard Test Method for Measuring Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers
- E648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
- E683 Standard Practice for Installation and Service of Solar Space Heating Systems for One- and Two-Family Dwellings
- E779 Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
- E781 Standard Practice for Evaluating Absorptive Solar Receiver Materials When Exposed to Conditions Simulating Stagnation in Solar Collectors With Cover Plates
- E782 Standard Practice for Exposure of Cover Materials for Solar Collectors to Natural Weathering Under Conditions Simulating Operational Mode
- E823 Standard Practice for Nonoperational Exposure and Inspection of a Solar Collector
- E881 Standard Practice for Exposure of Solar Collector Cover Materials to Natural Weathering Under Conditions Simulating Stagnation Mode
- E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

- E903 Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres
- E948 Standard Test Method for Electrical Performance of Photovoltaic Cells Using Reference Cells Under Simulated Sunlight
- F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
- F2034 Standard Specification for Sheet Linoleum Floor Covering
- F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

D. Bat Conservation International:
- Bat Approved Bat Houses

E. Center for Resource Solutions
- Green-e program

F. Environmental Protection Agency (EPA):
- Comprehensive Procurement Guidelines
- ENERGY STAR
- Environmentally Preferable Purchasing Program Final Guidance
- GreenScapes program
- Heat Island Initiative
- Indoor Air Quality Building Education and Assessment Model (I-BEAM)
- National Environmental Performance Track
- Pollution Prevention (P2)
- Product Stewardship Program
- Significant New Alternatives Policy (SNAP) Program

G. Federal Trade Commission:
- Guide for the Use of Environmental Marketing Claims

H. Forest Stewardship Council:
- Chain-Of-Custody
- Forest Management

I. International Iron and Steel Institute:
- CO2 Breakthrough Program

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

K. National Institute of Standards and Technology:
- BEES (Building for Environmental and Economic Sustainability) Lifecycle Decision Support Tool

L. US Composting Council:
- Seal of Testing Assurance Program

M. US Department of Agriculture:

- Biobased Products – Definitions and Descriptions

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 57 19.12 – NOISE MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

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

1.2 DEFINITIONS

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

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

C. Nighttime: All non-daytime hours.

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

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 NOISE MANGEMENT

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

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

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

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

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

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

C. Ambient Noise:

1. Maximum noise levels (dB (decibel)) for receiving noise area at property line shall be as follows:

   a. Residential receiving area
      Daytime: 65 dB
      Nighttime: 45 dB

   b. Commercial/Industrial receiving area
      Daytime: 67 dB
      Nighttime: 65 dB

   c. In the event the existing local ambient noise level exceeds the maximum allowable receiving noise level (dB), the receiving noise level maximum for construction operations shall be adjusted as follows:

   d. Residential receiving area: Maximum 3 additional dB above the local ambient as measured at property line.

   e. Commercial/Industrial receiving area: Maximum 5 additional dB above the local ambient as measured at the property line.

3.2 FIELD QUALITY CONTROL

A. Assess potential effects of construction noise on facility occupants in accordance with ASTM E1686 and as follows:

1. Ambient noise measurement: Measure at the property line at a height of at least four (4) feet above the immediate surrounding surface. Average the ambient noise level over a period of at least 15 minutes.

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

END OF SECTION 01 57 19.12

SECTION 01 57 23 - TEMPORARY STORM WATER POLLUTION PREVENTION

PART 1 - GENERAL

1.1 SUMMARY

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

B. The work of this section consists of implementing measures to prevent discharges of pollutants, including temporary storm water pollution during construction activities, through compliance with NPDES permit program,.

C. Work of this section consists of implementing measures to Temporary Storm Water Pollution during construction activities, either through compliance with NPDES permit program.

1.2 DEFINITIONS

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

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

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

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

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

1.3 SUBMITTALS

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

1. Common Plan SWPPP showing that the SWPPP satisfies all Federal and State NPDES permit requirements

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

C. Erosion Control Plan: Submit an erosion control plan for approval by the Contracting Officer (CO).

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

E. Certification of BioPreferred or biobased designated rolled erosion control products.

1.4 QUALITY ASSURANCE

A. Contractor shall prepare and submit a plan for storm water pollution prevention and for erosion control to the CO for review and concurrence.

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

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

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

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

PART 2 - PRODUCTS

2.1 TEMPORARY STORM WATER POLLUTION PREVENTION PLAN:

A. Provide SWPPP which satisfies all Federal and State NPDES permit requirements and includes:

1. Site description.
2. Identification and contract information for Pollution Prevention and Erosion Control Manager.
3. Expected sequencing of operations and construction schedule.
4. Weather monitoring procedure.
5. Descriptions and details BMPs for of pollution prevention and erosion controls, including dust control.
6. Pollution prevention and erosion control plans.
7. Controls for other potential onsite storm water pollutants.
8. Applicable specifications.
9. Maintenance and inspection procedures and forms.
10. Description of potential non-storm water discharges at site.
11. Notice of Intent (NOI) form.
12. Notice of Termination (NOT) form.
13. Contractor and Sub-contractor Certification forms.
14. Other record keeping forms and procedures.
15. Housekeeping BMP, including vehicle wash-down areas, protection of equipment storage and maintenance areas, and sweeping of roadways related to hauling activities.

2.2 EROSION CONTROL BALES, WATTLES, LOGS, AND ROLLS

A. Use a BioPreferred or biobased designated netting for all rolled erosion control products used on this project.

B. Straw wattles, logs or rolls:
1. Furnish straw wattles, logs, or rolls that are manufactured from weed free straw and encased in a seamless biodegradable tubular netting. Use natural fibers for all materials. Do not use any products containing materials from wheat or barley.

C. Short-term single-net erosion control blanket or open weave textile, furnish one of the following materials:
1. An erosion control blanket composed of processed degradable natural fibers mechanically-bound together by a single biodegradable natural fiber netting to form a continuous matrix; or
2. An open weave textile composed of processed degradable natural yarns or twines woven into a continuous matrix. The material must have a 12-month typical functional longevity and be designed for use on geotechnically stable slopes with gradients up to 1V:3H and channels with shear stresses up to 1.50 pounds per square foot.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL PROTECTION

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

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

1. Clearing, excavation, and grading shall be limited to those areas of the project site necessary for construction. Minimize the area exposed and unprotected.
2. Clearly mark and delineate the limits of work activities.
3. Equipment shall not be allowed to operate outside the limits of work or to disturb existing vegetation.
4. Excavation and grading shall be completed during dry season to maximum extent possible
5. Material should be stored away from locations where water is present to the greatest extent practicable.

3.2 REGULATORY REQUIREMENTS

A. Permits: Contractor shall obtain required NPDES permits resulting in no impacts to scheduled work. Contractor shall account for possibility of significant lead time in scheduling and executing work.

1. Implement the requirements of the NPDES permit for erosion control due to storm water runoff during construction.
2. Implement good housekeeping practices, inspections and record keeping.
3. Prior to construction, Contractor and Subcontractors shall sign certifications (included in the plan) that they understand requirements of NPDES permit.
4. Subcontractors shall comply with requirements of NPDES under supervision of Contractor.
5. Accepted plan shall comply with terms and conditions of EPA permit.

B. NOI: The Contractor shall file a NOI and formal SWPPP as required to the Agency(ies) with Jurisdiction.

C. NOT: After Substantial Completion of the construction project, file a NOT with the Agency(ies) with Jurisdiction.

D. CO Notification: Contractor shall notify CO in writing and by telephone of these events:

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

3.3 TEMPORARY STORM WATER POLLUTION PREVENTION PLAN

A. Review and Acceptance: The Contractor and the CO will jointly review the draft Plan and agree to any needed revisions. The Contractor shall incorporate all revisions, sign, and submit the final Plan to the CO. The final Plan will be the document enforced on the project.

1. Accepted Plan will describe and ensure implementation of practices to be used to reduce the pollutants in storm water discharges.
2. Contractor shall maintain a current copy of Plan and all associated records and forms at jobsite throughout duration of project.
3. Plan shall be available for public inspection and inspection and use of the CO.
4. Approval of Contractor's Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations.

B. Implementation: Implement the Plan as required throughout the construction period and maintain all erosion control elements in proper working order.

1. Do not perform clearing and grubbing or earthwork until the Plan has been implemented.

C. The SWPPP (including inspection forms) and all data used to complete the NOI shall be provided to the CO after Substantial Completion of the project.

3.4 SITE INSPECTIONS AND PLAN REVISIONS

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

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

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

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

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

3.5 HOUSEKEEPING AND SITE MANAGEMENT

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

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

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

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

3.6 EROSION CONTROL MEASURES

A. Erosion control measures shall consist of any and all BMPs for storm water discharges, including but not limited to silt fencing, barrier protectors, straw bales, temporary soil retention blankets, excelsior drainage filters, sediment traps and berms.

B. Berms and excelsior drainage filters shall be used to form sediment traps and control run-on and run-off into other areas, including creeks, streams, marshes, access roads, well areas, and staging areas.

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

D. Earthen sediment traps or holding ponds shall not be used unless accepted by Contracting Officer.

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

F. Divert surface runoff around and away from cut and fill slopes.

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

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

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

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

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

3.7 MAINTENANCE OF TEMPORARY FACILITIES

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

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

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

3.8 REPORTING

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

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

3.9 SEDIMENT DISPOSAL

A. Sediment excavated from temporary sediment control structures shall be disposed on the site with general fill, or with topsoil. Sediment shall be allowed to dry out as required before reuse.

B. Contractor shall place the sediment removed from traps and other structures where iat will not enter a storm drain or watercourse and where it will not immediately reenter the basin.

3.10 REMOVAL OF TEMPORARY STORM WATER POLLUTION CONTROL MEASURES

A. All temporary control measures shall be removed with permission of the CO within 20 working days after final acceptance of the project, and/or once grading is completed and slopes have stabilized.

END OF SECTION 01 57 23

SECTION 01 73 40 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

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

1. Examination.
2. Preparation.
3. Construction layout.
4. Field engineering.
5. General installation of products.
6. Progress cleaning.
7. Protection of installed construction.
8. Correction of the Work.

1.2 SUBMITTALS

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

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

C. Quantity Surveys: Submit 2 copies showing quantities of work performed and actual construction completed and in place.

1.3 QUALITY ASSURANCE

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

3.2 PREPARATION

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

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

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

3.3 CONSTRUCTION LAYOUT

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

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

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

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

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

3.4 FIELD ENGINEERING

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

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

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

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

3.5 INSTALLATION

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

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

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

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

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

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

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

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

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

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

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

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

3.6 PROGRESS CLEANING

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

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

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

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

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

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

1. Utilize non-toxic cleaning materials and methods.

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

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

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

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

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

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

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

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

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

1. Provide final cleaning in accordance with ASTM E1971.

L. Water Sources: Non-potable construction water may be available through the National Park Service from streams, lakes or fire hydrants. Provide a fish friendly screen approved by the park fishery biologist on the intake. Coordinate use with the CO in consultation with the Park.

1. Provide a backflow preventer and a water meter.

3.7 PROTECTION OF INSTALLED CONSTRUCTION

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

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

3.8 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

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

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

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

END OF SECTION 01 73 40

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

1.2 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

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

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

E. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

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

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

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

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

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

1.3 PERFORMANCE REQUIREMENTS

A. General: Project shall minimize creation of construction, deconstruction, and demolition waste to protect and restore natural habitat and resources. Minimize factors contributing to waste such as over packaging, improper storage, ordering error, poor planning, breakage, mishandling, and contamination. A Waste Management Plan shall be developed to ensure that existing site and building materials are reused, salvaged, or recycled. Minimize waste disposal in landfills.

B. Salvage /Recycle Requirements: Government goal is to salvage and recycle as much nonhazardous demolition and construction waste as possible. Develop waste management plan that results in end-of-Project rates for salvage/recycling of 50 percent by weight of total waste generated by the Work. The following waste categories, at a minimum, shall be diverted from a landfill:

1. Land clearing debris (chipped debris can be used on site for mulch or erosion control)
2. Clean dimensional wood, palettes
3. Plywood, OSB, and particle board
4. Concrete (can be ground and used for fill on site)
5. Asphaltic concrete (can be ground and used for fill on site)
6. Cardboard, paper, packaging, newsprint
7. Metals (from banding, stud trim, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze)
8. Gypsum drywall—unpainted
9. Non-hazardous paint and paint cans
10. Beverage containers: Aluminum, glass, and plastic containers
11. Insulation
12. Ceiling grid and tiles
13. Ductwork
14. Wiring
15. Other mixed construction and demolition waste as appropriate

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

D. Existing items and material to be removed during deconstruction/demolition phase shall be reused in construction phase of the Project. Items that cannot be reused shall be recycled. Items considered for reuse must be in refurbishable condition and must meet quality standards set forth in these specifications. Contractor shall ensure quality of the item(s) in question will meet or exceed accepted industry or trade standards for first quality commercial grade application. During construction, deconstruction, or demolition Contracting Officer (CO) may designate other objects or materials for reuse.

E. Environmental Protection

1. Oil and hazardous substances: Do not use equipment with leaking fluids. Repair equipment fluid leaks immediately. Keep absorbent material manufactured for containment and cleanup of hazardous material on the job site. Notify the CO of hazardous spills. Inspect all vehicles and equipment conducting operations in or within 150 feet (45 meters) of wetlands or water daily for fluid leaks.
2. Dirt, plant, and foreign material:
    a. Remove dirt, plant, and foreign material from vehicles and equipment before entry into Park. Prevent introduction of noxious weeds and non-native plant species into the work site. Follow applicable Federal land management agency requirements and state requirements. Maintain cleaning and inspection records. Clean hauling vehicles before their initial entry; subsequent entries will not require cleaning unless requested. Notify the CO a minimum of 48 hours before entry to allow for inspection.
    b. Clean all vehicles and equipment to remove all visible traces of soil, plant material, debris, and petroleum from wheels, tires, tracks, drive mechanisms, undercarriages, etc. Only materials and equipment free of toxic pollutants may be placed within wetlands and waters.
3. Other requirements:
    a. Store all food, toiletries, and other potential attractants (e.g., petroleum products, antifreeze, personal hygiene items) in wildlife-proof containers or enclosed construction equipment, except during actual use.
    b. Institute a litter control program during construction to eliminate accumulation of trash. Collect all trash so animals are not attracted to the site. Provide covered bear-proof and wildlife-proof trash containers for all trash and food items. All garbage shall be secured and covered in a locked vehicle with the windows closed or trash container. Transport these containers off the project on a weekly basis and dispose according to this section, article 3.6.
    c. Store all fuel tanks and fuel trucks at locations approved by the CO. Refuel and service equipment at least 150 feet from waterbodies when feasible. Use a lined containment dike fueling station with 110 percent containment capacity or other methods approved by the CO. If a pre-loaded fuel truck is used, provide a double-walled fuel truck. Two persons are required during fueling operations, one to operate the fuel nozzle and one on standby at the fuel truck ready to take any necessary actions to prevent any spills.
    d. Use absorbent spill diapers at all times during fueling; ensuring no droplets hit the ground. When not in use the fuel truck must be parked behind a lined containment dike with 110 percent capacity. Ensure all necessary precautions are taken to ensure no spills will occur. Dispose of contaminated soils and report the disposal of contaminated soils according to current Federal, state, and local regulations.
    e. When operating stationary equipment (e.g., generators, cranes, etc.) within 150 feet of any wetlands or waters, furnish and install CO approved secondary containment measures. Inspect equipment for fluid leaks daily and address all fluid leaks according to Division 01 Specification 01 73 40 “Execution”.
    f. Do not disturb any wildlife species (i.e. reptiles, migratory birds, raptors, or bats) found nesting, hibernating, estivating, or otherwise living in, or immediately nearby, worksites.
    g. Do not feed or approach wildlife.
    h. Soil disturbance shall be minimized to the greatest extent possible. Disturbance to existing vegetation shall be primarily contained in previously disturbed areas or

within narrow construction limits. Whenever practicable, soils and plants impacted by construction shall be salvaged for reuse in site restoration.

i. Weed/seed free materials such as gravel, soil, straw, and mulch shall be used.

j. Equipment and all vehicles used at the site shall be pressure cleaned and inspected to be free of weeds, seed, debris, and mud.

1.4 SUBMITTALS

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

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

C. Waste Reduction Calculations: Before request for Substantial Completion, submit three copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

H. Qualification Data: For Waste Management Coordinator.

I. Progress payment requirements:

1. With each Application for payment, submit updated Project Waste Management Plan worksheet for solid waste disposal and diversion.
2. With each Application for Payment, submit manifests, weight tickets, receipts, and invoices specifically identifying the Project and waste material.

J. Closeout Submittals

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

1.5 QUALITY ASSURANCE

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

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

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

PART 2 - PRODUCTS

2.1 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification and waste reduction work plan. Include separate sections in plan for demolition and construction waste. Indicate quantities by weight or volume but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials sold to individuals and organizations, include list of names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials donated to individuals and organizations, include list of names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:

1. Landfill tip fees/ton
2. If diverted, tip fee savings from landfill diversion
3. Costs of recycling, salvage, or reuse
4. Revenue from recycling, salvage, or reuse
5. Total cost or savings from diversion (Calculate by using tip fee savings and subtracting costs of recycling or adding revenue from recycling)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

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

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

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

D. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

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

F. Separation facilities:

1. Contractor shall designate and Contracting Officer shall approve a specific area or areas to facilitate separation of materials for potential reuse, salvage, recycling, and return.
2. Waste and recycling bins are to be placed near each other, and close to the point of waste generation but out of the traffic pattern.
3. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid co-mingling of materials.
4. Bins shall be protected during non-working hours from off-site contamination.
5. Garbage dumpsters should be checked periodically to monitor recyclables being thrown away or if there are undocumented materials that could be recycled.

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

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale: Not permitted on Project site.

C. Salvaged Items for Governments Use:

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

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

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

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

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

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.

4. Store components off the ground and protect from weather.
5. Remove recyclable waste off Government's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.

1. Grind asphalt to maximum 4-inch size.
2. Crush asphaltic concrete paving and screen to comply with requirements in Division 31 Section "Earth Moving".

B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Pulverize concrete to maximum 4-inch size.

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

D. Metals: Separate metals by type.

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

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

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

B. Site-Clearing Wastes: Chip brush, branches, and trees on-site.

C. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

3.6 DISPOSAL OF WASTE

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

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

B. Burning: Do not burn waste materials.

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

END OF SECTION 01 74 19

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

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

1.2 PROJECT RECORD DRAWINGS

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

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

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

1.3 CLOSEOUT SUBMITTALS

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

1. Specific warranties, guarantees, workman ship bonds, final certifications, and similar documents.
2. Project Record Documents, operation and maintenance manuals, final completion construction digital images recorded on CD-R (compact disc-recordable) or DVD-R (digital video disc-recordable) with index and descriptions, and similar final record information.
3. Terminate and remove temporary facilities, mockups, construction tools, and similar elements from Project site, complete final cleaning requirements, including touchup painting.
4. Touch up and repair and restore marred exposed finishes to eliminate visual defects.

1.4 FINAL INSPECTION, SUBSTANTIAL COMPLETION AND ACCEPTANCE PROCEDURES

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

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

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

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

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

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

1.5 PERMIT CLOSURE AND TRANSFER

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

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

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

D. Normally 30 days is sufficient. Number of days may vary depending on size and complexity of project; check with Contracting Officer. The primary source of what permit tasks still require action is the Permit Provisions Tracking Form, but the permits themselves should be checked to make sure the permits are properly closed.

1.6 WARRANTIES

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

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

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

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

PART 2 - PRODUCTS

2.1 MATERIALS

A. See Division 01 Specification Section “Execution” for information on cleaning agents.

PART 3 - EXECUTION

3.1 FINAL CLEANING

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

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

1. Complete following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    f. Leave Project clean and ready for occupancy.

C. Waste Disposal: Comply with requirements of Division 01 section, “Construction Waste Management and Disposal”.

END OF SECTION 01 77 00

Project Waste Management Plan Worksheet Sample

National Park Service (NPS) - Denver Service Center (DSC) | 10-13-21

	A	B	C	D	E	F	G	H	I	J
Material	**Quantity Recycled (in tons)**	**Quantity Salvaged or Reused (in tons)**	**A + B = Total Quantity Diverted from Landfill**	**Quantity to Landfill (in tons)**	**C + D = Total Quantity Generated (in tons)**	**Tip Fee/Ton at Landfill**	**C x F = Tip Fee Savings resulting from Landfill Diversion**	**Cost of Recycling (R), Salvage (S), or Reuse (Re)** (Specify R, S, or Re)	**Revenue from Recycling (R), Salvage (S), or Reuse (Re)** (Specify R, S, or Re)	**G - H + I = Total Cost (-) or Savings (+) from Diversion**
Asphalt/Concrete										
Brick/Masonry/Tile										
Building Materials (doors, windows, fixtures, shingles, lumber, insulation, sheet goods, etc.)										
Carpet										
Carpet Padding, Foam Only										
Cardboard										
Ceiling Tile										
Drywall										
Glass										
Scrap Metal Aluminum										
Copper										
Steel										
Unpainted Wood & Pallets										
Yard Trimmings, Brush, Trees, Stumps, etc.										
Garbage/Trash										
Other										
Column Totals										
	Total Quantity Recycled	Total Quantity Reused or Salvaged	Total Quantity Diverted from Landfill	Total Quantity to Landfill	Total Quantity Generated		Tip Fee Savings from Diversion	Total Cost of Recycling, Salvage, or Reuse	Revenue from Recycling, Salvage, or Reuse	Total Cost (-) or Savings (+) from Diversion

Percentage Diverted = _____ (C divided by E from Column Totals). Should meet 60% diversion goal.

SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This work includes concrete forming and accessories for cast-in-place concrete construction.

1.2 SUBMITTALS

A. Certifications of certified wood.

B. Certification of BioPreferred or biobased designated form release agent.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use wood, metal, glass, a combination of these materials, or other suitable material for forms. Keep forms clean and coat with a form release agent or form oil before placing concrete. Clean forms after each use and coat with form-release agent to guarantee separation from concrete without damage.

B. Use a BioPreferred or biobased designated form release agent.

C. Use mortar-tight concrete forms, true to the dimensions, lines, and grades of the structure and of sufficient rigidity to prevent objectional distortion of the formed concrete surface caused by pressure of the concrete and other lads incidental to the construction operations.

D. Use lumber that is free of knotholes, loose knots, cracks, splits, warps, or other defects that affect the strength or appearance of the structure. Rough lumber may be used for forming surfaces if visible rough surfaces do not show on the final surface.

E. Use lumber that is certified wood with certifications though Forest Stewardship Council (FSC) or Sustainable Forestry Initiative (SFI).

F. Do not use stay-in-place metal deck forms unless otherwise specified.

G. Use a concrete form-liner to achieve the specified concrete texture.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Design and construct forms that are free of bulge and warp and allow for removal without injuring the concrete. Design the forms for a lateral pressure equal to that exerted by a fluid weighing 150 pounds per cubic foot.

B. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for curbs to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

C. Countersink all bolt and rivet holes when using metal forms for exposed surfaces so that a plane smooth surface of the desired contour is obtained.

D. Form exposed element surfaces of a concrete structure with the same forming material or with materials that produce a concrete surface that is uniform in texture, color, and appearance.

3.2 FORM REMOVAL

A. Obtain authorization from the Contracting Officer before removing forms.

B. Remove struts, stays, and braces that hold the forms in correct shape and alignment when no longer necessary.

C. Remove all forms from the concrete surfaces.
   1. Do not use a method of form removal likely to cause overstressing of the concrete. Remove supports to permit the concrete to uniformly and gradually take the stresses due to its own weight.

D. Always remove forms before removing shoring from beneath beams and girders to determine the condition of columns.

E. Removing Falsework
   1. Do not remove falsework supporting the deck of rigid frame structures until the fill has been placed in back of the vertical legs.
   2. Keep falsework and forms in place under slabs, beams, and girders for 14 days after the day of last concrete placement.
      a. Slab forms with a clear space of less than 10 ft may be removed after seven days.
   3. Keep forms and falsework in place in cold weather according to the authorized cold weather concreting plan.

F. Patch formed surfaces within 24 hours after form removal.
   1. Cut back and remove all projecting wire or metal devices used for holding the forms in place and that pass through the body of the concrete at least 1 inch beneath the surface of the concrete.
   2. Remove lips of mortar and irregularities caused by form joints.
   3. Fill small holes, depressions, and voids with cement mortar mixed in the same proportions as that used in the body of the work.

4. Obtain a solid uniform surface by chipping away coarse or broken material to patch larger holes or honeycombs.
    a. Cut away feathered edges to form faces perpendicular to the surface.
    b. Apply epoxy adhesive to patch area according to manufacturer's recommendations.
    c. Fill the cavity with stiff mortar composed of one-part Portland cement to two parts sand thoroughly tamped into place.
    d. Pre-shrink the mortar by mixing it approximately 20 minutes.
        1) Vary the time according to manufacturer’s recommendations, temperature, humidity, and other local conditions.
    e. Float the surface of this mortar with a wooden float before initial set.
    f. Keep the patch wet for five days.
    g. Rub patches on exposed surfaces to blend them with surrounding concrete after curing.
    h. Add coarse aggregate to the patching material when patching large or deep areas.
    i. Make a dense, well-bonded, and properly cured patch.

G. Areas with extensive honeycombing will be rejected.

H. Apply the following requirements after fully removing all the closure joint forms if inserts are placed along the bottom edges of the precast concrete deck panels to form the closure pour joints:
    1. Cut off cast-in-place anchors at least 1 inch below the face of slab and repair according to this Section, Article 3.2, paragraph F.
    2. Fill all voids with dry-pack mortar flush with the bottom of slab.
    3. Fill voids created by the removal of re-usable concrete anchors with dry-pack mortar flush with the bottom of slab.
    4. Dry-pack mortar will be composed of one-part Portland cement to two parts sand.

3.3 CLEANUP

A. Remove falsework and falsework piling to 2 ft below the finished ground line, rubbish, and temporary building materials before final inspection.

3.4 FIELD QUALITY CONTROL

A. Testing and Inspections: By Owner-engaged agency.
B. Special Inspections: By Owner-engaged special inspector.

END OF SECTION 03 10 00

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. This work includes reinforcing steel and coating for reinforcing steel.

1.2 QUALITY ASSURANCE

A. Mockups to demonstrate tolerances and standard of work.

B. Submittals
   1. Prepare detailed shop drawings for review of the following:
      a. Field bending procedure if required. Provide the seal of a Professional Engineer (PE) or Professional Structure Engineer (SE) licensed in the State of Colorado.
      b. Mechanical butt splice shop drawings when proposed details differ from the plans and specifications.
         1) Show the number and location of mechanical butt splices.
         2) Provide two samples of mechanical butt splices and test to destruction in the presence of the Contracting Officer.
   2. Prepare the following documents related to proposed materials:
      a. Certificates of Compliance from the manufacturer.
      b. Samples for verification testing to meet the testing requirements of AASHTO M 31, ASTM A 706, and ASTM A 955, respectively.
      c. Continuous butt-welded reinforcing hoops
         1) The pre-production procedures for the qualification of material and equipment.
         2) The methods and frequencies for performing QC procedures during production.
         3) The calibration procedures and calibration frequency for all equipment.
         4) The welding procedure specifications (WPS) for resistance welding.
         5) The method for identifying and tracking lots.
      d. Two samples of welded spliced for verification testing.
      e. Epoxy adhesive material data sheet and recommended installation instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Steel Reinforcement.
   1. Deformed and plain carbon-steel bars.
      a. Conform to AASHTO M 31, Grade 60.
   2. Deformed or plain low-alloy steel bars
      a. Conform to ASTM A 706, Grade 60.

3. Deformed or plain stainless-steel bars.
    a. Conform to ASTM A 955, Type XM-28.

B. Coatings.
1. Epoxy coating.
    a. Conform to ASTM A 755 or ASTM A 934.
2. Galvanized coating.
    a. Conform to AASHTO M 111.
3. Coat bars as described:
    a. Maintain epoxy coating thickness between 8 and 12 mils.
    b. Maintain galvanized coating thickness according to ASTM A 767.
    c. Coat bars after bending unless the fabricator can show that satisfactory results can be obtained by coating before bending.
    d. Do not use bent bars with visible cracks or damage in the coating.

C. Precast concrete block bar supports.
1. Provide minimum 28-day compressive strength of 2,500 psi.
2. Use three-inch-thick supports with sides ranging from 4 to 6 inches with a minimum contact area of 24 in^2.

D. Mechanical Splice Coupler
1. Service strength bars:
    a. Reinforcing steel splice coupler shown by tests to be capable of developing in tension 125 percent of the specified yield strength of the reinforcing bar.
2. Ultimate strength bars:
    a. Use where shown.
    b. Reinforcing steep splice coupler shown by tests to be capable of developing in tension 150 percent of the specified yield strength of the reinforcing bar.
3. Coat the coupler with the same coating as the reinforcing steel being spliced.
4. Use stainless steel splice coupler with stainless steel reinforcement.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

B. Verify use of suppliers with the Contracting Officer.

C. Do not heat the bars during the bending operations.

D. Maintain a clean surface keeping all reinforcement free from loose mill scale, loose or thick rust, dirt, paint, oil, or grease.

E. Field bend bars according to the authorized field bending procedures.

F. Place all reinforcement in designated position and securely hold in position while placing and vibrating concrete.
1. Placing Tolerances

a. Decks or members 10 inches or less in thickness
1) Cover: -1/8 inch, + ¼ inch.
b. Longitudinal spacing for individual bars: ±1 inch.
1) Clear spacing between bars: not less than the greater of 1½ inches, 1½ bar diameters, and 1½ times the maximum aggregate size.
c. Average spacing for 10 bars: +1 /16 inch.
1) Do not use tolerance to decrease number of bars or increase bar spacing.
2. Length of bar laps -1 inch
3. Embedment length -1 inch

G. Tie bars together with ties at intersections except when spacing is less than 9 inches in each direction, in which case tie at alternate intersections.
1. Tie bundled bars together at not more than 6 ft centers.

H. Maintain the required distance from the forms and between layers of reinforcement with prefabricated chairs, ties, hangers, or other devices.

I. Use precast concrete block bar supports only when the concrete is placed in contact with the soil and then only as the support for the bottom mat of bars.

J. Do not tack weld reinforcing bars in place.

K. Do not place concrete until the Contracting Officer has verified the reinforcement placement and fastening.

L. Place stainless steel reinforcement so that it does not come in contact with carbon steel.
1. Do not tie stainless steel to uncoated or coated carbon steel reinforcement, galvanized attachments, or galvanized conduits.
a. Maintain at least 1 inch clearance between the metals using nylon or polyethylene spacers when stainless steel reinforcing or dowels must be near coated or uncoated reinforcing, or galvanized metals. Bind using nylon cable ties.
1) Maintain at least 1inch clearance unless insufficient space exists.
a) Either bar may be sleeved with a 1/8-inch minimum thick insulator material, such as polyethylene, nylon or rubber tube, extending at least 1 inch in either direction past the point of closest contact between the two dissimilar bars.
b) Sleeves are not allowed for bars that run parallel to each other.

M. Field Cutting
1. Saw or shear coated bars that are specified to be cut in the field. Do not flame cut.
2. Repair the coating at the sawed or sheared end using the specified patching or repair material.

N. Splicing
1. Furnish all reinforcing steel in the lengths shown.
2. Do not splice bars except where shown.
3. Stagger splices as far as possible.
4. Place and tie lapped splices in the bars. Maintain the minimum distance to the surface of the concrete shown.
5. Do not allow lap splices in vertical column reinforcing bars unless shown.
6. Do not lap splice No. 14 and No. 18 bars.

a. Use mechanical splice couplers.

7. Use mechanical splice couplers when shown.
   a. Follow the manufacturer's published recommendations for equipment and splicing procedures.

O. Field Bending
1. Do not field bend reinforcing steel unless shown.
2. Follow the authorized field bending procedures.
3. Use methods that do not damage coatings.
4. Do not heat the bars during the bending operations.
5. Do not bend bars partially embedded in concrete except as shown or preapproved by the Contracting Officer. Do not field straighten, or re-bend fabricated bent bars.

3.2 FIELD QUALITY CONTROL

A. Testing and Inspections: By Owner-engaged agency.

B. Special Inspections: By Owner-engaged special inspector.

C. Delivery, Storage, and Handling:
1. Protect the bars and the coating during handling and storage.
   a. Use systems with padded contact areas when handling epoxy coated bars.
   b. Pad all bundling bands for epoxy coated bars.
   c. Lift all bundles with strong-back, multiple supports, or a platform bridge.
   d. Do not drop or drag bars.
2. Repair damaged coating.
   a. Epoxy coated
      1) Meet requirements of ASTM A 775 Appendix A.2 for repair material.
      2) Follow manufacturer recommendations for repairs.
      3) Do not use bars with total damaged surface area of epoxy coating greater than 2 percent in any 1 ft section.
      4) Do not use bars with 5 percent or greater damage to total surface area during all stages of work.
3. Store bars above ground surface on wooden or padded supports.
   a. Place timbers between bundles when stacking is necessary.
   b. Space the supports close enough to prevent sags in the bundles.
4. Cover epoxy coated reinforcing steel with an opaque covering upon delivery to the project site.
   a. Protect epoxy coated reinforcing steel that has been partially embedded in concrete or placed in formwork.
      1) Cover with an opaque covering before 30 days exposure to sunlight.
   b. Place the opaque coverings to provide air circulation and prevent condensation on the reinforcing steel.

END OF SECTION 03 20 00

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This work includes cast-in-place concrete construction in concrete structures such as curbs, gutters, drop inlets, slabs-on-grade, pavement, sidewalks, ABA ramps, and miscellaneous structures.

1.2 SUBMITTALS

A. Utilize stratified random sampling of each batch produced and placed to assure that all material within the batch has an equal probability of being selected for testing. The CO will provide random numbers as required for each day's sampling, based on the anticipated production for that day. Adjustments in sampling locations and times necessary due to differences between anticipated and actual production quantities will be made by the CO. The CO may at any time, notwithstanding previous plant acceptance, reject and require the Contractor to dispose of any batch which is deemed unfit for use due to contamination, segregation, incomplete coating of aggregate, non-specification temperature, or other indication of defective material. Such rejection may be based on only visual inspection or temperature measurements. Similarly, the CO may at any time reject and require the Contractor to correct any concrete that was placed with unacceptable test results. In the event of such rejection, the Contractor and CO may take split samples of the area(s), and if it can be demonstrated by testing that such material or constructed pavement was erroneously rejected, payment will be made for the material at the contract unit price.

B. All samples of concrete flatwork shall be split samples and the split portion delivered to the CO. Samples shall be split in accordance with applicable AASHTO or ASTM procedures. Deliver to the CO all core samples taken from the compacted pavement after testing. Protect samples from damage before delivering to the CO.

C. Mix design for all A and AA concrete classes to be used for approval.
   1. Before batching concrete, submit the following at least 30 days before production:
      a. Type and sources of material;
      b. Material certification for material;
      c. Saturated surface dry mass of the fine and coarse aggregate per cubic yard of concrete;
      d. Gradation of fine and coarse aggregate;
      e. Mass of mixing water per cubic yard of concrete;
      f. Entrained air content of plastic concrete in percent by volume;
      g. Maximum slump of plastic concrete in inches.
   2. Provide concrete mix design split samples to NPS DSC for record-keeping and option to test through third party laboratory.
   3. Test the samples and record to include at least the following:
      a. The proposed mix design.
      b. Target slump value.

c. Trial batch test results.
d. Test results verifying that coarse and fine aggregates meet this Specification section 2.1.
e. Test results for the proposed mix design for potential reactivity of coarse and fine aggregates.
f. Test results demonstrating the ability of the combinations of cementitious materials and aggregates to control the reactivity when using potentially reactive aggregates in a mix design.
g. Written plan for admixtures.
h. Well-graded combined aggregate gradation for the mix design when used.

1) Provide targets for each required sieve (listed in the Table 2-2) for control and acceptance.
2) Submit the coarseness factor, 0.45 power chart, percentage retained (8-18 gradation chart) or a combination of methodologies.
3) Identify the aggregate size and number of component stockpiles.
4) Provide gradations for each component stockpile and the target percentages of each stockpile used to achieve the total combined gradation.

D. Mix design, manufacturer's product data, or manufacturer's labeling for Class B concrete approval. Refer to Table 3-1 for concrete mix design requirements.

E. Cold Weather Concreting Plan and Hot Weather Concreting Plan for review.
1. Include the following:
a. Detailed procedures for the placement, protection, curing, and temperature monitoring of concrete during cold and hot weather.
b. Procedures to be implemented upon abrupt changes in weather conditions or equipment failures.
c. Refer to this Section, Article 3.4, paragraphs A-C for cold and hot weather concreting requirements.
2. Allow the Engineer 10 calendar days to review the plans.
a. The Engineer may grant an increase in contract time when this review and approval time is exceeded.
b. This review period applies each time the plans are submitted.
3. Do not begin cold weather concreting before the Cold Weather Concreting Plan is approved.
4. Do not begin hot weather concreting before the Hot Weather Concreting Plan is approved.
5. Not required for precast concrete members provided by prequalified suppliers.

F. Concrete Colorant (only applies to concrete used at the visitor center)
1. Colored concrete (Davis color 10134 Salmon) is required for the vertical concrete curbs, sidewalks, and all concrete flatwork. Submit preliminary samples of the colored concrete. Prepare a 2-foot x 2-foot concrete panel for each acceptable mix that is to be colored. Finish and cure the curb samples in the same manner as the concrete will be finished and cured on the project.
2. Integrally color the concrete by adding a coloring agent. Use Davis color 10134 or an approved equal by the CO.
3. Coloring agents are to be mineral oxide pigments, light fast, lime proof, stable and inert when used in concrete or mortar. Coloring agents containing carbon black are not acceptable.

4. Add coloring agents mixed with water at the time the cement is added to the mix during batching. Determine coloring agent batch amounts by weight, not volume. Use additional mixing time required as recommended by the manufacturer. The amount of coloring agent to be used will be determined by the CO based on the test section results and shall not exceed 6 percent of the weight of cement.
5. At least five weeks prior to placing concrete, cast and cure three test samples. Provide test samples of the ”Salmon” color with 1 lb, 2 lbs, and 3 lbs of powder color admixture per cubic yard of concrete, in accordance with the requirements of the color specifications. Use the same amount of cement per cubic yard and the same proportions of aggregates and admixtures in the test samples as will be used in the final mixes. After the test samples have cured at least three weeks transport the test samples to a location designated by the CO, with existing-colored curbs and flatwork, for evaluation and approval. Use the selected shade for all the vertical concrete curbs. Contractor is responsible for removal and disposal of the test sections after the project is complete and accepted.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Coarse Aggregate
1. Use coarse aggregate that meets AASHTO M 80 physical properties. Use one of the gradations in the Portland Cement/Blended Hydraulic Cement Equivalencies table below.
2. Do not exceed percentages of deleterious substances as specified in AASHTO M 80, Table 2, for Class A aggregates.

Table 2-1

Coarse Aggregate Gradations – Percent Passing (by weight)									
Aggregate Size (inches or sieve size)	**2 ½**	**2**	**1 ½**	**1**	**¾**	**½**	**3/8**	**No. 4**	**No. 200**
2 to No. 4	100	95-100		35-70		10-30		0-5	0-1
1½ to No. 4		100	95-100		35-70		10-30	0-5	0-1
1 to No. 4			100	95-100		25-60		0-10	0-1
¾ to No. 4				100	90-100		20-55	0-10	0-1

3. Maximum nominal size of coarse aggregate:
   a. Not larger than 1 /5 the narrowest dimension between sides of forms.
   b. Not larger than ⅓ the depth of slabs.
   c. Not larger than ¾ the minimum clear distance between reinforcing bars or between bars and forms, whichever is less.

B. Fine Aggregate

1. Use fine aggregate that meets AASHTO M 6 physical properties. Use the gradation in Coarse Aggregate Gradations table above.
2. Do not exceed percentages of deleterious substances as specified in AASHTO M 6, Table 2, for class A aggregates, using option "b" for material finer than the No. 200 sieve.

Table 2-2

Fine Aggregate Gradation	
Sieve Size	**Percent Passing (by weight)**
3/8 inch	100
No. 4	95 to 100
No. 16	45 to 80
No. 50	10 to 30
No. 100	2 to 10
No. 200	0 to 3.0

A. Aggregate Stockpiles

1. Provide an operator and front-end loader to help the Contracting Officer take aggregate samples at the concrete batch plant.
2. Provide separate stockpiles for coarse and fine aggregates. Construct stockpiles to minimize segregation of aggregates.
3. Allow washed aggregates to drain to uniform moisture content before use (12 hours minimum).

B. Curing Material. Conform to the following:

1. Burlap cloth — AASHTO M 182
2. Sheet material — ASTM C 171
3. Liquid membrane forming compounds — ASTM C309, Type I D, Class A

C. Water – Conform to the following:

1. Water for mixing or curing cement concrete, mortar, or grout: Conform to AASHTO M 157. Potable water of known quality may be used without testing according to AASHTO T 26. Potable water is safe for human consumption as defined by the public health authority having jurisdiction.
2. Water for planting or care of vegetation: Furnish water that is free of substances injurious to plant life such as oils, acids, alkalis, or salts.
3. Water for earthwork, pavement courses, dust control, and incidental construction: Furnish water free of substances detrimental to the work.

D. Color Additive for curb and gutters, sidewalks, and all flatwork: Colorant – High purity, chemically inert, unfading, and alkali-fast synthetic pigment coloring material according to ASTM C 979.

1. Color additive pigment shall be for integral coloration of the concrete mix. Use additive and sealers as recommended by manufacturer. Test sections will be required for

determining the exact amount of additive, as stated in Section 1.2 E of this Specification. Determine coloring agent batch amounts by weight, not volume. Use additional mixing time required as recommended by the manufacturer. The amount of coloring agent to be used will be determined by the CO based on test section results. The color of the concrete will be Davis color ”Salmon” with dye color 10134.

E. Cementitious Materials:
   1. Portland Cement: ASTM C150, Type II
   2. Fly Ash: AASHTO M 295 Class F
      a. Loss on Ignition (LOI) Not to exceed 3 percent.
      b. Allowable CaO content Not to exceed 15 percent.
      c. Label the storage silo for fly ash to distinguish it from cement.
      d. Use different size unloading hoses and fittings for cement and fly ash.
   3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
   4. Blended Hydraulic Cement:
      a. Blended hydraulic cement substituted for Portland Cement:
         1) Use ASTM C 1567 to verify that expansion is less than 0.1 percent 14 days after the zero reading. Implementation 01-09-2017 Portland Cement Concrete 03055 – Page 7 of 14 January 1, 2017
         2) Refer to the equivalent cements listed in Table 4.
      b. Do not exceed 30 percent total pozzolan limit when adding fly ash to a blended hydraulic cement.
         1) Submit documentation of the total pozzolan content with the mix design.

Table 2-3

Portland Cement/Blended Hydraulic Cement Equivalencies		
AASHTO M 85 (Low Alkali)	**ASTM C 595**	**ASTM C 1157**
*Type I	IP, IL, IT	GU
Type II	IP(MS), IT(MS)	MS
Type III	-	HE
*Type V	IP(HS), IT(HS)	HS

   5. Pozzolan
      a. Fly Ash
         1) Class F according to AASHTO M 295 except Table 2.
            a) Loss on Ignition (LOI) Not to exceed 3 percent.
            b) Allowable CaO content Not to exceed 15 percent.
            c) Label the storage silo for fly ash to distinguish it from cement.
            d) Use different size unloading hoses and fittings for cement and fly ash.
      b. Natural Pozzolan (Class N)
         1) Refer to AASHTO M 295.
         2) May use instead of fly ash provided that the expansion does not exceed 0.1 percent. Refer to ASTM C 1567.
      c. Silica Fume
         1) Refer to AASHTO M 307.

F. Epoxy Adhesive. Refer to AASHTO M 235, Type II.

PART 3 - EXECUTION

3.1 MIX DESIGN

A. Conform to Table 3-1 Concrete Class AA(AE) and Mix Requirements.

Table 3-1
Concrete Class AA(AE) and Mix Requirements

Property	Coarse Aggregate Size	Max. Water/ Cementitious Ratio	Max. % Shrinkage at 28 days AASHTO T 160	Chloride Ion Penetration AASHTO T 358 Table 1	Air Content Percent (%)*	Mix Design Compressive Strength *f'cr* (psi)	28 Day Minimum Compressive Strength *f'c* (psi)
Specific-ation	2" to No. 4 1 ½" to No. 4 1" to No. 4 ¾" to No. 4	0.44	N/A	N/A	4.0 – 7.0 4.5 – 7.5 5.0 – 7.5 5.0 – 7.5	5,200	4,000

Notes:
* Values listed represent in-place air content. Make necessary adjustments for impacts to air content due to placement.

B. Batch Materials
1. Batch Tolerances. Refer to AASHTO M 157.
   a. Cementitious Material : ± 1 percent of the required mass
   b. Aggregate: ± 2 percent of the required mass
   c. Total Water: ± 3 percent of the required mix amount
2. Truck-Mixed Concrete (Dry-Batch)
   a. Do not load trucks in excess of their rated mixing capacity, 63 percent of the drum gross volume, or less than 2 yd^3.
   b. The truck rating plate must be readable.

C. Do not exceed water/cementitious ratio.
1. Calculate the water/cementitious ratio (w/c) by weight according to the following formula:
   W/C = Water / (Cement + Pozzolan)

D. Use 94 lb additional cementitious material per cubic yard to the amounts determined in the mix design for concrete deposited in water.

E. The Contractor assumes responsibility for the compatibility of admixtures with the mix design and their potential effects on concrete properties.

F. Design the cementitious system to mitigate potential alkali-aggregate reactivity. Use at least 20 percent pozzolan by weight of the total cementitious system.

G. Do not exceed 30 percent total pozzolan in any mix unless approved or otherwise specified.

H. Obtain approval from the Contracting Officer for the project specific application of an approved mix design.

3.2 INSTALLATION

A. Excavate and backfill according to Section 31 20 00. When concrete is cracked, spalling, or scaling, remove concrete to the nearest joint. Examine the prepared subgrade and proceed with operations only after nonconforming conditions have been corrected and the subgrade is ready to receive the aggregate base layer and concrete pavement.

B. Remove loose material from the compacted aggregate base surface before placing concrete.

C. Install form work and accessories according to Section 03 10 00.

3.3 TESTING

A. Test Sections - At least five weeks prior to placing concrete, cast and cure three test sections of curb and gutter each three feet long. Provide three separate concrete test sections, with each requiring 1 cubic yard of sample material. Construct the test sections at a location within Bryce Canyon National Park determined by the CO. In the event that the Park does not want the test sections to remain in place, remove and dispose of the test sections at no additional cost to the Government.

B. The test sections will not be a part of the project work. Make each test section and demonstrate concrete color and surface finish. Provide test sections with color admixture in accordance with the requirements of the color specifications provided by the CO. After the test sections have cured for at least seven days, contact the CO for evaluation and approval. Use the same amount of cement per cubic yard and the same proportions of aggregates and admixtures in the test sections as will be used in the final mixes. Contractor is responsible for stripping the forms and backfilling around the concrete test sections, as necessary, to make the area useable.

C. Slump tolerance
1. Establish the target slump by mix design trial batch.
2. The target slump tolerance is the acceptable variation from the maximum target slump. Do not exceed a 9 inch slump.

Table 3-2

Target Slump Tolerance (inch)		
	3 inches or less	More than 3 inches
Plus tolerance	0	0
Minus tolerance	1 ½ inches	2 ½ inches

3.4 PLACING CONCRETE

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Cold weather is defined as a period when the following conditions exist for more than three consecutive days: (1) the average of the highest and the lowest temperatures occurring during the period from midnight to midnight is less than 40 degrees F, and (2) the air temperature is not greater than 50 degrees F for more than one-half of any 24 hour period.

B. Comply with ACI 306.1 for cold weather protection and as follows. Remove snow, ice, or frost from aggregate base surface before placing concrete. Protect concrete from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen surfaces.

C. When hot weather conditions exist, place concrete according to ACI 305R. Hot weather is any time during the concrete placement that the ambient temperature at the work site is above 90 degrees F. Cool all surfaces that come in contact with the mix to below 90 degrees F. Cool by covering with wet burlap or cotton mats, fog spraying with water, or by other approved methods.

D. Moisten the forms and foundation immediately before placing concrete.

E. Protect the concrete from rain at all times during and immediately after placement.

F. Place concrete to avoid segregation of material. Do not use aluminum pipe for transporting or placing concrete. Do not exceed 30 minutes between deliveries of batches for a single pour on a structure. Avoid cold joints.

G. Do not apply water to plastic concrete surfaces during finishing operations.

H. Light the work site so all operations are plainly visible if mixing, placing, or finishing occurs after daylight hours.

I. Keep all traffic off pavement slab closure pours for at least 7 days after final concrete placement, until all concrete is fully cured, and until all concrete achieves 100 percent of the specified 28-day minimum compressive strength based on field cured cylinders. High-early strength concrete used in pavement slab closure pours may be opened to traffic at least 3 days after final concrete placement and after concrete achieves 100 percent of the specified 28-day minimum compressive strength based on field cured cylinders.

3.5 CONCRETE CURING

A. Cure concrete uninterrupted for at least 7 days. The curing compound is ASTM C309, Type I D, Class A at an application rate of 100 ft^2/gal.

B. Begin curing immediately after the free surface water has evaporated and the finishing is complete. If the surface of the concrete begins to dry before the selected cure method can be implemented, keep the concrete surfaces moist using a fog spray without damaging the surface.

C. Liquid membrane forming compounds shall not change the color or texture of the concrete.

3.6 FIELD QUALITY CONTROL

A. Acceptance for strength, air entrainment, and slump is according to NPS DSC minimum sampling and testing requirements.
   1. Strength acceptance is covered in this Section, article 3.1, paragraph A.
   2. Slump acceptance and tolerance is covered in this Section, article 3.3, paragraph C.

B. Testing: By Contractor.

C. Special Inspections: By Contractor and the Government Representative (CMR).

END OF SECTION 03 30 00

SECTION 10 14 26 - POST AND PANEL/PYLON SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. This work includes ground mounted roadside traffic signs, including supports, foundations, and panels. Signposts will be breakaway posts.

B. This specification section includes the installation of rectangular rapid flashing beacons.

C. This specification section includes the installation of flexible delineators.

D. This specification section includes the installation removal and reset of the traffic loops and associated equipment.

1.2 SUBMITTALS

A. Manufacturer’s product data and specifications for retroreflective panels.

B. Flexible Post Testing for Delineators
   1. Meet Cold Bend Test
      a. Subject two posts to a temperature of -10°F, ± 5°F for at least four hours.
      b. Immediately bend each post four times through a 90-degree angle around a 2-inch mandrel.
      c. Each post must return to its original straight configuration within a ± 10-degree angle within five minutes at the end of the four bends.
      d. Any cracking or significant loss of rigidity are grounds for failure.
   2. Meet Hot Bend Test
      a. Subject two posts to a temperature of 100°F ± 5°F for at least four hours.
      b. Satisfy all bending and physical requirements specified in the Cold Bend Test.
   3. Meet Impact Resistance Test
      a. Subject post to impacts by a typical sedan as follows:
         1) Three hits - 0-degree angle at 0°F.
         2) Three hits - 0-degree angle at 100°F.
         3) Ten hits - 0-degree angle at 35 mph.
         4) Five hits - 15-degree angle at 55 mph
      b. Acceptable Results
         1) Installed post remain intact, securely anchored, and within ± 10-degrees of vertical orientation.
         2) Installed post shows minimal signs of cracking or loss of rigidity.
         3) Installed post retains at least 50 percent of its reflective sheeting.
         4) Impact vehicle suffers little or no damage during the impact test.
   4. Exposure
      a. Expose the specimens for 500 hours in a carbon arc-type apparatus according to ASTM G 23, Method 1.
      b. Acceptable results:

1) Exposure does not result in delamination, distress, or discoloration.
2) Sheeting is not removable from the specimens without damage.
3) Post is resistant to ultraviolet light, ozone, hydrocarbons, and other weathering.

C. Certifications of certified wood for plywood backing.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fabricate according to the details in the plans.

B. Substrate Aluminum – 0.080 or 0.125 inch thick as follows. Refer to ASTM B 209 alloy 6061-T6, or 5052-H38.
1. Use 0.125 for signs installed on frame and Gore signs.
2. Use 0.080 for all other signs.

C. Plywood Backing – According to APA product standard PS 1-83, Group One: ½ inch thick.
1. 30/30, high density BB exterior (Douglas Fir) B Grade.
2. Plugged-core (Douglas Fir) with ½ inch maximum gaps
3. Use lumber that is certified wood with certifications though Forest Stewardship Council (FSC) or Sustainable Forestry Initiative (SFI).

D. Bases – According to the breakaway details in the plans. Design and installation requirements for breakaway posts and connections are identified in the plans.

E. Posts, "T" and "U" brackets, extensions, and hardware according to details in the drawings.
1. Posts
   a. Refer to ASTM A 513 or ASTM A 787
   b. Galvanize according to ASTM A 653 or ASTM A 123
2. "T" and "U" Extension and 90-degree Post Extension
   a. Galvanize according to ASTM A 653 or ASTM A 123
3. S Section and W Section steel posts
   a. Structural Steel: Refer to details in the drawings.

F. Retroreflective and non-reflective sheeting
1. Sheeting – The retroreflective or non-reflective material that comprises the background, legend (word messages and symbols), and border.
   a. Conform to ASTM D 4956 , including supplementary requirements.
   b. Components – The matched component products required for the manufacture of highway signs consist of the sheeting, cutout letters and borders, adhesives, inks, and overlay films.
      1) Failure of the sheeting inks or overlay films, provided, sold, or recommended for use, constitute a failure of the entire sign and replacement under manufacturer's warranty replacement obligations.
      2) All components and warranties will be compatible with substrates used by the Owner, including Aluminum ASTM B 209 5052 - H 38 or 6061-T6.

3) Use only acrylic EC film to achieve color. Do not use vinyl EC film to achieve color.

c. Permanent Signs – Include sign installations that are in their final configuration and that are expected to have a multi-year life. Examples include freeway guide signs, regulatory signs, warning signs, barrier markers, crash cushion markers, and delineation.

d. Work Zone Standard Signs – MUTCD standard application signs including but not limited to Road Work Ahead, Work Zone Speed Limit, Flagger Symbols, Business Access, and Regulatory signing within the work zone.
   1) Standard signs a. Meet or exceed the minimum requirements of ASTM Type XI.
   2) Use fluorescent retroreflective sheeting for orange, yellow, and yellow-green.

e. Work Zone Project Specific Signs – Signs that have legends specific to the project and that cannot be reused on a future project. Examples include: "Alder Street closed from 1st to 2nd Avenue – use Birch Street" or project notification signs. These are typically used for only one construction season.
   1) Meet or exceed the minimum requirements of ASTM Type III high intensity prismatic sheeting.
   2) Use fluorescent retroreflective sheeting for orange, yellow, and yellow-green.

f. Flexible Work Zone Devices – Include such devices as roll up signs, cones, tall cones, and flags with retroreflective sheeting.
   1) Use ASTM Type VI with minimum Coefficient of Retroreflection as shown in Table 2-1.

Table 2-1

Coefficient of Retroreflection (Candelas/Lux/Square Meter)						
Observation Angle	**Entrance Angle**	**White**	**Fluorescent Yellow-Green**	**Fluorescent Yellow**	**Fluorescent Orange**	**Fluorescent Pink**
0.2°	- 4°	500	400	300	200	180
0.2°	+ 30°	200	160	120	80	72
0.5°	- 4°	225	180	135	90	80
0.5°	+ 30°	85	68	51	34	30
1.0°	- 4°	50	40	30	20	18
1.0°	+ 30°	20	16	12	8	7

g. Work Zone Channelization Devices – Include such devices as drums, vertical panels, barricades, tubular markers, and pavement marking tabs.
   1) Vertical panels, barricade Types I, II, and III, and directional indicator barricades.
      a) Meet or exceed the minimum requirements of ASTM Type XI.
      b) Use of standard orange acceptable.
   2) Meet or exceed the minimum requirements of ASTM Type IV with the minimum requirements of the Coefficient of Retroreflection as shown in Table 2-2 and the minimum requirements of the Color Specification Limits (daytime) of Table 2-3 for all other channelization devices.

Table 2-2

Coefficient of Retroreflection (Candelas/Lux/Square Meter)			
Observation Angle	**Entrance Angle**	**White**	**Fluorescent Orange**
0.2°	- 4°	500	200
0.2°	+ 30°	200	80
0.5°	- 4°	225	90
0.5°	+ 30°	85	34
1.0°	- 4°	50	20
1.0°	+ 30°	20	8

Table 2-3

Color Specification Limits (daytime)										
Color	**Chromaticity Coordinates**								**Luminance Factor (Y%)**	
	1		2		3		4			
	x	y	x	y	x	y	x	y	Min	Max
White	0.303	0.306	0.368	.0366	0.340	0.393	0.274	0.329	27	--
Fluorescent Orange	0.645	0.355	0.562	0.348	0.506	0.404	0.570	0.429	20	

3) Use fluorescent retroreflective sheeting for orange and yellow.
4) Do not obscure retroreflective sheeting with paint or other materials.

G. Fasteners for ground mounted signs – Refer to applicable details in the drawings.

H. Foundation for ground mounted signs – Refer to applicable details in the drawings.
1. Concrete – Class AA(AE). Refer to Specification 03 30 00 Cast-in-Place Concrete.
2. Reinforcing steel – Refer Specification 03 20 00 Concrete Reinforcing.
3. Anchor bolts – Refer to the details in the drawings.

I. Flexible Delineator Posts
1. Free of burns, discoloration, contamination, and other defects.
2. Remains flexible at temperatures from – 5° F to + 140°F.
3. Capable of being driven into an earth shoulder with or without a pilot hole.
4. Tensile strength of 1,100 psi. Refer to ASTM D 638.

J. Signs and Plaques
1. All sign assemblies shall use provided anti-vandal fasteners and tools to mount components to sign, and sign to fixture.
2. Crossing signs shall be W11-2, S1-1 or W11-15 per MUTCD
3. Crossing plaques W16-7P shall also accompany the crossing signs.
4. STOP signs shall be R1-1 per MUTCD.
5. Pedestrian pushbutton instruction signs shall be furnished, at a minimum size of 5" x 7", to be mounted adjacent to or integral with each pedestrian pushbutton.

K. Traffic Counter Loops
1. Provide dedicated polyvinyl chloride (PVC) conduits for each lead-in from the edge of pavement to a new pull box.
2. For loop wires use 14/IC, RHW, use, XLPE, RHWN or THWN wire.
3. Terminate stranded conductors smaller than #14 AWG with crimp style terminal lugs.

4. Provide a dedicated PVC conduit and wiring from the pull box to the existing traffic counter box."
5. Plug conduits and brushings with steel wool to prevent rodent entry and with a water-resistant material to prevent moisture entry.

L. Rectangular Rapid Flashing Beacon
1. Light Bar Housing and Indications
   a. Construct the Light Bar housing from durable, corrosion-resistant powder-coated aluminum with stainless steel fasteners.
   b. Enclosed components shall be modular in design whereby any component can be easily replaced using common hand tools, without having to remove the housing from the pole.
   c. Provide all stainless-steel mounting hardware required for mounting the Light Bar housing.
   d. Each of the two vehicle RRFB-XL™ LED or approved equal indications shall be approximately 7.25" wide x 3" high.
   e. Side-mount a pedestrian LED indication and a red STOP LED indication, approximately 0.5" wide x 2.5" high, in the Light Bar housing.
   f. The LEDs used shall be rated for a minimum 15-year life span.
2. Controller
   a. House the Controller in a NEMA 3R rated aluminum enclosure, intended for indoor or outdoor use, primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, hose-directed water, and damage from ice formation.
   b. The LED light outputs, and flash pattern shall be completely programmable, with the capability to actuate RRFB-XL, RRFB, round LED signal beacons and LED-enhanced signs.
   c. The flashing output shall have 70 to 80 periods of flashing per minute, during which one of the yellow or red indications shall emit two medium pulses of light and the other yellow or red indication shall emit four short rapid pulses of light followed by a long pulse. The output current shall be maintained as programmed for the duration of the pulse. The flashing output shall be programmable.
   d. The Controller shall be reconfigurable if future MUTCD or State guidelines specify a different flash pattern.
   e. The Controller shall be capable of storing input count data in preset intervals, with downloadable capabilities using optional Windows-based PC software program and standard RS232 programming cable.
   f. The Controller shall be, in the unlikely event of failure, replaceable independently of other components.
3. Battery
   a. The Battery shall be a 12VDC Absorbed Glass Mat (AGM) sealed lead-acid, maintenance-free battery.
   b. The Battery shall be rated at 45AH minimum and shall conform to Battery Council International (BCI) specifications.
   c. Solar charge the Battery with a capacity up to 30 days of autonomy without sunlight, varying with ambient temperature and number of activations.
   d. The Battery shall be replaceable independently of other components.
   e. The Battery shall have a minimum operating temperature range of -76º to 140ºF (-60º to 60ºC).

4. Wireless Transceiver Radio
    a. Radio control shall be solar-powered, operating on a FCC-approved 900mhz frequency, hopping spread spectrum network with a normal operating range of 1000 feet.
    b. Radios shall provide wireless communication between the Assemblies to integrate the pushbutton activation of indications.
    c. To ensure all integral indications consistently flash in unison, the Radio shall synchronize the Controllers to activate the indications within 120msec of one other and remain synchronized throughout the duration of the flashing cycle.
    d. Radio systems shall operate from 3.6 VDC to 15VDC
    e. The Radio shall be, in the unlikely event of failure, replaceable independently of other components.
    f. The Radio shall have a minimum operating temperature range of -30ºF to 165ºF (-34.4º to 73.8ºC).
5. Solar Panel
    a. The Solar Panel shall provide 55 watts at peak total output.
    b. The Solar Panel shall be affixed to an aluminum plate and bracket, adjustable at an angle of 45°- 60° to facilitate adjustment for maximum solar collection and optimal battery strength.
    c. The Solar Panel Assembly (panel, plate and bracket) shall be mounted on a 360º rotatable pole cap mount, to facilitate adjustment for maximum solar collection and optimal battery strength.
    d. Rated for 90mph wind conditions
    e. The Solar Panel shall have a minimum operating temperature range of -40º to 185ºF (-40º to 85ºC).
6. Bulldog Pushbutton
    a. The Push Button for the pedestrian crosswalk shall be capable of continuous operation within a temperature range of -30º to 165ºF (-34º to 74ºC).
    b. The Push Button shall be ABA compliant and shall operate as a normally open (n/o) circuit.

PART 3 - EXECUTION

3.1 GENERAL

A. Do not reverse screen sign larger than 7 ft.

B. Do not remove a sign that is being replaced until the new sign is placed and uncovered.

C. Compact backfill to a density equal to surrounding materials.

D. Establish proper elevation and orientation of all signs and structures and determine proper signpost lengths as dictated by construction slopes.

E. Cover signs that require temporary covering with an opaque material. Secure at the rear of the sign so that the sign is not damaged.
    1. Maintain covering until covering or sign is removed.

F. Construct signpost foundations with concrete according to dimensions.

G. Paint all exposed steel and wood on signposts and the backs of all signs with 780B-7 Behr Bison Brown paint. Submit color sample to CO for approval prior to painting the posts.

H. Affix to each sign a 2-inch x 2-inch impermeable, non-fading weather-resistant, self-adhesive label.
   1. Label includes the month and year of manufacture, Contractor's name, and type of sheeting. Attach label where it will not obscure sheeting.

I. Relocate Existing Sign
   1. Remove existing foundations to a minimum of 6-inches below the ground line and backfill.
   2. Provide and install new posts and accessories as required.
   3. Retrofit as required to meet current standards.

J. Remove Existing Sign
   1. Remove foundations to a minimum of 6-inches below the ground line and backfill.

K. Traffic Loop
   1. Remove old traffic loops buried in asphalt road as shown on plans, maintain existing traffic counter box.
   2. Do not install loops when the pavement is wet. Saw cut, wire, and seal for loop wires on the same day. Do not allow vehicular traffic to pass over an open saw cut unless protected.
   3. Saw clean, smooth, well-defined, 5/16-inch (8-millimeter) wide and 1¾-inch (45-millimeter) deep cuts without damaging the adjacent pavement. Overlap saw cuts to provide full depth at corners. Saw cut the lead-in to the pull box as close as possible to the edge of pavement. Thoroughly clean the saw cut of foreign material by sandblasting, water blasting, or mechanical wire brushing. Repeat the process until a new, clean concrete face is exposed. Dry the joint with compressed air.
   4. Install the loop wire in one continuous length at the bottom of the cut. Install without kinks, curls, or other damage to the wire or its insulation. Replace damaged wires. Hold the loop wire in place with 24-inch (600-millimeter) long backer rods.
   5. Where the loop wire crosses a crack or joint, use a plastic sleeve that extends 4 inches (100 millimeters) on each side of the crack or joint. Provide extra loop wire in the sleeve for joint expansion and contraction.
   6. Twist the loop lead-in wires 5 turns per foot (16.5 turns per meter) from the loop to the pull box. Color code the wires of each loop for identification of separate loops. Coil 36 inches (900 millimeters) of lead-in pair slack in the pull box for each loop.
   7. Identify and label loop wires inside each pull box in which the loop wires enter. Maintain consistent wiring identification and labeling when entering the cabinet and with connection to the traffic counter. Use water resistant material for wiring identification and labeling. Obtain approval for loop wire assignments at all locations.
   8. Before applying sealant, test the loop and lead-in for continuity and resistance by applying a 1000-volt megohmmeter between each end of the loop lead-in and the nearest reliable electrical ground. If no available ground exists, establish a ground for the measurement. Record the location and megohmmeter readings and submit readings and test equipment data. Replace the loop if the megohmmeter reading is less than 10 megohms or the inductance is less than 60 microhenries or more than 100 microhenries.
   9. Apply sealant to the saw cuts with the backer rods in place. Apply the sealant in a manner that does not produce air bubbles. Remove excess sealant and finish level with the

pavement. Follow the manufacturer's instructions for sufficient time for the sealant to harden before allowing traffic to cross the loops.

10. Repeat the resistance and continuity test after sealant is applied. Report the second test for comparison with the first test report.
11. Testing
    a. Before energizing portions of the system, demonstrate that the conductor system is clear and free of short circuits, open circuits, and unintentional grounds. Repair or replace faulty circuits.
    b. After energizing the system, demonstrate that all electrical components work properly. Repair or replace faulty electrical components.
    c. After completing electrical component tests, conduct a demonstration test for 30 continuous days. Adjust and correct deficiencies in the system during the 30-day demonstration period. If part of the system is replaced or repaired, retest that part of the system for an additional 30 days.

L. Rectangular Rapid Flashing Beacon
1. Meet the minimum specifications of Society of Automotive Engineers (SAE) standard J595 (Directional Flashing Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles) dated November 2008, for the light intensity of the vehicle indications. Provide manufacturer Certification of Compliance upon request.
2. When activated, all indications associated with a given crosswalk (including those with an advance crossing sign, if used) and a stop sign shall simultaneously commence operation of their alternating rapid flashing within 120msec and shall cease operation at a predetermined time after the pedestrian actuation.
3. Direct toward and make visible the pedestrian indication to pedestrians in the crosswalk and drivers in the roadway, and it shall flash concurrently with the vehicle indications to give confirmation that the RRFB-XL™ is in operation.
4. The system shall include an actuation counter providing data that can be downloaded on-site to a laptop computer using DB9 or USB type cables.
5. Autonomy with a fully charged battery shall be up to 14-28 days without sun, dependent upon ambient temperature and number of activations.
6. Provide a shield over the top and sides that directs light towards approaching vehicles and meets National Park Service Dark Sky Park requirements. The shield shall not allow any light to shine above the plane of the lights.

END OF SECTION 10 14 26

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. This work includes clear, grub, remove, and dispose of trees, stumps, and debris within the designated limits of the roadways, channels, easements, and other designated areas.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify with the Contracting Officer the vegetation or objects to be removed and stake the limits of the removal area.

B. Review work procedures with the Contracting Officer.

C. Provide temporary erosion and sedimentation control measures.

3.2 VEGETATION REMOVAL

A. Stake areas requiring vegetation removal and notify the CO a minimum of 4 weeks prior to vegetation removal to allow the Government to salvage vegetation prior to grubbing.

B. Grub the areas 2 ft below natural ground, within the limits of clearing, of all stumps, roots, buried logs, and all other underground obstructions.

C. Stumps, roots, and non-perishable solid objects may remain in cleared areas where the embankment is:
   1. 2 ft or more above the natural ground.
   2. At least 2 ft away outside the slope stake lines.

D. Completely grub stumps and roots where a structure is to be constructed, piles are to be driven, or unsuitable material is to be removed.

3.3 TOPSOIL REMOVAL

A. Strip and stockpile topsoil. Re-spread on site as directed by the Contracting Officer.

B. Conserve topsoil…

3.4 BACKFILLING

A. Backfill all stump holes, cuts, depressions, and other holes resulting from clearing and grubbing within areas to receive embankment.
   1. Compact backfilled areas to the density of the surrounding ground.
   2. Measure and pay separately for materials used for backfilling under Roadway Excavation or Borrow.
   3. Consider Roadway Excavation and Borrow as incidental to the work when these items are not included in the bid proposal.
      a. No separate payment made for grading associated with extending or replacing culverts.

3.5 DISPOSAL

A. Dispose of material. Refer to Specification 01 74 19 Construction Waste Management and Disposal.

B. Do not dispose of material within the designated roadbed.

C. Outside of the Park
   1. Acceptable when done according to prevailing laws including environmental laws, ordinances, regulations, and rules.

D. Inside the Park
   1. Bury material at locations specified by or acceptable to the Contracting Officer.
   2. Use material to widen embankments and flatten embankment side slopes as approved by the Contracting Officer.
   3. Cover disposed material with at least 2 ft of earth and grade to drain properly.
   4. Reduce wood to chips a maximum of ½ inch thick for mulching cut and fill slopes.
      a. Chips may be buried or distributed uniformly on the ground surface and mixed with the underlying earth so the mixtures will not sustain burning.

3.6 PROTECTION

A. Land monuments, property markers, or official datum points
   1. Protect until their removal is approved.
   2. Reference for re-establishment before removing.

B. Protect trees from damage to roots and branches unless they are designated to be removed.

C. Protect other vegetation and objects to remain. If damage occurs, repair or replace the vegetation in an acceptable manner. Where possible, preserve vegetation adjacent to bodies of water. Treat cuts or scarred surfaces of trees and shrubs with tree wound dressing.

END OF SECTION 31 10 00

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. This work consists of excavating material and constructing embankments. This includes furnishing, hauling, stockpiling, placing, disposing, sloping, shaping, compacting, and finishing material.

1.2 DEFINITION

A. Excavation consists of the following:
   1. Roadway excavation: All material excavated from within the right-of-way or easement areas, except subexcavation covered in (2) below and structure excavation. Roadway excavation includes all material encountered regardless of its nature or characteristics.
   2. Subexcavation: Material excavated from below subgrade elevation in cut sections or from below the original ground line in embankment sections. Subexcavation does not include topsoil, rock cuts, or earth cuts.
   3. Borrow excavation: Material used for embankment construction that is obtained from outside the roadway prism. Borrow excavation includes unclassified borrow, select borrow, and select topping. Borrow shall be obtained at locations, known to be an active borrow pit, located outside park boundaries.

B. Embankment construction consists of placing and compacting roadway or borrow excavation. This work includes:
   1. Constructing roadway embankments
   2. Benching for side-hill embankments
   3. Constructing dikes, ramps, mounds, and berms
   4. Backfilling subexcavated areas, holes, pits, and other depressions

C. Salvaged topsoil
   1. Excavated material salvaged from the roadway excavation and embankment foundation areas that is suitable for growth of grass, cover crops, or native vegetation.

D. Waste
   1. Excess and unsuitable roadway excavation and subexcavation that cannot be used.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Conform to the following section and subsections:
   1. Backfill material – Furnish a well-graded, compactable material free of excess moisture, muck, frozen lumps, roots, sod, or other deleterious material conforming to the following:
      a. For all structures and pipes other than plastic pipe:

1) Maximum particle size 3 inches
2) Soil classification, AASHTO M 145 A-1, A-2, or A-3

b. For plastic pipe:
1) Maximum particle size 1½ inches
2) Soil classification, AASHTO M 145 A-1, A-2-4, A-2-5, or A-3

2. Select borrow – Furnish granular material free of excess moisture, muck, frozen lumps, roots, sod, or other deleterious material conforming to the following:
a. Gradation Table 3-1
b. Liquid limit, AASHTO T89 30 max.

Table 3-1
Select Borrow Gradation

Sieve Size	Percent by Mass Passing Designated Sieve (AASHTO T 27 & T 11)
3 inch	100
1 inch	70-100
No. 4	30-70
No. 200	0-5

3. Water – Conform to the following:
a. Water for mixing or curing cement concrete, mortar, or grout. Conform to AASHTO M 157. Potable water of known quality may be used without testing according to AASHTO T 26. Potable water is safe for human consumption as defined by the public health authority having jurisdiction.
b. Water for planting or care of vegetation. Furnish water that is free of substances injurious to plant life such as oils, acids, alkalis, or salts.
c. Water for earthwork, pavement courses, dust control, and incidental construction. Furnish water free of substances detrimental to the work.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. Preparation for Roadway Excavation and Embankment Construction.
1. Clear the area of vegetation and obstructions within the clearing limits as follows:
a. In areas of cut slope rounding, cut stumps flush with or below the final ground line.
b. In areas outside the excavation, embankment, and slope rounding limits, cut stumps flush with the ground.
c. Trim tree branches that extend over the road surface and shoulders to attain a clear height of 20 feet. If required, remove other branches to present a balanced appearance. Trim according to accepted tree surgery practices. Treat wounds with tree wound dressing.

B. Salvaged Topsoil
1. Salvage topsoil from excavated areas. Stockpile salvaged topsoil at an approved location.
2. Refer to Section 03 10 00 “Site Clearance” Article 3.3, paragraph B for topsoil conservation.

C. Roadway Excavation

1. Excavate as follows:
    a. Do not disturb material and vegetation outside the construction limits.
    b. Incorporate only suitable material into embankments. Replace any shortage of suitable material caused by premature disposal of roadway excavation.
    c. Dispose of unsuitable or excess material legally off the project.
    d. At the end of each day's operations, shape to drain and compact the work area to a uniform cross-section. Eliminate all ruts and low spots that could hold water.

D. For the purpose of compaction, use AASHTO T 27 to determine the amount of material retained on a No. 4 sieve. Compact as follows:

1. More than 80 percent retained on a No. 4 sieve. Adjust the moisture content to a level suitable for compaction. Fill the interstices around rock with earth or other fine material as practical. Use compression-type rollers at speeds less than 6 feet per second and vibratory rollers at speeds less than 3 feet per second. Compact each layer of material full width with one of the following and until there is no visible evidence of further consolidation.
    a. Four roller passes of a vibratory roller having a minimum dynamic force of 40,000 pounds impact per vibration and a minimum frequency of 1000 vibrations per minute.
    b. Eight roller passes of a 20-ton compression-type roller.
    c. Eight roller passes of a vibratory roller having a minimum dynamic force of 30,000 pounds impact per vibration and a minimum frequency of 1000 vibrations per minute.
2. Increase the compactive effort for layers deeper than 12 inches as follows:
    - For each additional 6 inches or fraction thereof, increase the number of roller passes in (1.a) above by four passes.
    - For each additional 6 inches or fraction thereof, increase the number of roller passes in (1.b) and (1.c) above, by eight passes.
3. 50 to 80 percent retained on a No. 4 sieve. Use AASHTO T 99 to determine the optimum moisture content of the portion of the material passing a No. 4 sieve. Multiply this number by the percentage of material passing a No. 4 sieve, and add 2 percent to determine the optimum moisture content of the material. Adjust the moisture content of material classified A-1 through A-5 to a moisture content suitable for compaction. Adjust the moisture content of material classified A-6 and A-7 to within 2 percent of the optimum moisture content. Use compression-type rollers at speeds less than 6 feet per second and vibratory rollers at speeds less than 3 feet per second. Compact each layer of material full width according to (1) above.
4. Less than 50 percent retained on a No. 4 sieve. Classify the material according to AASHTO M 145. For material classified A-1 or A-2-4, determine the maximum density according to AASHTO T 180, method D. For other material classifications, determine the optimum moisture content and maximum density according to AASHTO T 99, method C.
    a. Adjust the moisture content of material classified A-1 through A-5 to a moisture content suitable for compaction. Adjust the moisture content of material classified A-6 and A-7 to within 2 percent of the optimum moisture content.
    b. Use compression-type or vibratory rollers. Compact each layer of material full width to at least 95 percent of the maximum density. Determine the in-place density and moisture content according to AASHTO T 310 or other approved test procedures. When required, use AASHTO T 224 to correct for coarse particles.

E. Earth Cuts
1. Scarify earth cuts to 6 inches below subgrade within the roadbed limits. Compact the scarified material according to this Section, Article 3.1, paragraphs D.

F. Subexcavation
1. Excavate material to the limits designated by the Contracting Officer (CO).
a. Take roadway cross-sections normal to centerline. When the centerline curve radius is less than or equal to 500 feet, take cross-sections at a maximum centerline spacing of 25 feet. When the centerline curve radius is greater than 500 feet, take cross-sections at a maximum centerline spacing of 50 feet. Take additional cross-sections at significant breaks in topography and at changes in the typical section. Along each cross-section, measure and record points at breaks in topography, but no further apart than 20 feet. Measure and record points to at least the anticipated slope stake and reference locations. Reduce all cross-section distances to horizontal distances from centerline.
2. Prevent unsuitable material from becoming mixed with the backfill.
a. Dispose of unsuitable or excess material legally off the project. When there is a pay item for waste, shape and compact the waste material in its final location. Do not mix clearing or other material not subject to payment with the waste material.
3. Backfill the subexcavation with topping, or other suitable material. Compact the material according to this Section, Article 3.1, paragraph D.

G. Borrow Excavation
1. Use all suitable roadway excavation in embankment construction. Do not use borrow excavation when it results in excess roadway excavation.

H. Preparing Foundation for Embankment Construction
1. Prepare foundation for embankment construction as follows:
a. For Embankments less than 4 feet high over natural ground. Remove topsoil and break up the ground surface to a minimum depth of 4 inches by plowing or scarifying. Compact the ground surface according to this Section, Article 3.1, paragraph D.
b. Embankment across ground not capable of supporting equipment. Dump successive loads of embankment material in a uniformly distributed layer to construct the lower portion of the embankment. Limit the layer thickness to the minimum depth necessary to support the equipment.
c. Embankment on an existing slope steeper than 1V:3H. Cut horizontal benches in the existing slope to a sufficient width to accommodate placement and compaction operations and equipment. Bench the slope as the embankment is placed and compacted in layers. Begin each bench at the intersection of the original ground and the vertical cut of the previous bench.

I. Embankment Construction
1. Furnish select borrow for the embankment. Construct embankments as follows:
a. General
1) At the end of each day's operations, shape to drain and compact the embankment surface to a uniform section. Eliminate all low spots that could hold water. Compact embankment side slopes with a tamping foot roller, by walking with a dozer, or by over-building the fill and then removing excess material to the final slope line.
b. Embankment within the roadway prism

1) Place embankment material in horizontal layers not exceeding 4 inches in compacted thickness.

c. Embankment outside of roadway prism

1) Where placing embankment outside the staked roadway prism, place material in horizontal layers not exceeding 4 inches in compacted thickness. Compact each layer according to this Section, Article 3.1, paragraph D.

J. Slope, grade, and shape ditches

1. Remove all projecting roots, stumps, rock, or similar matter. Maintain all ditches in an open condition and free from leaves, sticks, and other debris. Form furrow ditches by plowing or using other acceptable methods to produce a continuous furrow. Place all excavated material on the downhill side so the bottom of the ditch is approximately 18 inches below the crest of the loose material. Clean the ditch using a hand shovel, ditcher, or other suitable method. Shape to provide drainage without overflow.

K. Sloping, Shaping, and Finishing

1. Complete slopes, ditches, culverts, riprap, and other underground minor structures before placing aggregate courses. Slope, shape, and finish as follows:

a. Sloping. Leave all earth slopes with uniform roughened surfaces, except as described in (b) below, with no noticeable break as viewed from the road. Except in solid rock, round tops and bottoms of all slopes including the slopes of drainage ditches. Round material overlaying solid rock to the extent practical. Scale all rock slopes. If a slide or slip out occurs on a cut or embankment slope, remove or replace the material, and repair or restore all damage to the work. Bench or key the slope to stabilize the slide. Reshape the cut or embankment slope to an acceptable condition.

b. Stepped slopes. Where required by the contract, construct steps on slopes of 1⅓V:1H to 1V:2H. Construct the steps approximately 18 inches high. Blend the steps into natural ground at the end of the cut. If the slope contains nonrippable rock outcrops, blend steps into the rock. Remove loose material found in transitional area. Except for removing large rocks that may fall, scaling stepped slopes is not required.

c. Shaping. Shape the subgrade to a smooth surface and to the cross-section required. Shape slopes to gradually transition into slope adjustments without noticeable breaks. At the ends of cuts and at intersections of cuts and embankments, adjust slopes in the horizontal and vertical planes to blend into each other or into the natural ground.

d. Finishing. Remove all material larger than 6 inches from the top 6 inches of the roadbed. Remove unsuitable material from the roadbed, and replace it with suitable material. Finish roadbeds that are compacted according to Subsection 3.1.D(2) and (3) to within ±0.05 feet of the staked line and grade. Finish roadbeds that are compacted according to Subsection 3.1.D (1) to within ±0.10 feet of the staked line and grade. Finish ditch cross-sections to within ±0.10 feet of the staked line and grade. Maintain proper ditch drainage.

L. Disposal of Unsuitable or Excess Material

1. Dispose of unsuitable or excess material legally off the project.

M. Acceptance

1. All work and quantities will be evaluated by the CO in accordance with the design drawings and specifications.

END OF SECTION 31 20 00

SECTION 321123 – AGGREGATE BASE AND SUBBASE COURSE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes production, construction, and compaction of an aggregate base course used for pavements, shoulders, and incidental construction.

B. Quality control and acceptance:

1. The Contractor is responsible for controlling the quality of materials and work during production and placement.
2. The CO will monitor the adequacy of the Contractor's QC activities during production and placement and may perform inspection, sampling and testing to verify conformance with contract requirements.

1.2 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. AASHTO T 11: Materials Finer than 75-μm (No. 200) Sieve in Mineral Aggregates by Washing
2. AASHTO T 19: Bulk Density ("Unit Weight") and Voids in Aggregate
3. AASHTO T 27: Sieve Analysis of Fine and Coarse Aggregates
4. AASHTO T 89: Determining the Liquid Limit of Soils
5. AASHTO T 90: Determining the Plastic Limit and Plasticity Index of Soils
6. AASHTO T 96: Resistance to Degradation of Small-Sized Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
7. AASHTO T 180: Moisture-Density Relations of Soils Using a 4.54 kg (10 lb) Rammer and 457 mm (18 in) Drop
8. AASHTO T 193: The California Bearing Ratio
9. AASHTO T 255: Total Evaporable Moisture Content of Aggregate by Drying
10. AASHTO T 335: Determining the Percent of Fracture in Coarse Aggregate

1.3 DEFINITION

A. Completed Course: Compacted, unyielding, free from irregularities, with smooth, tight, even surface, true to grade, line, and cross-section.

B. Completed Lift: Compacted with uniform cross-section thickness.

C. Base Course: Crushed aggregate or similar as specified placed and compacted on prepared subgrade or subbase course.

D. Gravel Surfacing: Aggregate used for construction of low-volume access and staging area that can be easily graded and compacted.

E. Leveling Course: Crushed aggregate placed and compacted on base course to be used for finish grading.

F. Subbase Course: Sandy, gravelly material placed and compacted on prepared subgrade.

1.4 SUBMITTALS

A. Written report for approval for each aggregate class and source, a minimum of five working days before placement. Include the following:

1. Aggregate suitability. Refer to this Section, Part 2.
2. Name of supplier and location of source.
3. Maximum Dry Density and Optimum Moisture Content and associated test result data. Refer to AASHTO T 180, Method D.
4. Job mix gradation including single values for each sieve size, No. 4 and finer. The target values must be within the gradation limits of Table 2

PART 2 - PRODUCTS

2.1 SUBBASE COURSE

A. Clean granular material, free of clay, graded from coarse to fine, having a maximum aggregate size of 3 inches conforming to the requirements of AASHTO M 147 Sections 3 and 4.

2.2 BASE COURSE

A. Well-graded, clean, hard, tough, durable, and sound mineral aggregates consisting of crushed stone, crushed gravel, or crushed slag, free of organic matter and contamination from chemical or petroleum products, according to Table 2-1.

1. Material not meeting the gradation requirements may be allowed to remain in-place at the discretion of the Engineer provided density requirements are met.
2. Additional lots may not be placed until the deficiencies are addressed and corrected.
3. Correct material that does not meet the specified criteria by scarifying, placing additional material, re-mixing, reshaping, and re-compacting when determined by the Engineer.
4. Do not place additional material on any unaccepted layer.

Table 2-1

Aggregate Properties			
	Aggregate Class		
	A	**B**	
Dry Rodded Unit Weight	Not less than 75 lb/ft^3		AASHTO T 19
Liquid Limit/Plastic Index	Non-plastic	PI $\leq$ 6	AASHTO T 89 AASHTO 90
Aggregate Wear	Not to exceed 50 percent		AASHTO T 96
Gradation	Table 2-2		AASHTO T 11 AASHTO T 27

CBR with a 10 lb surcharge measured at 0.20 inch penetration	70% Minimum	N/A	AASHTO T 193
Two Fractured Faces	50% Min	N/A	AASHTO T 335

B. Establish the job mix (target) gradation for the 3⁄4 inch sieve and finer within the gradation limits.

1. The Job Mix Gradation Tolerance, Table 2-2, is the allowable deviation from the job mix (target) gradation on the applicable sieves.
2. All other percent passing shall be within the gradation limits. Refer to AASHTO T 11 and AASHTO T 27.
3. Percent passing based on total aggregate (dry weight) and fine and coarse aggregate with approximately the same bulk specific gravities.

Table 2-2

Gradation Limits		
Sieve Size	**Job Mix Gradation Target Blend**	**Job Mix Gradation Tolerance**
1 ½ inch	100	
1 inch	90 – 100	±9.0
¾ inch	70 – 85	±9.0
½ inch	65 – 80	±9.0
3/8 inch	55 – 75	±9.0
No. 4	40 – 65	±6.0
No. 16	25 – 40	±5.0
No. 200	7 - 11	±3.0

C. Pavement

1. Use Class A aggregate, Table 2-1. Random samples may be taken from the grade and tests for moisture, gradation, and laboratory density and performs in-place density determinations. Meet gradation limits and applicable tolerances of Table 2-2 for each gradation test. Meet minimum density test average of 95 percent of maximum laboratory density with no test less than 94 percent.

D. Curb, curb & gutter, ABA ramps, sidewalks, paved ditches, waterway, and other flatwork

1. Use Class A aggregate, Table 2-1. Random samples may be taken from the grade and tests for moisture, gradation, and laboratory density and performs in-place density determinations. Meet gradation limits and applicable tolerances of Table 2-2 for each gradation test. Meet minimum density test average of 95 percent of maximum laboratory density with no test less than 92 percent.

E. Shouldering

1. Use Class A or B aggregate, Table 2-1. Adjust moisture content before compaction

2.3 SOURCE QUALITY CONTROL

A. Perform tests necessary to locate acceptable source of materials meeting specified requirements.

B. Final approval of aggregate material will be based on test results of installed materials.

C. Should separation of coarse from fine materials occur during processing or stockpiling, immediately change methods of handling materials to correct uniformity in grading.

PART 3 - EXECUTION

3.1 SUBGRADE PREPARATION

A. Obtain Engineer's acceptance of subgrade before placing base course or surfacing material.

B. Do not place base course or surfacing materials in snow or on soft, muddy, or frozen subgrade.

3.2 EQUIPMENT

A. Compaction Equipment: Adequate in design and number to provide compaction and to obtain specified density for each layer.

3.3 HAULING AND SPREADING

A. Hauling Material:

1. Do not haul over surfacing in process of construction.
2. Loads: Of uniform capacity.
3. Maintain consistent gradation of material delivered; loads of widely varying gradations will be cause for rejection

B. Spreading Material:

1. Distribute material to provide required density, depth, grade, and dimensions with allowance for subsequent lifts.
2. Produce even distribution of material upon roadway or prepared surface without segregation.
3. Should segregation of coarse from fine materials occur during placing, immediately change methods of handling materials to correct uniformity in grading.

3.4 CONSTRUCTION OF COURSES

A. Subbase Course:

1. Maximum Completed Lift Thickness: 6 inches.
2. Completed Course Total Thickness: As shown.
3. Spread lift on prepared subgrade to required cross-section.
4. Water, grade, and roll surface until thoroughly compacted.
5. Blade or broom surface to maintain true line, grade, and cross-section.

B. Base Course:

1. Provide moisture content of ± 2 percent of optimum at the time of placement. Refer to AASHTO T 180, Method D and AASHTO T 255.
2. Place in layers of uniform thickness and compact each layer to a thickness not to exceed a 6 inch depth.
3. Finish to a uniform line and grade with surface deviations no more than 3⁄8 inch in 10 ft in any direction.
4. Correct any profile deviations greater than 3⁄8 inch.
5. Rework minimum of 4 inch lift to achieve homogeneous density.
6. Determine limits of correction based on extent of deviation.
7. Continue finishing until existing deviation is less than 3⁄8 inch.
8. Maintain optimum moisture content ± 2 percent during compaction.
9. Use appropriate compaction equipment adjacent to abutments, backwalls, approach slabs, wing walls, retaining walls, and other structures
10. Use a minimum of two passes with a roller for Type III placement or as directed by the Engineer
11. Finished surface shall be true to grade and crown before proceeding with surfacing.

3.5 FIELD QUALITY CONTROL

A. In-Place Density Tests:

1. Provide testing laboratory at least 4 hours' advance notification prior to testing.
2. Show proof that areas meet specified requirements before identifying density test locations.
3. Refer to Table 3-1 for minimum sampling and testing requirements for aggregate base course and surfacing.

Table 3-1

Minimum Sampling and Testing Requirements			
Property	**Test Method**	**Frequency**	**Sampling Point**
Gradation	ASTM C117and ASTM C183	One sample every **500** tons but at least every 4 hours of production	Roadbed after processing
Moisture Density (Maximum Density)	ASTM **D1557**, Method D	One test for every aggregate grading produced	Production output or stockpile
In-Place Density and Moisture Content	ASTM D5195, ASTM D6938, and ASTM D2216 for moisture content	One for each 500 ton but at least every 10,000 sq ft of area	In-place completed, compacted area

3.6 CLEANING

A. Remove excess material from the Work area. Clean stockpile and staging areas of all excess aggregate.

END OF SECTION 32 11 23

SECTION 32 12 13.13 - ASPHALT PRIME/TACK COAT

PART 1 - GENERAL

1.1 DESCRIPTION

A. This work consists of applying an emulsified asphalt tack coat and prime coat.

B. SUBMITTALS
1. Material invoice or bill for lading.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Emulsified Asphalt: A group of asphalt products using water and soap (emulsifier) to reduce viscosity. These products consist of approximately 60 percent asphalt and 40 percent emulsifier. When specified for tack coat, an equivalent anionic grade emulsion may be substituted for a cationic grade and vice versa. The sieve test in AASHTO M 208 is not required.
1. Anionic emulsions shall conform to AASHTO M 140. For RS-1h and RS-2h, conform to AASHTO M 140 for RS-1 and RS-2, except conform the following for the penetration on the residue.
a. Ductility, 77 ºF, 2 inches/min, AASHTO T 51 40 mm min.

B. Prime Coat: Liquid asphalt applied to a prepared subgrade or untreated base course.
1. Design according to MC-70 or MC-250.
2. Blotter Material – Granular materials, Table 2-1, when tested according to AASHTO T 27.

Table 2-1
Granular Materials

Sieve Size	Percent Passing
No. 4	90 to 100
No. 10	25 to 80
No. 200	0 to 15

C. Tack Coat: Emulsified asphalt to the existing surface or new pavement surface and intermediate lifts.
1. Design according to AASHTO M 208.
a. Select emulsion according to the time constraints required for Maintenance of Traffic (MOT) and the ability to fully cure before allowing traffic on the roadway.
1) Residual asphalt content to be approximately 60 percent.
a) Dilute at terminal only.
b) Do not change dilution before obtaining approval from the Contracting Officer.

D. Water – Conform to the following:

1. Water for mixing or curing cement concrete, mortar, or grout shall conform to AASHTO M 157. Potable water of known quality may be used without testing according to AASHTO T 26. Potable water is safe for human consumption as defined by the public health authority having jurisdiction.
2. Furnish water for planting or care of vegetation that is free of substances injurious to plant life such as oils, acids, alkalis, or salts.
3. Furnish water for earthwork, pavement courses, dust control, and incidental construction free of substances detrimental to the work.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. Equipment
   1. Asphalt distributor:
      a. Capable of heating asphalt evenly;
      b. Adjustable full circulation spray bar to 15-foot width;
      c. Positive controls including tachometer, pressure gauge, volume measuring device, or calibrated tank to uniformly deposit asphalt over the full width within 0.02 gallons per square yard of the required rate; and
      d. Thermometer for measuring the asphalt temperature in the tank.
   2. Rotary power broom.
      a. Self-propelled; and
      b. Capable of controlling the vertical broom pressure.
   3. Pneumatic-tire rollers. Furnish a minimum of two pneumatic-tire rollers both with the following capabilities:
      a. Self-propelled;
      b. Minimum compacting width – 5 feet; and
      c. Gross weight adjustable within the range of 200 to 360 pounds per inch of compaction width.

B. Surface Preparation. Clean the existing surface of all loose material, dirt, or other deleterious substances by approved methods. When the surface is concrete, remove excess joint and crack filler.
   1. Prime Coat
      a. Shape the surface to the required grade and section.
      b. Keep the surface free from ruts, corrugations, or other irregularities.
      c. Compact the surface to the level approved by the Contracting Officer.
   2. Tack Coat
      a. Clean the surface of all materials that prevent the tack coat from bonding to the existing surface such as mud, dirt, leaves, and water.
      b. Cover all tacked surface areas with surfacing materials the same day the tack coat is applied.

C. Weather Limitations. Apply asphalt tack coat on a dry, unfrozen surface when the air temperature in the shade is above 35 ºF and rising.

D. Prime Coat and Tack Coat Application
   1. Protect the surfaces of nearby objects to prevent spattering or marring.

2. The Contracting Officer (CO) will approve the exact application rate, temperature, and area to be treated before application and may make adjustments for variations in field conditions. Apply the prime and tack coat uniformly with an asphalt distributor. Move distributor forward at the proper application speed at the time the spray bar is opened. Use care not to apply excess asphalt at the junction of spreads. Correct skipped areas or deficiencies. Remove and dispose of paper or other material used.
3. Apply at the following rates:
   a. Prime Coat: 0.5 gal/yd^2
   b. Tack Coat: Refer to Table 3-1.

Table 3-1
Application Rate (gal/yd^2)

Existing Pavement Condition	Residual	Undiluted	1:1 Dilute	2:1 Dilute
New Hot Mix Asphalt	0.03	0.05	0.10	0.08
Milled Hot Mix Asphalt	0.07	0.12	0.24	0.18

4. When a tack coat cannot be applied with an asphalt distributor spray bar, apply the tack coat uniformly and completely by fogging with a hand spray attachment or by another approved method. If excess asphalt material is applied, squeegee the excess from the surface. Allow the tacked surfaces to completely cure before placing the covering course. Place the covering course within 4 hours of placing the tack coat.
5. Do not apply prime coat or tack coat:
   a. On a wet surface or where surface conditions prevent proper adhesion.
   b. When the surface temperature is below 50 degrees F.
   c. When weather conditions prevent proper adhesion.
6. Keep the viscosity between 50 and 100 centistokes. Refer to AASHTO T 201.
7. Immediately apply another application to under primed surface.
8. Apply tack coat between all lifts of Hot Mix Asphalt and to all surfaces, including vertical that will come in contact with Hot Mix Asphalt.
   a. Apply prime coat to protect the grade from damage.
9. Spread blotter material if the prime coat does not penetrate.
   a. Use the quantities required to absorb the excess asphalt.
   b. Blotter material cost will be incidental to the tack coat pay item cost.
10. Allow prime or tack coat to fully cure before allowing traffic on paving.

END OF SECTION 321213

SECTION 32 12 16.02 - ASPHALT PAVEMENT – STATISTICALLY ACCEPTED

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes

1. Work under this Section shall consist of constructing one or more courses of Asphalt Pavement – Statistically Accepted. Furnish all labor, material, equipment, tools, transportation and supplies necessary to complete the work according to the contract.
2. Furnish asphalt pavement (pavement) mixture composed of mineral aggregate, performance-graded asphalt binder, recycled asphalt, mineral filler, anti-strip additives and, if applicable, manufactured warm mix asphalt (WMA) additive and/or WMA plant process modifications that are mixed in a central mixing plant.
   (1) Prepare the surface by cleaning the existing surface of loose material, dirt, or other deleterious material by approved methods.
   (2) Placed on a prepared surface(s) in accordance with these specifications and in conformance to the lines, grades, compacted thicknesses and typical cross sections shown on the contract drawings or as directed by the Contract Officer (CO).
   (3) Apply an asphalt tack coat to contact surfaces of pavements, curbs, gutters, manholes, and other structures according to section 32 12 13

B. Related Sections

1. 32 11 23 – Aggregate Base Course
2. 32 12 13 – Tack Coat
3. 32 17 23 – Pavement Markings

C. Measurement Procedures

1. Surface preparation and Asphalt emulsion for Tack Coat, as required by the plans and these specifications, will not be measured separately for payment. It will be included in the price of the Asphalt Pavement in place.
2. Asphalt Pavement will be measured by the lump sum for all work required. Work constructed outside of the planned lines and grades, or exceeding the dimensions as detailed in the contract, will not be measured for payment. The lump sum contract bid price for Asphalt Pavement will include:
   - cost of the Performance-Graded Asphalt Binder (including any binder modifiers)
   - anti-strip additive (if required by the job mix formula)
   - warm mix additives and technologies, if used
   - pre-construction conference
   - surface preparation
   - construction of control strip(s)
   - development and implementation of the Quality Control Plan (QCP)
   - joint treatments
   - removal of cores and filling voids left by cores
   - tack coat material and application
   - all sampling and testing required by the contract
   - all materials, labor, and equipment required to construct the asphalt pavement course(s)

D. Payment Procedures

1. Asphalt Pavement – Statistically Accepted: The accepted work will be paid at the contract lump sum price for each asphalt mix type listed as a pay item in Section 012700, Article 3.1 List of

Contract Line Items, except the lump sum bid price for each listed asphalt mix type will be adjusted according to this section Part 3 Article 3.4 FIELD QUALITY CONTROL.

1.2 REFERENCES

A. AASHTO - American Association of State Highway and Transportation Officials
1. AASHTO M 320 - Standard Specification for Performance-Graded Asphalt Binder
2. AASHTO R 26 - Standard Practice for Certifying Suppliers of Performance-Graded Asphalt Binders
3. AASHTO R 35 – Standard Practice for Superpave Volumetric Design for Asphalt Mixtures
4. AASHTO T 84 – Standard Method of Test for Specific Gravity and Absorption of Fine Aggregate
5. AASHTO T 85 – Standard Method of Test for Specific Gravity and Absorption of Coarse Aggregate
6. AASHTO T-166 – Standard Method of Test for Bulk Specific Gravity (G_{mb}) of Compacted Hot Mix Asphalt (HMA) Using Saturated Surface-Dry Specimens
7. AASHTO T 283 – Standard Method of Test for Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage
8. AASHTO T 308 – Standard Method of Test for Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method
9. AASHTO T 312 – Standard Method of Test for Preparing and Determining the Density of Asphalt Mixture Specimens by Means of the Superpave Gyratory Compactor

B. ASTM - ASTM International, formerly known as American Society for Testing and Materials

C. FAR - Federal Acquisition Regulations
1. FAR 46.105 Contractor responsibilities
2. FAR 52.236-9 Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements
3. FAR 52.246-12 Inspection of Construction

1.3 DEFINITIONS

A. ESAL = Equivalent Single Axle Load

B. RAP = Recycled Asphalt Pavement

1.4 SUBMITTALS

A. Job Mix Formula (JMF): No pavement shall be placed on the project site until a JMF has been submitted by the Contractor, approved by the CO and a prepaving meeting conducted. The JMF shall be submitted in writing by the Contractor at least 30 days prior to the start of paving operations. The submittal shall be a signed statement prepared by the contractor's testing laboratory that certifies the proposed JMF meets the requirements of the contract and can be placed and compacted in the field during production. For each JMF submit the following:
1. The JMF shall identify the specific part of the work for which it is intended to be used (i.e. base course, intermediate course, surface course, sidewalk, etc.) and shall indicate minimum criteria listed above for each JMF. If multiple mixing plants are proposed to be used, submit a separate JMF for each plant.
2. Submit a list of materials proposed for use in the work under this Subsection including the name and address of the materials producers and the locations from which the materials are to be obtained.
3. Percent of performance graded asphalt binder (PGAB) required by the JMF to meet the specified design parameters.
4. PGAB Production Certificate of Compliance (COC) certifying the specified binder grade and

properties are in accordance with AASHTO M 320 and R 26.

(1) State the type of modification, if applicable. No PPA modification shall be used as a modifier or as a cross-link agent. The PAV test temperature shall be 2120F.

(2) Date and place of manufacture

(3) Lot number or other means of cross-referencing to the manufacturer's inspection and testing system

(4) Substantiating evidence that the material conforms to the contract quality requirements as required by FAR 46.105(a)(4), including all of the following:

a. Test results on material from the same lot and documentation of the inspection and testing system

b. A statement from the manufacturer that the material complies with all contract requirements

c. Manufacturer's signature or other means of demonstrating accountability for the certification

5. Mixing temperature: Conform to recommendations of PGAB supplier. Do not heat above 350F.
6. Compaction temperature requirements for the asphalt binder grade specified for either hot mix asphalt (HMA) or WMA, as applicable.
7. Percent and type of anti-stripping additive, if required.
8. Individual bin/stockpile percentages including average percent passing each specified sieve size, resulting blend gradations and proposed designated sieve Target Values (TV) for specified gradation. Gradation shall be performed using AASHTO T-11 procedure B.
9. Submit aggregate quality test results and furnish certificates of compliance signed by the materials producers or subcontractors and suppliers, stating that materials when tested according to specified test method(s) meet or exceed the specified contract requirements.
10. At the time of JMF submittal, the Contractor shall provide samples of aggregates, binder, mineral filler, bag house fines (if used in the submitted JMF), and antistrip additive (if used in the submitted JMF). Provide sufficient quantity of each component for JMF verification by the CO. This may require up to 800 pounds of aggregates, proportioned according to individual bin combinations, five individual gallons of PGAB, and proportionate amounts of the other components necessary to complete JMF verification. Confirm with the CO the actual quantities required before delivering samples for JMF verification. Allow the CO the opportunity to witness sampling and splitting of JMF submittal samples.
11. WMA – Include a complete description of the WMA technology and the target dosage rate together with the submission of an MSDS for the additive, if applicable, and submission of either enough of the additive for the laboratory mix design verification, or the additive pre-blended in the PGAB at the correct dosage. If the additive is not pre-blended into the PGAB, include directions for properly incorporating the additive into the laboratory made mixture. Include documentation of at least three successful past WMA technology field applications including project type, project owner, tonnage placed, mix design, mixture volumetric and performance, temperature range for laboratory mixing and compacting, asphalt binder performance grade test data over the range of WMA additive percentages proposed for use, if applicable, evidence of compatibility of WMA additive with asphalt binder and anti-strip agent, and the temperature range for field mix production, delivery, laydown and compaction.

B. Control Test Section

1. After the JMF has been approved a Control Test Section (CTS) shall be placed, and accepted, prior to beginning full production. The purpose of the CTS is to demonstrate the contractor's ability to produce, place and compact the mixture as designed, specified and approved. If necessary, during this time, adjustments to the mix design may be made according to Subsection 3.5 ADJUSTMENTS. TV adjustments to the JMF greater than those designated in Table 1-1 may require a completely new mix design submittal and verification.

Table 1-1
Allowable JMF Revision Limits

Test Property	**Verification and Adjustment Limits,%**
Asphalt Binder Content	+/- 0.4
Gradation: 2.36mm & Larger 600um & 300um	+/- 3.0 +/- 2.0
Gradation: 0.075mm	+/- 1.0
Voids in Mineral Aggregate, VMA,	Min. per Table 2-1
Voids Filled with Asphalt, VFA,	Range per table 2-1

2. The CTS will be, unless otherwise directed by the CO, due to project configuration, a minimum of 1000 feet long and two lanes wide. It shall include a Longitudinal Joint Wedge if the placement thickness is equal to or greater than 1-1/2 inches. It shall be of the same depth, and placed on the same underlying material, as the work that it represents. The equipment used in construction of the CTS shall be the same type and weights to be used on the remainder of the work.
3. Take three (3) random samples from behind the laydown machine. The samples shall be split, and the split portion shall be delivered to the CO for verification testing. Testing shall include: VMA, VFA, VTM, TSR, aggregate gradation and asphalt binder content. The contractor shall test their portion of the samples and report data to the CO. Test samples according to contract specified testing methods. PGAB shall be verified using approved documentation production COC meeting the specified grade.
4. Take five (5) randomly selected cores from the finished pavement mat and five (5) randomly selected cores from the longitudinal joint in the CTS. Provide splits to the CO for evaluation. Test samples according to contract specified testing methods. Correlation of density equipment with cores will be as described in the QCP and approved by the CO. Provide correlation data between the density gauge and the cores to the CO.
5. All density gauges shall be calibrated in accordance with manufacturers' recommendations prior to use on the project. Provide calibration record to the CO.
6. The CTS shall be considered acceptable and allowed to remain in place if:
7. Mixture and Density. The mix, placed mat, and longitudinal joint are acceptable if the mean of the multiple test results are within specification limits for: gradation, asphalt content, air voids, VMA, TSR and density; with no single test result falls outside the specification limits as defined in Section 3.4 FIELD QUALITY CONTROL.
8. Smoothness: pavement mat is uniform in texture and smoothness, with no surface deviations in excess of ¼-inch in 10 feet.
9. If the initial CTS is unacceptable as described above, adjust the JMF, plant operations or placing and compacting procedures, as necessary and construct another CTS.
10. Additional CTSs, as required, shall be constructed and evaluated until an acceptable CTS is constructed. All unacceptable CTSs shall be removed at the Contractor's expense. Costs incurred by the Government, if any, for additional sampling, testing and inspection required due to unacceptable CTSs will be deducted from payments owed the contractor.
11. Full production shall not begin until an acceptable CTS has been constructed. However, production may begin, contingent upon the TSR results, if all other test results are acceptable, at the Contractor's risk.

1.5 QUALITY ASSURANCE & CONTROL

A. The provisions of FAR 52.246-12 Inspection of Construction shall apply.

B. QCP: Comply with the requirements specified in Section 01 40 00 "Quality Requirements."
1. In addition, the QCP shall include:

(1) Quality Control Sampling and Testing
a. Frequency of sampling
b. Testing procedures
c. Random Sampling Plan
d. Sample Identification System and numbering
e. Quality Control Sampling & Testing
f. Split Sample procedures
g. Reporting
h. Sample Storage and Retention
(2) Field Operations
a. Placement Equipment and Procedures
b. Placement QC Sampling, Testing process
c. Evaluation of test data from placement operations
d. Reporting

C. Inspection
1. The Contractor shall perform inspection of all work required by this contract. At a minimum, schedule pre-work meetings with the CO, production and placement personnel, and subcontractors and suppliers at the following phases of the work: Preparatory - at least seven (7) days prior to beginning any work element: Start-Up - at beginning of each work type; Production and Placement - periodically throughout the work.
2. The minimum frequency for inspections shall be as shown in the approved QCP. The results and findings of QC inspections shall be documented on Inspector Daily Reports (IDR).
3. Sample template for IDR is attached at the end of this section, contract to use this or a form which includes, at minimum, the information from the template.

D. Sampling and Testing Requirements
1. Testing to be conducted by third-party agency.
2. Perform sampling and testing at both third-party agency facility and at the site of field placement. Take samples and test per Table 3-1 for quality assurance acceptance testing, verification (correlation), or other purposes and deliver to the CO immediately after sampling and splitting.
3. All sampling and testing shall be in accordance with applicable AASHTO, ASTM, or agency procedures as designated in the contract. Furnish industry standard containers for all material samples. Provide the CO the opportunity to monitor and witness all sampling, splitting and testing.
4. Complete required tests on production and deliver test results to the CO within twenty-four (24) hours of taking each sample, but preferably before the next day’s paving operation begins.

E. Documentation and Reporting
1. Document all inspection, sampling and testing activities on IDR forms and/or Test Report Forms (TRF), as appropriate. Deliver to the CO within one working day of those activities occurring. The QC Manager shall review and evaluate IDRs and TRFs on a daily basis to assure that all work conforms to contract requirements. Include, at a minimum, the following information:
(1) Daily weather or environmental conditions
(2) A summary of production or placement activities completed, including equipment used and hours worked
(3) Any non-conforming material or workmanship identified.
(4) Any corrective actions recommended or taken
(5) Discussions with subcontractors or CO personnel
(6) Visitors to the production facility or project site
2. Corrective Action: Describe in the QCP what action will be taken when inspection or test results indicate that non-conforming work is being produced. Correct all areas of unacceptable pavement

at no additional cost to the Government. Submit corrective plan to the CO for approval.

1.6 DELIVERY & HANDLING

A. Asphalt mixture deliveries shall be scheduled so that placing and compacting of pavement mixtures is continuous, with minimal stopping and starting of the paver.

B. Coordinate trucks dispatched from the plant to ensure that all asphalt mixtures delivered to the project is placed and compacted during daylight hours. Provide for reliable two- way radio or cellular phone communication between the project site and the plant.

C. Do not use or combine asphalt mixes produced from different plants unless they are produced using the same JMF, are materials from the same sources, and have been approved. Construct a separate control section for each plant from which production is intended.

D. The temperature range of the asphalt mixture when delivered to the project site will be established in the Contractor QCP utilizing the approved JMF. Monitor the temperature of the mixture for each load, in the haul vehicles, in the paver hopper, and behind the laydown. Use approved methods and instruments for measuring temperature. Record results on Inspector's Daily Reports. Visually inspect the delivered asphalt mixture for crusting or segregation. Reject material that is crusted, segregated, or which is not within the delivery temperature range established in the Contractor QCP.

1.7 PROJECT SITE CONDITIONS

A. Place HMA on a dry, unfrozen surface when the air temperature in the shade is above 35 ºF and rising for minimum 2.1 inches; above 40^0F and rising for minimum 1.5 inches; above 50^0F and rising for less than 1.5 inches and, the temperature of the road surface in the shade conforms to Table 1-2.

B. Place WMA on a dry, unfrozen surface and only when weather conditions allow for proper production, placement, handling and compaction for the specific WMA technology used.

Table 1-2

HMA Placement Temperature Compacted Lift Thickness Road Surface Temperature ºF	<2 Inches	2.1-3 Inches	>3.1 Inches
	Minimum Lay-Down Temperature (1) oF		
< 35	(2)	(2)	(2)
35 - 39.9	(2)	(2)	280
40 - 49.9	(2)	285	275
50 - 59.9	295	280	270
60 - 69.9	285	275	265
70 - 79.9	280	270	265
80 – 89.9	270	265	260
≥ 90	265	260	255

(1) Never heat the asphalt mix above the temperature specified in the approved mix design.
(2) Paving not allowed.

C. Rain and Surface Conditions:
1. Immediately cease transportation of asphalt mixtures from the plant when rain begins at the project.
2. Do not place asphalt mixtures while rain is falling, or when there is water on the surface.
3. Placing asphalt may continue, when the rain has stopped and water has been removed from the tacked surface to the satisfaction of the CO and if the temperature of the asphalt meets the specification requirements.
4. Information regarding the air temperature, average wind speed, overcast conditions, mix delivery temperature, and existing moisture conditions shall be evaluated by the CO and a Contractor's representative located at the paving operation prior to placement.
5. The Contractor assumes responsibility for constructing the pavement to meet compaction, bonding to the underlying surface and specification requirements.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Superpave PGAB:
1. The asphalt binder shall be a PGAB which meets the specification requirements of AASHTO M320 and AASHTO R26.
2. The PG binder shall be achieved by the use of Neat Asphalt with elastomer polymer modification if needed.
3. The grade for the PGAB shall be PG 58-28. Grade SX (½-inch nominal maximum aggregate size [NMAS]) mix for the surface layer of HMA and Grade SX 1. ½-inch NMAS) for underlying lifts. Use a lift thickness for Grade SX between 1-1/2 and 2 inches.
4. Acceptance of the PGAB will be in accordance with AASHTO R26 "Standard Practice for Certifying Suppliers of Performance Graded Asphalt Binders". PGAB shall be provided by an Approved Supplier (AS) under the Approved Supplier Certification (ASC) system. Provide a COC for the specified PGAB with each bulk delivery to the mixing plant during the production.
5. The blending at the asphalt plants of PG binders from different suppliers is strictly prohibited.
6. The COC for binder shall be a production certificate. All materials requiring a production certification shall require the manufacturer to furnish a production certification for each shipment of material. Include the following with each production COC:
(1) Date and place of manufacture;
(2) Lot number or other means of cross-referencing to the manufacturer's inspection and testing system;

(3) Substantiating evidence that the material conforms to the contract quality requirements as required by FAR 46.105(a)(4), including all of the following:

- Test results on material from the same lot and documentation of the inspection and testing system;
- A statement from the manufacturer that the material complies with all contract requirements; and
- Manufacturer's signature or other means of demonstrating accountability for the certification.

B. All other manufactured, non-project produced materials shall require Commercial Certification such as mineral filler, antistrip and WMA additives.

C. RAP Material:

1. General Requirements: RAP may be used as a component of the asphalt mixture if approved by the CO. Usage of RAP is subject to the following requirements: no RAP in Open Graded Friction Courses; a maximum of 20 percent for surface courses; and a maximum of 25 percent for all other courses. Percent RAP is computed by mass.

D. When required by the mix design (job mix formula) furnish lime conforming to AASHTO 303

E. Aggregates: Shall conform to the requirements of Section 32 11 23 of these specifications for the designated grading.

F. WMA – If WMA is proposed, use a WMA technology that has been approved by the state in which the project is being constructed. Provide evidence of the state approval.

2.2 EQUIPMENT

A. Mixing Plant – use mixing plants conforming to AASHTO M 156 supplemented as follows:

1. All plants.
   (1) Automated controls. Control the proportioning, mixing, and discharging of the mix automatically.
   (2) Dust collector. AASHTO M 156, Requirements for All Plants, Emission Controls is amended as follows: Equip the plant with a dust collector. Dispose of the collected material. In the case of bag house dust collectors, dispose of the collected material or return the collected material uniformly. Use of bag house fines in asphalt concrete mixes requires approval unless included as part of the approved JMF.
   (3) RAP. When RAP material is incorporated into the mixture, modify plants according to the plant manufacturer's recommendations to process reclaimed material, and according to any state specific specifications related to processing RAP.
   (4) WMA – When proposed and approved, modify the asphalt plant as required by the manufacturer to introduce the WMA technology.
2. Drum dryer-mixer plants.
   (1) Bins. Provide a separate bin in the cold aggregate feeder for each individual aggregate stockpile in the mix. Use bins of sufficient size to keep the plant in continuous operation and of proper design to prevent overflow of material from one bin to another.
   (2) Stockpiling procedures. Separate aggregate into at least 2 stockpiles with different gradations. As a minimum, stockpile mostly coarse material in one stockpile and mostly fine material in another.
3. Batch and continuous mix plants.
   (1) Hot aggregate bin. Provide a bin with 3 or more separate compartments for storage of the screened aggregate fractions to be combined for the mix. Make the partitions between the

compartments tight and of sufficient height to prevent spillage of aggregate from one compartment into another.

(2) Load cells. Calibrated load cells may be used in batch plants instead of scales.

(3) RAP. Modify batch plants so the RAP is introduced into the mix after bypassing the dryer. Design the cold feed bin, conveyor system, and special bin adjacent to the weigh hopper, if used, to avoid segregation and sticking of the RAP material. Heat aggregate to a temperature that will transfer sufficient heat to the RAP material to produce a mix of uniform temperature within the range specified in the approved JMF.

B. Hauling Equipment – Use vehicles with tight, clean, and smooth metal beds for hauling asphalt mixture.

1. Thinly coat the beds with an approved material such as a small amount of lime solution or an approved soap solution or detergent to prevent the mix from adhering to the beds. Do not use petroleum derivatives or other coating material that contaminates or alters the characteristics of the mix.
2. Drain the bed before loading.
3. Equip each truck with a canvas cover or other suitable material of sufficient size to protect the mix from the weather and thermal segregation and during hauling.
4. When necessary to maintain temperature, use insulated truck beds and securely fastened covers pinned on the sides.
5. Provide a minimum of two (2) access port or holes for checking temperature of asphalt mix in the truck, located near the midpoint of the body, at least 12 inches above the bed.

C. Pavers: Use pavers that are:

1. Self-contained, power-propelled units with adjustable vibratory screeds with full width screw augers;
2. Heated for the full width of the screed;
3. Capable of spreading and finishing courses of asphalt mix in widths at least 12 inches more than the width of one lane;
4. Equipped with a receiving hopper having sufficient capacity to ensure a uniform spreading operation;
5. Equipped with automatic feed controls, which are properly adjusted to maintain a uniform depth of material ahead of the screed;
6. Operable at forward speeds consistent with satisfactory mix lay down;
7. Capable of producing a finished surface of the required smoothness and texture without segregating, tearing, shoving, or gouging the mix; and
8. Equipped with automatic screed controls with sensors capable of sensing grade from an outside reference line, sensing the transverse slope of the screed, and providing the automatic signals that operate the screed to maintain grade and transverse slope.
9. Do not use diesel during paving operations as release agent on any parts that come in contact with the mix.

D. Rollers

1. Rollers of the vibratory, steel wheel, oscillatory, and pneumatic-tired type may be used. They shall be in good condition, capable of reversing direction without backlash, and operating at slow speeds to avoid displacement of the pavement mixture.
2. Static rollers shall be operated at speeds not to exceed 3 mph and vibratory rollers shall be operated at a minimum of 10 to 12 impacts/ft. in vibratory mode.
3. The number, type, and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition.
4. The Contractor shall exercise caution when using vibratory rollers so as not to cause damage to buried infrastructure or adjacent infrastructure. Damage to buried or adjacent infrastructure will

be the responsibility of the Contractor.

5. The new Oscillation type rollers are acceptable for use for compaction rolling.

E. Materials Transfer Vehicle (MTV). Furnish and use an MTV with the following:

1. A loading system with the ability to receive mixtures from the hauling equipment;
2. A min storage capacity of 13 tons with a remixing system in the MTV storage bin;
3. A discharge conveyor to deliver the mixture to the paver hopper; and
4. A weight not exceeding the maximum legal loadings on structures.
5. Pick-up machines, hopper inserts, and material transfer devices are not considered MTVs.

2.3 MIXES

Composition of Asphalt Mixture, JMF

A. Furnish mixes of aggregate, asphalt binder, RAP, and additives that meet applicable material specifications and the design requirements as designated in Table 2-1. Volumetric mix properties will be determined and approved at Ndes according to AASHTO T-312 and R35 after all additives/technologies have been incorporated. This includes meeting PGAB specification requirements. South Rim Drive ESAL = 0.27M per lane and Visitor Center parking lot = 0.02M. A gyratory number of 75 shall be used for the mix design.

Table 2-1
Asphalt Pavement Design Requirements

Design ESAL(5) (Million)	**Gyratory Compaction Level (% Theoretical Maximum Specific Gravity, G_{mm}) AASHTO T 312(4)**			**Minimum Voids-in-the Mineral Aggregate (VMA), % (1)**				**Voids Filled with Asphalt (VFA), %**	**Dust-to-Binder Ratio (3)**	**Minimum Tensile Strength Ratio, AASHTO T 283(4)**
				Nominal Maximum Size Aggregate (2)						
	$N_{initial}$	**N_{design}**	**N_{max}**	**1 inch**	**¾ inch**	**½ inch**	**⅜ inch**			
< 0.3	6 (≤91.5%)	50 (96.0%)	75 (≤98.0%)	12.0	13.0	14.0	15.0	70.0 - 80.0	0.8 -1.6	0.80
0.3 to < 3	7 (≤90.5%)	75 (96.0%)	115 (≤98.0%)					65.0 - 78.0		
3 to 30	8 (≤89.0%)	100 (96.0%)	160 (≤98.0%)					65.0 - 78.0		

(1) When mineral filler or hydrated lime is used, include in the calculation for compliance with the VMA.
(2) The nominal maximum size aggregate is one size greater than the first sieve to retain more than 10 percent of the combined aggregate.
(3) Dust to binder ratio is the effective asphalt content divided by the total percent of material passing the No. 200 (75 µm) sieve. Dust includes lime, bag house fines, and other mineral matter. Use washed sieve analysis.
(4) Prepare specimens in accordance with AASHTO T-312. AASHTO T-283 specimens shall be 4-inches in diameter for freeze thaw. Use AASHTO T-166 regardless of the volume of water absorbed.
(5) The design requirements for < 0.3 million ESALs will be referred to as Level NPS-1, 0.3 to <3 million ESALs will be referred to as Level NPS-2, and the design requirements for 3 to 30 million ESALs shall be designated at Level NPS-3.

B. Superpave Aggregate Gradation: Furnish nominal maximum size aggregate gradation(s) as specified in the JMF design and that conform to AASHTO M-323, Superpave Volumetric Mix Design, Table 3.

C. Fractured Faces Coarse Aggregate, Uncompacted Void Content of Fine Aggregate (% min), Sand Equivalent (%min), and Flat and Elongated (% max) shall meet requirements specified in AASHTO M-323, Superpave Volumetric Mix Design, Table 5.

D. Furnish hard durable particles or fragments of crushed stone conforming to state specifications.

E. Do not use aggregates known to polish or carbonate aggregates containing less than 25 percent by mass of insoluble residue when tested according to ASTM D3040.

F. WMA (if used) – Comply with the manufacturer's recommendations for incorporating the WMA technology. Test specimens may be made from plant produced or laboratory prepared WMA. Test specimens must be made from plant produced WMA if adding the WMA technology in the laboratory does not simulate the production process.

PART 3 – EXECUTION

3.1 INSTALLLERS

A. The Contractor shall place pavement mixtures at the locations, widths, thickness and to the grades shown on the Drawings

B. Maintain all equipment in safe and satisfactory operating condition.

C. Protection and Restoration of Property and Landscape—follow the requirements of FAR Clause 52-236-9 Protection of existing Vegetation, Structures, Equipment, Utilities and Improvements. In addition:

1. Protect adjacent work from contamination by paving materials and placement activities. Remove any stains or damage from adjacent work, structures, curbing, or other facilities, resulting from such contamination. Remove and dispose of all waste and spillage.
2. Do not damage or disturb existing improvements, facilities, features or vegetation. Provide suitable protection where required before starting work and maintain protection throughout the course of the work.
3. Restore damaged improvements, including existing paving on or adjacent to the site that has been damaged as a result of construction work.
4. Check frames, covers, grates, water valve boxes and other miscellaneous castings that are located in the proposed pavement areas to ensure that they have been correctly positioned and set to the proper slope and elevation.

3.2 PREPARATION –

A. Notify the CO at least 14 days prior to beginning paving work. A prepaving conference will be scheduled at least 7 days prior to starting pavement placement. All CO, Contractor and supplier representatives critical to the paving operation will be required to attend this meeting. At this meeting be prepared to discuss work schedule, traffic control, proposed equipment to be used, control strip construction and acceptance, production and placement quality control, final acceptance procedures and requirements, and any other elements critical to the successful execution of paving operations.

B. Preparation of the Underlying Surface

1. Immediately before placing the pavement mixture, the underlying course shall be thoroughly cleaned of all dust and debris by a self-propelled sweeper. Areas inaccessible by power sweepers shall be broom swept manually until the surface is clean.
2. Ensure that the surface to receive the pavement mixture has been approved by the CO, is properly compacted, and free from soft areas or other deficiencies that might affect the quality of the final pavement course.

3.3 CONSTRUCTION

A. Placement of Asphalt
1. Place all courses of pavement mixture with an asphalt paver or device approved by the CO.
2. On concrete pavement remove excess crack and joint material by trimming the excess material flush with the pavement surface prior to placing the pavement mixture.
3. Remove all excess joint or crack material on any pavement surface in excess of 1/16 inch in depth prior to placing new pavement courses.
4. The Contractor shall furnish, set, and maintain all line and grade stakes, string lines or other controls necessary to guide and control the paving equipment.
5. Hauling over freshly placed material shall not be permitted until the material has been compacted, as specified, and allowed to cool to an internal temperature of 140°F (60°C) minimum.

B. Prevent damage by construction operations to gutters, catch basins, curbs, concrete structures, pavement surfaces and other facilities adjacent to the work. If damage occurs, repairs shall be made to the satisfaction of the CO at no additional cost to the Government.

C. Production
1. Do not heat asphalt binder above 350^0F unless approved by the manufacturer.
2. Weigh or meter aggregates, additives and asphalt binder material and introduce into the mixer in the proportions specified by the JMF. Take corrective action as outlined in the QC plan when testing results indicate the material is not in compliance with the requirements of the contract and the approved JMF and when the PF is less than 0.90.
3. Mix the combined materials until the aggregate are uniformly coated with asphalt binder in accordance with state specifications and thoroughly distributed throughout the mixture.
4. The temperature of the mixture shall be in accordance with the Performance Graded Asphalt Binder (PGAB) allowable mixing and compaction temperature range. The temperature of the mixture when discharged from the mixer or silo shall be + 25°F from the value stated in the JMF. Mixtures exceeding these limits shall be subject to rejection.

D. Aggregate Preparation.
1. For batch plants, heat, dry, and deliver aggregate for pug mill mixing at a temperature sufficient to produce an asphalt concrete mix temperature within the approved range. Adjust flames used for drying and heating to prevent damage to and contamination of the aggregate.
2. Control plant operations so the moisture content of the asphalt concrete mix behind the paver is 0.5 percent or less according to AASHTO T 329.
3. Before starting asphalt concrete mix production, obtain approval of synchronized metering and weighing devices used to introduce a constant rate of lime and water.
4. When lime is used as an anti-strip, adjust the aggregate moisture to at least 4 percent by mass of aggregate. Mix the lime uniformly with the aggregate before introducing the aggregate into the dryer or dryer drum. Use calibrated weighing or metering devices to measure the amount of lime added to the aggregate.
5. Add lime to the aggregate by one of the following methods:
6. Method A: Add lime to the combined cold feed aggregate using an enclosed in-line cold feed mechanical pug mill mixer. Use a twin-shaft, continuous mixing pug mill with adjustable mixing paddles. Adjust the retention time of the mixture in the pug mill so no unmixed lime is visible after the lime and aggregate exit the pug mill.
7. Method B: Add lime to the produced aggregates during stockpiling using a pug mill. Distribute the lime per the stockpile ratios stated in the asphalt concrete mix design.
8. A minimum moisture content of two percent by dry weight for coarse aggregate and 4 percent by dry weight for fine aggregate is required at the time the aggregates and lime are mixed. Marinate treated aggregate in stockpiles from 24 hours to 60 days before using in asphalt concrete mix. Do

not use aggregate marinated longer than 60 days.

9. Method C: Add lime to the combined cold feed aggregate by introducing the lime between aggregate layers as the aggregate flows from the cold feed bins. Mix the lime and aggregate on the conveyor belt by placing a minimum of six paddles over the conveyor belt. Make the paddles protrude into the aggregate flow and direct the aggregate to fold over itself causing the material to migrate from one side of the conveyor belt to the other. Space the paddles to provide complete mixing. Provide a water spray over the conveyor belt as necessary to control dust and to maintain minimum moisture content.
10. WMA – All metering devices will meet the current state agency requirement for liquid or mineral additives. Document the integration of plant controls and interlocks when using WMA additive metering devices.

E. Mix Design Revisions

1. During production, the Contractor may request TV revisions to the approved JMF. Proposed changes are subject to meeting the following requirements: (1) the changed TV(s) must be within the limits defined in Table 1-2, test results from the new mixture indicate that the proposed JMF changes will produce asphalt mixtures
2. with the specified VTM, VMA, VFA, TSR and F/A ratio, and the resulting gradations are within the grading band for the specified nominal maximum size grading.
3. Proposed changes must include new and revised materials unit weights (T-209) for controlling pavement mat density.
4. Any proposed changes to the approved JMF, along with supporting documentation, shall be submitted in writing to the CO for approval prior to placement on the project.
5. Approved JMF changes will not be used retroactively for determining acceptance of material already placed. Changes to the approved JMF may necessitate and require additional evaluation and verification of the mix by the CO prior to final approval.

F. Tack Coat

1. Tack Coat shall conform to Specification Section 32 12 13.13.
2. Apply a uniform tack coat of asphalt emulsion to the contact surfaces of manholes, structures, existing pavement edges and surfaces and other abutting surfaces immediately prior to placing new pavement mixtures. This includes freshly placed layers of mixtures if one day has elapsed since placement, or if dust or debris has contaminated the fresh surface, or if traffic has been allowed on the surface to be paved.
3. A thin uniform coating of tack coat shall be applied to the pavement immediately before overlaying and be allowed sufficient time to break (set).
4. Allow tack coat to break or cure properly before placing pavement mixtures.
5. The Contractor shall apply tack coat in a manner which will prevent traffic from driving on the applied tack coat material
6. Tack coat will not be measured and paid for as a separate quantity but considered subsidiary to the work and included in the bid price for Asphalt Pavement – Statistically Accepted.

G. Transportation, Placing and Finishing

1. Set stringline or other fixed controls to ensure proper alignment of pavement centerline, joints and edges.
2. Verify the depth of each layer at frequent intervals behind the laydown machine and adjust if the compacted thickness does not meet the specified thickness. The average compacted depth will be verified by calculating yield using known bulk specific gravity values from the acceptance tests. Furnish daily calculated yields to CO at the end of each day for the day’s production.
3. The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least 6 inches. The joint in the top layer shall be at the designed centerline of the pavement. Transverse joints in one layer shall be offset by at least two (2) feet from transverse

joints in the previous layer.

4. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture may be placed using hand tools. Luting shall be performed in such a manner as to prevent segregation.
5. Unless otherwise permitted by the CO for special conditions and circumstances, only machine methods of placement shall be used.
6. Immediately after placement, and before the initial roller pass, the surface shall be checked, and any irregularities corrected. Irregularities in alignment and grade along outside edges shall be corrected by the addition or removal of mixture before the edges are rolled.
7. The newly placed pavement surface shall be free of visible segregation or other irregularities. Inspect the uncompacted mat behind the paver for longitudinal streaks, segregation or other irregularities. Correct as necessary before initial compaction.
8. If material segregation or irregularities in the mat behind the paver are noted, the Contractor shall review the production, transportation, and placement operations and take corrective action. The Contractor's QCP shall fully outline procedures for inspecting the mat during placement, identifying and troubleshooting material segregation or temperature related segregation, and implementing corrective action.

H. Joints, Edges and Cleanup

1. Transverse Joints: The roller shall not pass over the unprotected end of the freshly laid mixture except when necessary to form a transverse paving joint. When necessary to form a temporary transverse paving joint, it shall be made by means of placing a bulkhead or by temporarily tapering the course, in which case the edge shall be cut back to its full depth and width on a straight line to expose a vertical face. In both methods, all contact surfaces shall be given a tack coat of asphaltic material before placing any fresh mixture against the joint.
2. Longitudinal Joints-Wedge: For placement depths greater than or equal to 1-1/2 inches, use a Notched Wedge plate attachment on the screed such as the Trans Tech notch wedge, or approved equal. The attachment must provide, for the first paver pass, a ½" notch at the top of the wedge, followed by a diagonal slope down to the underlying surface where a step is formed equal to the nominal maximum aggregate size. The width of the joint shall be a minimum of 6 inches. The attachment will include a mechanism to provide compaction of the sloped surface of the notched wedge. If no mechanism exists in the attachment, the diagonal shall be compacted by other means satisfactory to the CO. The subsequent paver pass will place mix at a depth equal to the lane being matched, plus the appropriate roll-down, to result in a fully compacted joint meeting the smoothness requirement of these specifications.
3. Longitudinal Joints-Confined Edge: For pavement depths less than 1-1/2 inches, use a confined-edge longitudinal joint. This is the most typically constructed longitudinal joint which attempts to confine the outside edge of the first paver pass of the mat as much as possible to create a near vertical edge.

I. Asphalt Pavement Compaction

1. Furnish rollers of sufficient size, number and type, to support the production rate and meet compaction requirements.

J. Pavement Uniformity and Roughness

1. Uniformity and Smoothness: The finished mat and surfaces of the pavement shall be smooth, dense and uniform in appearance, free from irregularities in contour and texture and shall present a smooth-riding surface.
2. Measure the profile of the pavement surface according to CDOT MRI Category II (from Design Bulletin 2011 Number 3 Pavement Smoothness Categories), and in accordance with Article 3.4 FIELD QUALITY CONTROL. In addition, construct all pavement surfaces to meet the requirements of article 3.4, subparagraph B.5. Straightedge Measurement.

K. Opening to Traffic: No vehicular traffic or construction loads shall be permitted on the newly completed pavement until the material has cooled to a temperature of 140^{o}F or less.

3.4 FIELD QUALITY CONTROL

A. Materials and Placement

1. General: In addition to performing QC testing during production and placement of asphalt pavement, the contractor shall perform acceptance testing as specified in Table 3-1.
2. Contractor QC test results may be used by the CO for acceptance if through verification (correlation) and validation, the Contractor QC test results are deemed acceptable by the CO. The CO has sole discretion to include Contractor QC test results in the acceptance determination or to use only results from tests performed by the CO or the CO's agent.
3. The CO shall have access at any time to all parts of the production and material storage facilities and to all parts of the project site, to perform inspections and tests, as deemed necessary to ensure the quality of the final product.
4. Utilize stratified random sampling of each sublot produced and placed to assure that all material within the Lot has an equal probability of being selected for testing. The CO will provide random numbers as required for each day's sampling, based on the anticipated production for that day. Adjustments in sampling locations and times necessary due to differences between anticipated and actual production quantities will be made by the CO.
5. The CO may at any time, notwithstanding previous plant acceptance, reject and require the Contractor to dispose of any batch of asphalt mixture which is deemed unfit for use due to contamination, segregation, incomplete coating of aggregate, non-specification temperature, or other indication of defective material. Such rejection may be based on only visual inspection or temperature measurements.
6. Similarly, the CO may at any time, notwithstanding field acceptance for mat or longitudinal joint density, reject and require the Contractor to correct any material that was placed with unacceptable mat uniformity or paving joints, due to low density, lack of bond, segregation, improper elevation, tearing or other material or workmanship defects. In the event of such rejection, the Contractor and CO may take split samples of the area(s), and if it can be demonstrated by testing that such material or constructed pavement was erroneously rejected, payment will be made for the material at the contract unit price.
7. All samples of PGAB and asphalt mixture and pavement cores shall be split samples and the split portion delivered to the CO. Samples shall be split in accordance with applicable AASHTO or ASTM procedures.
8. Deliver to the CO all core samples taken from the compacted pavement after testing. Protect cores from damage before delivering to the CO. Contractor to fill all core holes by tack coating the periphery of the core hole, then lay in asphalt mix manufactured, polymer modified cold patch mix to a level that will yield a smooth final surface, compact to specification density, and then swab the surface with tack coat.
9. Lots and Sublots: The entire quantity of each asphalt mixture type will be considered one lot and an individual sublot will be considered 500 tons.
10. Contractor Furnished Samples: Furnish samples to the CO in industry standard containers for all required samples. Notify the CO in advance of sampling in order to provide the opportunity to observe and witness the sampling and splitting procedures.
11. Selective Sampling: The CO may sample the work at any time to verify the quality of the work being performed. These non-random selective samples will not be included in the statistical evaluation or for determining PWL as described in this Section. Work represented by these samples will be removed and replaced at no cost to the Government if, through further evaluation, the tests indicate that the represented work does not conform to contract requirements.
12. Independent Assurance Sampling: The CO or their authorized agent may sample the work at any time to verify the quality of the sampling and testing and equipment used in the Acceptance

determination. This will include the Contractor's quality of the sampling and testing and equipment calibrations if Contractor QC tests are used in the Agency Acceptance.

Table 3-1
Sampling, Testing, and Acceptance Requirements during placement

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time	Remarks
Asphalt pavement	Statistical	Asphalt Content (1)	I	AASHTO T 308	1 per 500 tons	Behind the paver before compaction	Yes	6 hours	—
		Air voids	I	AASHTO T 312 & T 166	"	"	"	"	—
		VMA	I	AASHTO R 35	"	"	"	"	—
		Core density (2)	I	AASHTO T 166	"	In-place after Compacting	"	24 hours	
		Core density Long. Joint (5)	I	AASHTO T166	"	"	"	"	
		Full depth core thickness	I	ASTM D 3549	Minimum 1 per day	"	Yes	24 hours	
Asphalt pavement	Measured and tested for conformance	Placement Temperature	—	—	First load and as determined by CO thereafter	Hauling vehicle prior to dumping, or windrow before pickup	—	Immediately upon completion of measurement	—
		Maximum specific gravity (3)(4)	—	AASHTO T 209	Minimum 1 per day	Behind the paver before compaction	Yes	24 hours	—
Asphalt Binder	Measured and tested for conformance	Quality		AASHTO M 320	After each delivery and mixing	In line between tank and mixing plant	2 – 1 quart (1 liter) samples	See remarks	Test by Government
Asphalt pavement	Measured and tested for Conformance – Acceptance & Information and Control - QC	Gradation	—	AASHTO T 30	1 per 500 tons of mix	Behind the paver before compaction	Split	6 hours	—

(1) Use AASHTO T 308, Method A. Calculate the asphalt binder content by weighing the sample before and after the burn using a calibrated external balance.
(2) Side by side cores will be obtained for core density testing. Submit one core to the CO for verification testing and the other to the Contractor for acceptance testing. Perform specific gravity and thickness tests on the cores and deliver to the CO after testing is completed. Use AASHTO T 166 regardless of the volume of water absorbed. Care should be taken to dry cores to constant mass at 125 ± 5°F, before testing.
(3) After production paving has begun, use the average maximum specific gravity value (AASHTO T 209) for each day to adjust the percent compaction for the cores that represent that day's paving.
(4) Do not use the supplemental procedure for mixtures containing porous aggregate (dry back method) of AASHTO T 209).
(5) The six-inch diameter core shall be taken on the centerline of the longitudinal joint. For the notched-wedge joint, the lower specification limit is 92.0 percent of the maximum specific gravity with the cores taken on the wedge portion of the joint with the core centered on the diagonal.
(6) The core density samples may be used to determine core thickness, minimizing the number of total cores taken.

B. Acceptance sampling and testing – Roughness

1. Inertial profiling system: Measure the profile of the pavement surface according to the designated pavement roughness type. In addition, construct all pavement surfaces to meet the requirements of this article, subparagraph B.5. Straightedge Measurement.

(1) Profile Measurement

a. Equipment. Provide an ASTM E 950, class 1, inertial profiling system meeting all the requirements and specifications found in AASHTO M 328 and certified according to AASHTO R 56. At least 21 days before profiling begins, provide copies of the system certifications. Display a current decal on the equipment indicating the expiration date of the certifications.

b. Personnel. Provide an operator certified according to AASHTO R56. At least 21 days before profiling begins, provide copies of the operator's certifications.

c. Measuring. The CO will identify the beginning and ending points and excluded areas. Excluded areas will include: Curves on which the profiling equipment as defined in (a) above cannot maintain a minimum speed of 15 MPH, Cattle guards, turning lanes, passing lanes, and side roads will be excluded from profile measurement. Measure excluded areas with a straightedge according to this article, subparagraph B.5. Straightedge Measurement.

d. Measure the pavement profile in both wheel paths using a sensor path spacing of 65-71 inches and centered in the traveled way of the lane. Operate the inertial profiler according to the manufacturer's recommendations and AASHTO R 57. Use a long wave cutoff filter distance of 200 feet and report the profile data (elevation and distance) at a maximum interval of 2 inches. Provide a lead-in distance, after reaching the testing speed, of at least 150 feet. Furnish personnel to provide flagging operations as required. Use profiler's automatic start/stop activation when collecting data. Use event markers to identify the beginning and ending location of areas to be excluded from profile measurement.

e. The CO will coordinate and observe profiling operations. Immediately after profiling, export each profile (elevation, distance data, header and marker information) in pvp (project and embedded data file format) to a disk (CD or DVD) and give the disk to the CO. Non-continuous data files will not be accepted.

f. Evaluation. The CO will review and analyze all profile measurements. The CO may perform verification testing, equipment validation, or both. If the CO elects to perform verification testing the following will apply:

g. Verification testing will consist of the CO profiling a section of road and comparing the results against the contractor's results for the same section. Comparison runs will be made within 21 days of each other. The contractor's results will be considered verified if the CO's international ride index (IRI) for each wheel path differs from the contractor's IRI for the same wheel path by no more than 10 percent of their mean. Do not use equipment that fails verification.

h. Equipment validation will consist of determining a cross correlation value on at least one section having a minimum length of 528 feet. The contractor's profiler and the CO's profiler will be cross correlated on the same day. Coordinate the equipment validation date through the CO. When requested provide the CO with a list of three or more possible dates in three or more different weeks that the profiler and operator will be available for cross correlation verification. The CO will determine the location of the cross-correlation segments. The minimum acceptable cross correlation value is 0.90. Do not use equipment that fails validation.

i. The CO will use the profile measurements to determine the mean roughness index (MRI) for the traveled way using the current version of Profile Viewer and Analysis (ProVAL) software. The MRI is determined by averaging the IRI value from each wheel path. The CO will also determine areas of localized roughness. The MRI and areas of localized roughness will be used to determine payment for the designated pavement roughness type.

j. Areas of localized roughness will be identified using a report of continuous MRI with a base length of 25 feet. This will yield the MRI of every possible 25-foot segment. Any area for which the continuous report exceeds the threshold MRI value for the specified roughness type will be considered a defective area requiring correction, or payment deductions, at the COs discretion. No deduction will be made for areas of localized roughness identified within 12.5 feet of the beginning or end of a profile section or within 12.5 feet of an excluded area. Measure these areas with a straightedge according to this article, subparagraph B.5 Straightedge Measurement.

k. Correct areas of localized roughness according to this article, subparagraph B.7. Defective Area Correction.

2. Type I Pavement Roughness

(1) Measure the profile of the initial pavement surface within 14 days after receiving the Notice to Proceed and before construction activities disturb the existing pavement surface. The initial pavement surface is defined as the original in-situ pavement surface immediately before construction activities begin. The localized roughness threshold computed to the nearest whole number for Type I pavement roughness is equal to the following:

(2) Localized Roughness (LR) = Initial MRI + 1.881(S25). Where the Initial MRI is the MRI obtained before construction activities begin and (S25) is the sample standard deviation of the 25-foot MRI.

(3) Do not disturb the initial pavement surface until the CO's analysis is complete.

(4) Measure the profile of the final pavement surface before placing a surface treatment and within 21 days of completing roadway paving. The initial MRI will be used in conjunction with the final MRI to determine the percent improvement for the traveled way.

(5) The percent improvement in MRI will be determined to one decimal place for the traveled way according to the following formula:

(6) Percent Improvement = [(Initial MRI – Final MRI) / Initial MRI] x 100

(7) Table 3-2 will be used to determine the final pay factor (PFrough) for the traveled way to two decimal places. If the percent improvement is less than 25.0 percent and the final MRI is less than or equal to 70.0 inches per mile, Table 3-4 and Table 3-5 Type III will be used to determine the final pay factor (PFrough). Correct areas of localized roughness according to this article, subparagraph B.7 Defective Area Correction. Place a minimum 1-inch overlay over the entire paved surface of any pavement with a negative percent improvement.

Table 3-2

Type I Pavement Roughness Pay Factors

Percent Improvement (%)	Pay Factor (PF_{rough})
Greater than 50.0	PF = 1.05
47.6 to 50.0	PF = 1.04
45.1 to 47.5	PF = 1.03
43.6 to 45.0	PF = 1.02
42.1 to 43.5	PF = 1.01
25.0 to 42.0	PF = 1.00
24.0 to 24.9	PF = 0.99
23.0 to 23.9	PF = 0.98
22.0 to 22.9	PF = 0.97
21.0 to 21.9	PF = 0.96
20.0 to 20.9	PF = 0.95
19.0 to 19.9	PF = 0.94
18.0 to 18.9	PF = 0.93
17.0 to 17.9	PF = 0.92
16.0 to 16.9	PF = 0.91
15.0 to 15.9	PF = 0.90
14.0 to 14.9	PF = 0.89
13.0 to 13.9	PF = 0.88
12.0 to 12.9	PF = 0.87
11.0 to 11.9	PF = 0.86
10.0to 10.9	PF = 0.85
5.0 to 9.9	PF = 0.80
0.0 to 4.9	PF = 0.70
Negative % Improvement	Correct and Overlay

3. Type II Pavement Roughness.

(1) Measure the profile of the initial pavement surface within 14 days after receiving the Notice to Proceed and before construction activities disturb the pavement surface. The initial pavement surface is defined as the original in-situ pavement surface immediately before construction activities begin. The localized roughness threshold computed to the nearest whole number for Type II pavement roughness is equal to the following:

Localized Roughness (LR) = Initial MRI + 1.282(S25)

(2) Where the Initial MRI is the MRI obtained before construction activities begin and (S25) is the sample standard deviation of the 25-foot (7.62-meter) MRI.

(3) Do not disturb the initial pavement surface until the CO's analysis is complete. Measure the profile of the final pavement surface before placing a surface treatment and within 21 days of completing roadway paving. The initial MRI will be used in conjunction with the final MRI to determine the percent improvement for the entire traveled way.

(4) The percent improvement in MRI will be determined to one decimal place for the traveled way according to the following formula:

Percent Improvement = [(Initial MRI – Final MRI) / Initial MRI] x 100

(5) Table 3-3 will be used to determine the final pay factor (PF_{rough}) for the traveled way to two

decimal places. When the percent improvement is less than 49.0 percent and the final MRI value is less than or equal to 70.0 inches per mile, Table 3-4 and Table 3-5. Type III will be used to determine the final pay factor (PFrough). Correct areas of localized roughness according to this article, subparagraph B.7 Defective Area Correction. Place a minimum 1-inch overlay over the entire paved surface of any pavement with a percent improvement of less than 10.0 percent.

Table 3-3
Type II Pavement Roughness Pay Factors

Percent Improvement (%)	**Pay Factor (PF_{rough})**
Greater than 60.0	PF = 1.05
58.6 to 60.0	PF = 1.04
57.6 to 58.5	PF = 1.03
56.6 to 57.5	PF = 1.02
55.1 to 56.5	PF = 1.01
49.0 to 55.0	PF = 1.00
48.0 to 48.9	PF = 0.99
47.0 to 47.9	PF = 0.98
46.0 to 46.9	PF = 0.97
45.0 to 45.9	PF = 0.96
44.0 to 44.9	PF = 0.95
43.0 to 43.9	PF = 0.94
42.0 to 42.9	PF = 0.93
41.0 to 41.9	PF = 0.92
40.0 to 40.9	PF = 0.91
38.0 to 39.9	PF = 0.90
36.0 to 37.9	PF = 0.89
35.0 to 35.9	PF = 0.88
34.0 to 34.9	PF = 0.87
33.0 to 33.9	PF = 0.86
31.0 to 32.9	PF = 0.85
25.0 to 30.9	PF = 0.80
10.0 to 24.9	PF = 0.70
Less than 10.0	Correct & Overlay

4. Type III Pavement Roughness

Measure the profile of the final pavement surface before placing a surface treatment and within 21 days of completing roadway paving. The localized roughness threshold for Type III pavement roughness is 140 inches per mile. Pay factors from Table 3-4 will be used in conjunction with the histogram printout from ProVAL's Smoothness Assurance Analysis. The final pay factor (PF_{rough}) is equal to the sum of the products of the individual pay factors indicated in Table 3-4 multiplied by ProVAL's corresponding histogram percentages, divided by 100. The final pay factor (PF_{rough}) will be determined to four decimal places. Correct any pavement with an MRI greater than 125 inches per mile and areas of localized roughness according to this article, subparagraph B.7. Defective Area Correction.

Table 3-4
Type III Pavement Roughness Pay Factors

Mean Roughness Index (MRI) inches/mile (meters/kilometer)	**Pay Factor (PF_{rough})**
Greater than 95.0 (1.499)	0.700
95.0 to 90.0 (1.499 to 1.420)	0.800
90.0 to 85.0 (1.420 to 1.342)	0.850
85.0 to 80.0 (1.342 to 1.263)	0.900
80.0 to 75.0 (1.263 to 1.184)	0.960
75.0 to 70.0 (1.184 to 1.105)	0.980
70.0 to 65.0 (1.105 to 1.026)	1.000
65.0 to 60.0 (1.026 to 0.947)	1.010
60.0 to 55.0 (0.947 to 0.868)	1.020
55.0 to 50.0 (0.868 to 0.789)	1.025
50.0 to 45.0 (0.789 to 0.710)	1.030
45.0 to 40.0 (0.710 to 0.631)	1.035
40.0 to 35.0 (0.631 to 0.552)	1.040
35.0 to 30.0 (0.552 to 0.473)	1.045
Less than 30.0 (0.473)	1.050

5. Straightedge Measurement
   (1) Use a 10-foot metal straight edge to measure at right angles and parallel to the centerline
   (2) Defective areas are deviations between the surface and the bottom of the straightedge in excess of 0.25 inches, measured between any two contacts of the straightedge, or deviations in excess of 0.25 inches measured at the end of the straightedge.
   (3) Use a straightedge to measure areas within 12.5 feet of the beginning or end of a profile section or within 12.5 feet of any excluded areas.
   (4) Correct defective areas according to this article, subparagraph B.7 Defective Area Correction.
6. Localized Roughness Pay Reduction. Each area of localized roughness exceeding the threshold MRI specified for the designated pavement roughness type will receive a further reduction according to Table 3-5.
7. Defective Area Correction
   (1) If corrections are not allowed, pay deductions will be made in accordance with the pay factor (PF_{rough}) and the localized roughness pay deductions described in Table 3-5. If corrections are allowed, correct defective areas at no additional cost to the Government. Either mill a minimum of one half the pavement depth and fill with an approved asphalt mixture or cut and remove the pavement and repave with an approved asphalt mixture. When correction by any other method is proposed, submit a proposal to the CO for approval.
   (2) If grinding is proposed, use a diamond blade machine and specify the manufacturer and model of the equipment to be used. Identify the beginning and ending station of each grind location, the grinding depth and lateral extent of grinding. The endpoints of the areas where a grinder is to be applied must be optimized using ProVAL. Specify the type of seal to be placed after grinding is completed. Place all seals in a manner acceptable to the CO. Limit grinding depth to 12.5% of the design pavement thickness unless it is accompanied by a minimum 1-inch overlay. The CO may take up to 7 days to approve, modify, or reject the proposal. Do not begin corrective work until CO approval is obtained.

(3) After corrections are made, re-measure the pavement profile according to this article subparagraph C Acceptance Sampling and Testing - Roughness. Data from the re-measurement will be analyzed to determine the MRI or percent improvement, areas of localized roughness and will be used to determine final payment according to Article 1.1 subparagraph D. Payment Procedures.

(4) The maximum pay factor obtainable when correction and re-measurement of the surface are required is 1.00.

Table 3-5
Localized Roughness Pay Reductions

Type I	**Type II**	**Localized Roughness Limit (MRI)**	**Type III**	
Deduct per Occurrence	**Deduct per Occurrence**		**Localized Roughness Limit (MRI) inches/mile (meters/kilometer)**	**Deduct per Occurrence**
\$200	\$300	Computed MRI value For designated Type	140.0 to 169.9 (2.210 to 2.682)	\$300
			170.0 to 179.9 (2.683 to 2.840)	\$450
			180.0 to 189.9 (2.841 to 2.998)	\$600
			190.0 to 199.9 (2.999 to 3.156)	\$750
			200.0 to 209.9 (3.157 to 3.313)	\$900
			210.0 to 219.9 (3.314 to 3.471)	\$1,200
			220.0 to 229.9 (3.472 to 3.629)	\$1,500
			230.0 to 239.9 (3.630 to 3.787)	\$2,000
			Greater than or equal to 240.0 (3.788)	\$4,000

C. Acceptance sampling and testing – Thickness

1. Measure the full depth thickness, as specified in Table 3-1, after the final lift of pavement has been constructed. In addition, obtain cores randomly in parking areas, approach roads and pullouts as directed by the CO.
2. Pay Adjustment: The CO will determine pay adjustment for asphalt concrete pavement mix properties including thickness. The lower specification limit (LSL) for thickness is equal to the plan design asphalt concrete pavement thickness less the allowable deviation according to this article subparagraph D 4. (7) Pavement Thickness Allowable Deviations.
3. Method of Correction: The contractor may propose in writing alternative methods in lieu of a pay adjustment for pay factors between 1.00 and 0.75. The method of correction to the final surface of the pavement will meet or exceed the structural and roughness requirements for the contract. Obtain approval, in writing from the CO for the proposed method of correction.
4. Areas in reject due to insufficient pavement thickness will require an asphalt overlay. Minimal overlay thickness will be twice the nominal maximum aggregate size or that which can be placed smooth, dense and uniform. Approval and acceptance for the hot mix asphalt concrete overlay and mix design will be in accordance with the contract requirements for the originally specified asphalt.
5. Pavement not in reject for insufficient thickness, and with a pay factor less than 1.00 for thickness may be corrected, in lieu of pay adjustment, by an approved asphalt pavement overlay or surface treatment. Approval and acceptance for the overlay and mix design will be in accordance the contract requirements for the originally specified asphalt pavement.

D. Final acceptance of work and analysis

1. General: Test results from random sampling will be used statistically to determine acceptance as provided for in this article subparagraph A. Contractor QC test results may be included in this evaluation, if the CO has determined that they will be used for acceptance, as provided for in this subparagraph. The materials acceptance parameters and characteristics as noted in Table 3-1 with a sample frequency of 1/sublot will be accepted statistically. The determination of acceptability, including pay adjustments, if applicable, will be as described in Part 1 Article 1.1 subparagraph D. Payment Procedures. Those materials, products and characteristics with test frequencies other than 1/sublot will be accepted based on the conformance tests, materials certifications and by visual acceptance for workmanship and material quality as provided in the contract.
2. Statistical Evaluation and Determination of Pay Factors (value of work)
    1. Analysis of Lot Quality Level: For statistically accepted materials, products and characteristics, the CO will determine the Percent Within Limits (PWL) and the applicable Pay Factor (PF) for the following:
        (1) Asphalt content: The upper and lower specification limits are the approved JMF TV plus or minus 0.4 percent; the upper and lower engineering limits (n=1) are the approved JMF TV plus or minus 0.7 percent.
        (2) VMA: The lower specification limit is the value specified for the nominal maximum size aggregate designated. After the JMF has been verified the Contractor's combined coarse and fine bulk specific gravity of aggregate Gsb values shall be used to calculate VMA on field produced asphalt mixtures.
        (3) Mat Density: The lower specification limit is 92.0 percent and the upper specification limit is 97.5% of the maximum specific gravity (density) determined according to AASHTO T 166 and T 209. The lower engineering limit (n=1) is 89.0 percent and the upper engineering limit is 98%. The percent compaction will be determined using the average maximum specific gravity (AASHTO T 209) from all samples tested each day.
        (4) Longitudinal Joint Density: For the confined edge joint, the lower specification limit is 90.0 percent and the upper specification limit is 97.5 percent of the maximum specific gravity (density) determined according to AASHTO T 166 and T 209. The lower engineering limit is 88.0 percent and the upper engineering limit is 98 percent. The percent compaction will be determined using the average maximum specific gravity (AASHTO T 209) from all samples tested each day. The six-inch diameter core shall be taken on the centerline of the longitudinal joint. For the notched-wedge joint, the lower specification limit is 92.0 percent and the upper specification limit is 97.5 percent. The lower engineering limit (n=1) is 89.0 percent and the upper engineering limit is 98.0 percent of the maximum specific gravity with the cores taken on the wedge portion of the joint with the core centered on the diagonal.
        (5) Air voids: The upper and lower specification limits are 5.5 and 2.5 percent respectively. The upper and lower engineering limits are 6.0 and 2.0 percent respectively. Air voids are determined by AASHTO T 269, AASHTO T 209, and AASHTO T 166 of the compacted specimen.
        (6) Asphalt Binder Grading: CO will determine acceptability based upon sampling and conformance to specification limits for each test property. The CO may test split liquid asphalt samples taken as part of the contractor's required QC sampling requirements and use those results as part of the final acceptance process.
        (7) Gradation: The Allowable deviations (D) in the following table will apply to the acceptability of the CTS and will apply to the production mix for control of mix and contract compliance.

Table 3-6
Allowable Deviations -- Gradations

Percent Passing		Allowable Deviation(D)
Minimum	Maximum	
70.1	89.9	4
60.1	70.0	5
55.1	60.0	6
45.1	55.0	7
40.1	45.0	6
30.1	40.0	5
21.1	30.0	4
8.1	21.0	3
0	8.0	2

(8) Pavement Thickness Allowable Deviations: The lower specification limits (LSL) will be the design pavement thickness for asphalt pavement minus the allowable deviation. The allowable deviation will be 10% of the designed pavement thickness. The allowable deviation for the lower engineering limit (n=1) will be 20% of the designed pavement thickness.

(9) Pavement Roughness by IRI: The evaluation for payment will be made in according to this article subparagraph C Acceptance Sampling and Testing - Roughness.

3. Statistical evaluation of work is a method of analyzing inspection or test results to determine conformity with the contract requirements. The work will be accepted as follows:

a. General. For work evaluated based on statistical evaluation, both the Government and Contractor assume some risk.

b. The Government's risk is the probability that work of a rejectable quality level is accepted. The Contractor's risk is either the probability that work produced at an acceptable quality level (AQL) is rejected (α) or the probability that the work produced at the AQL is accepted at less than the contract price (α100).

c. Acceptable quality level is the lowest percentage of work within the specification limits that is considered acceptable for payment at contract price. There are 2 categories. Category I is based on an AQL of 95 percent. Category II is based on an AQL of 90 percent. In both cases, the Contractor's risk (α100) is 5 percent and the risk of rejection (α) is significantly lower.

d. As an incentive to produce uniform quality work and to offset the Contractor's risk, a final payment greater than the contract price may be obtained under certain conditions.

e. The quality characteristics to be evaluated, lot size, sampling frequency, sampling location, test methods, specification limits, and category are as follows:

f. Lot size. A lot is a discrete quantity of work to which the statistical evaluation procedure is applied. A lot normally represents the total quantity of work produced. More than one lot may occur if changes in the TV, material sources, or JMF are requested in writing and approved.

g. Sampling frequency. The frequency of sampling is listed in Table 3-1. The frequency rate normally results in a minimum of 10 samples. The minimum number required to perform a statistical evaluation is 5. The maximum obtainable pay factor with 3, 4, or 5 samples is 1.01. A minimum of 8 samples are required to obtain a 1.05 pay factor. If the sampling frequencies and quantity of work would otherwise result in fewer than 10 samples, a written request is required to increase the sampling frequency to provide for a minimum of 10 samples. Provide the request to increase the sampling frequency at least 48 hours before beginning production.

h. Sampling location. The point of sampling is listed in Table 3-1. The exact location of

sampling will be specified by the CO based on random numbers.

i. Test methods. The test methods used to test the sample are listed in Table 3-1.

j. Category. The category for each quality characteristics to be statistically analyzed is listed in Table 3-1.

E. Acceptance. The work in the lot will be paid for at a final pay factor when all inspections and test results are completed and evaluated.

1. Before determining the final pay factor, the work may be incorporated into the project provided the current pay factor does not fall below 0.90
2. If the current pay factor of a lot falls below 0.90, terminate production. Production may resume after the Contractor takes effective and acceptable actions to improve the quality of the production.
3. If a lot is terminated due to material not meeting minimum Pay Factor of 0.90 for VMA, air voids, in place density or asphalt content, the Contractor shall suspend delivery of mix to the project. Take appropriate action which may include producing acceptable material on a trial basis for testing purposes without shipment to the project, and at no expense to the Government. After corrective action satisfactory to the CO has been taken delivery to the project may resume. The Contractor may request that the lot prior to corrective action be terminated and a new lot begun. Payment for the terminated lot will be adjusted according to the resultant pay factor prior to the corrective action, for the quantity in the terminated lot per Part 1 Article 1.1 subparagraph D. Payment Procedures.
4. A lot containing an unsatisfactory percentage of material not meeting the specification (less than 1.00 pay factor) is accepted provided the lowest single pay factor has not fallen below 0.80.
5. When approved, it is permissible to voluntarily remove material not meeting the specification and replace it with new material to avoid or minimize a pay factor of less than 1.00. New material will be sampled, tested, and evaluated according to this article.
6. For any material or product that results in a Pay Factor of less than 75%, remove and replace with material that meets the specification or product requirements. As an alternative to removal and replacement, the Contractor may submit a written request to: (a) have the work accepted at a reduced price; or (b) be given permission to perform corrective measures to bring the work into conformity. The request must contain supporting rationale and documentation. Include references or data justifying the proposal based on an evaluation of test results, effect on service life, value of material or work, quality, aesthetics, and other tangible engineering basis. The CO will determine disposition of the nonconforming work.
7. Any quantity of material may be rejected based on visual inspection or test results. Do not incorporate rejected material in the work. The results of tests run on rejected material will be excluded from the lot.
8. Statistical evaluation. The Variability-Unknown/Standard Deviation Method will be used to determine the estimated percentage of the lot that is within specification limits.
9. The number of significant figures used in the calculations will be according to AASHTO R 11, absolute method. Random Sampling shall be stratified random sampling in accordance with either ASTM D3665, or, a random number generator function.

END OF SECTION 32 12 16.02

Construction Management Representative (CMR) & Contractor Quality Control (CQC) Daily Report

National Park Service (NPS) - Denver Service Center (DSC) | 2-6-18

REPORT NUMBER		PROJECT MANAGEMENT INFORMATION SYSTEM NUMBER (PMIS No.):	

PROJECT	CONTRACT NUMBER	DATE	
PARK	CONTRACTOR	CMR REPORTING	

WEATHER (Rain, Snow, Cloudy, Windy)	MOISTURE AMOUNT (INCHES)	TEMPERATURE		WEATHER DELAY	DESCRIBE WEATHER DELAYED WORK	GROUND CONDITIONS (Dry, Damp, Wet, Frozen)
		MAXIMUM	MINIMUM	Yes ☐ No ☐		

PRIME CONTRACTOR:

EMPLOYEES BY JOB CATEGORIES	NUMBER	HOURS	EQUIPMENT ON JOB (Include model, manufacture, size, year.)	NUMBER OF UNITS	EQUIPMENT HOURS WORKING		
					YES	STANDBY	MOBILIZED/ DEMOBILIZED DATE
Project Manager (PM)							
Superintendent							
Quality Control Officer							
Safety Officer							
Laborers							

MATERIALS DELIVERED	QUANTITY	OFFICIAL VISITORS

WORK PERFORMED BY PRIME: (Include detail description per each activity including location, quantities, and production.)

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

TESTING:

Was any testing performed today YES / NO. (Complete and attach Test Report Information Sheets.)

☐ ☐

Type and Location of Testing:

SUBCONTRACTOR(S):	PMIS Number:		Date:	

SUBCONTRACTOR NAME

EMPLOYEES BY JOB CATEGORIES	NUMBER	HOURS	EQUIPMENT ON JOB (Include model, manufacturer, size, and year.)	NUMBER OF UNITS	EQUIPMENT HOURS WORKING			
					YES	STANDBY	MOBILIZED/ DEMOBILIZED DATE	

MATERIALS DELIVERED	QUANTITY	EQUIPMENT MOBILIZIED/DEMOBILIZED

WORK PERFORMED BY SUBCONTRACTOR: Include detail description per each activity. Include location, quantity, and production.

SUBCONTRACTOR NAME

EMPLOYEES BY JOB CATEGORIES	NUMBER	HOURS	EQUIPMENT ON JOB (Include model, manufacturer, size, and year.)	NUMBER OF UNITS	EQUIPMENT HOURS WORKING			
					YES	STANDBY	MOBILIZED/ DEMOBILIZED DATE	

MATERIALS DELIVERED	QUANTITY	EQUIPMENT MOBILIZIED/DEMOBILIZED

WORK PERFORMED BY SUBCONTRACTOR: Include detail description per each activity. Include location, quantity, and production.

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					YES	STANDBY	MOBILIZED/ DEMOBILIZED DATE	

MATERIALS DELIVERED	QUANTITY	EQUIPMENT MOBILIZIED/DEMOBILIZED

WORK PERFORMED BY SUBCONTRACTOR: Include detail description per each activity. Include location, quantity, and production.

SUBCONTRACTOR(S):		PMIS Number:		Date:	

SUBCONTRACTOR NAME

EMPLOYEES BY JOB CATEGORIES	NUMBER	HOURS	EQUIPMENT ON JOB (Include model, manufacturer, size, and year.)	NUMBER OF UNITS	EQUIPMENT HOURS WORKING			
					YES	STANDBY	MOBILIZED/ DEMOBILIZED DATE	

MATERIALS DELIVERED	QUANTITY	EQUIPMENT MOBILIZIED/DEMOBILIZED

WORK PERFORMED BY SUBCONTRACTOR: Include detail description per each activity. Include location, quantity, and production.

SUBCONTRACTOR NAME

EMPLOYEES BY JOB CATEGORIES	NUMBER	HOURS	EQUIPMENT ON JOB (Include model, manufacturer, size, and year.)	NUMBER OF UNITS	EQUIPMENT HOURS WORKING			
					YES	STANDBY	MOBILIZED/ DEMOBILIZED DATE	

MATERIALS DELIVERED	QUANTITY	EQUIPMENT MOBILIZIED/DEMOBILIZED

WORK PERFORMED BY SUBCONTRACTOR: Include detail description per each activity. Include location, quantity, and production.

SUBCONTRACTOR NAME

EMPLOYEES BY JOB CATEGORIES	NUMBER	HOURS	EQUIPMENT ON JOB (Include model, manufacturer, size, and year.)	NUMBER OF UNITS	EQUIPMENT HOURS WORKING			
					YES	STANDBY	MOBILIZED/ DEMOBILIZED DATE	

MATERIALS DELIVERED	QUANTITY	EQUIPMENT MOBILIZIED/DEMOBILIZED

WORK PERFORMED BY SUBCONTRACTOR: Include detail description per each activity. Include location, quantity, and production.

PMIS Number:		Date:	

CRITICAL POINT/MILESTONE OBSERVATIONS (*Describe item inspected, observations, problems, and action items.)*

DESCRIPTION OF WORK BEING MONITORED ON A TIME AND MATERIAL BASIS AND WHY

BREAKDOWN OF TIME AND MATERIAL WORK PERFORMED

Location:

Labor:

Equipment:

Material:

Production Rates:

STATUS OF GOVERNMENT FURNISHED SERVICES AND/OR SUPPLIES

SAFETY COMMENTS

Accidents / Lost Time:

Incidents:

First Aid Administered:

Other:

DIFFICULTIES WITH CONSTRUCTION CONTRACTOR

UNFORESEEN DEVELOPMENTS *(Describe conditions, action taken, person contacted, and recommended actions.)*

CONSTRUCTION DEFICIENCIES OR RE-TESTING REQUIRED

OTHER COMMENTS

CERTIFICATION

For Construction Management Representative (CMR): I certify the above report is complete and correct and that I, or my authorized representative, have inspected all work performed this day by the Prime Contractor and each Subcontractor and determined all materials, equipment, and workmanship are in strict compliance with plans and specifications except as may be noted above.

I certify that I or my authorized representative have reviewed and reconciled all differences between this daily report and the Construction Contractors. In the event a discrepancy is found, the Construction Contractor was notified and an acceptable revision was completed and resubmitted by either or both parties within this document. If unable to agree with the Construction Contractor, explain nature of disagreement in "Other Comments" above as needed.

For Contractor's Representative: I certify that the above report is complete and correct and that I, or my authorized representative, have inspected all work performed this day by the Prime Contractor and each Subcontractor and determined that all materials, equipment, and workmanship are in strict compliance with the plans and specifications except as may be noted above. I have reconciled all differences found when comparing this CQC daily diary with the CMR's daily diary. All unresolved issues are described under "Other Comments" above.

SIGNATURE	TITLE:

PMIS Number:		Date:	

ADDITIONAL COMMENTS OR INFORMATION (***Describe item inspected, observations, problems, and action items.)***

PMIS Number:		Date:	

IMAGES IN SUPPORT OF REPORT INFORMATION

SECTION 32 17 23 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This work includes applying permanent and temporary pavement paint, markings, and markers on the completed pavement.

1.2 QUALITY ASSURANCE

A. Submit documentation of the manufacturer of the pavement marking paint and production batch identification for the paint used.

B. Provide fixtures such as ball valves, gate valves, or others on paint truck for the purposes of obtaining field samples.

C. The Contracting Officer will:

1. Accept pavement marking paint from qualified manufacturer supplied samples.

2. Sample from the applicator's yard, at the owner's discretion for acceptance.

3. Provide pavement marking stencils that are consistent with existing pavement markings in Black Canyon of the Gunnison National Park.

4. Visually inspect longitudinal lines and transverse markings to verify compliance with the required dimensions.

5. Inspect at the end of each production day or more frequently as required.

6. Verify quantities applied by either of the following methods:
   a. Measuring both paint and bead tanks before and after application.
   b. Witnessing the meter readings before and after application.
      1) A printout of meter readings instead of witnessing may be accepted at the Contracting Officer's discretion.

7. Sample in the field with approval from the Park.

D. Stop all agitation before sample is drawn.

E. Repaint any line or legend failing to meet bead application rates and dimensional requirements.

1. Do not remove earlier application

1.3 SUBMITTALS

A. Documentation of the manufacturer and production batch identification for the paint used.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Paint

1. Meet the requirements for Acrylic Water Based Paint specified in Table 2-1.

Table 2-1

Paint Requirements				
Property	**White**	**Yellow**	**Black**	**Test**
Pigment – Percent by weight, minimum	62.0	62.0	62.0	ASTM D 3723
Total Solids – Percent by weight, minimum	77.0	77.0	77.0	ASTM D 1644
Nonvolatile vehicle – Percent by weight vehicle, minimum*	43.0	43.0	43.0	ASTM D 3723 ASTM D 1644
Viscosity, KU @ 77 degrees F	80 – 95	80 - 95	80 – 95	ASTM D 562
Density, lb/gal, minimum	14.0	14.0	14.0	ASTM D 1475
Volatile Organic Content (VOC) – g/L, maximum	100	100	100	ASTM D 3960
Titanium Dioxide Content, lb/gal	1.0 min	0.2 max	N/A	ASTM D 5381
Color Definition	37875	33538	N/A	Federal Standard 595B
Directional Reflectance Minimum	90.0	50.0	N/A	ASTM E 1347
Dry Opacity – Minimum (5 mils wet)	0.95	0.95	N/A	ASTM D 2805

*Binder – 100 percent acrylic cross-linking polymer, by weight, as determined by infrared analysis, and other chemical analysis available to the Department. Refer to ASTM D 2205.

2. No-Pick-Up Time
   a. Paint may not smear or track three minutes after application to the roadway using standard application equipment, at the mil thickness required, and with an ambient shaded temperature of at least 50 degrees F.

3. Additional Requirements
   a. Free of lead, chromium, or other related heavy metals. Refer to ASTM D 5381.
   b. Refer to ASTM D 2743 and ASTM D 5381 for tests used to verify paint samples meet ASTM requirements.

B. Pavement Marking Tape

1. Preformed adhesive tape with a raised profile for longitudinal lines on all pavement surfaces.

2. Preformed adhesive tape with a flat or raised profile for legends and symbols on all pavement surfaces.

3. Minimum service life for the following applications under all traffic volumes and wear conditions:

Table 2-2

TYPE	ELEVATION (ft above mean sea level)	INSTALLATION METHOD	MIN. SERVICE LIFE
Longitudinal Lines	All	Hot inlay	48 months
Longitudinal Lines	0 to 5499	Grooved	72 months
Longitudinal Lines	5500 or more	Grooved	48 months
Legends and Symbols	All	All	24 months

4. Performance measures for retro-reflectivity and presence.
   a. Minimum retro-reflectivity
      1) White longitudinal lines 125 millicandelas
      2) Yellow longitudinal lines 125 millicandelas
      3) Legends and symbols 125 millicandelas
   b. Minimum presence level – 90 percent of the longitudinal line on any 1,000 ft segment or 90 percent of the legend and symbol must be present.
   c. Failure to meet and of the specified performance measures on at least 90 percent of the longitudinal line in and 1,000 ft segment or 90 percent of a legend or symbol is considered a complete failure of that marking and requires complete replacement by the manufacturer.

C. Glass Spheres (Beads) used in Pavement Marking Paint

1. Heavy metal concentration: Manufacturer must provide a certificate of compliance stating that all beads contain no more than the amounts listed for the following materials as determined by testing performed according to EPA test methods 3052 and 6010C.
   a. Other suitable x-ray fluorescence spectrometry analysis methods may be used to screen samples of glass spheres for arsenic, antimony and lead content.

Table 2-3

Heavy Metal Materials	
Material	**Level (ppm, total)**
Arsenic	200
Antimony	200

Lead	200

2. Longitudinal Lines – Refer to AASHTO M 247, Specific Properties, with the following exceptions:
   a. Gradation:

Table 2-4

Gradation of Glass Beads	
Sieve Size	**Accumulated Percent Passing**
No. 18	65 – 80
No. 30	30 – 50
No. 50	0 - 5

   b. Coating – Dual coating for optimum adhesion and embedment.
   c. Roundness – 80 percent true spheres below the number 30 sieve. Refer to ASTM D 1155
   d. Color/Clarity – Colorless/clear and free of carbon residue.
   e. Refractive Index – Minimum 1.51 by oil immersion method.
   f. Air Inclusions – Less than 5 percent by visual inspection.
   g. Hardness – Beads above the number 30 sieve exhibit an average hardness of C70.5 when measured using the Rockwell C scale method and using a minimum sample of 100 beads.
   h. Crushing Strength – Beads above the number 30 sieve exhibit an average crushing strength of 60,000 psi when measured by the L/D2 method and with a minimum sample of 100 beads.
   i. Chemical Resistance – Beads resistant to hydrochloric acid, water, calcium chloride, and sodium sulfide. TT-B Federal Specification 1325C sections 4.3.6 to 4.3.9.

3. Transverse Markings – Refer to AASHTO M 247, Specific Properties, with the following exceptions:
   a. Gradation:

Table 2-5

Gradation of Glass Beads	
Sieve Size	**Accumulated Percent Passing**
No. 20	90 – 95
No. 30	45 – 70
No. 50	5 – 25
No. 80	0 - 5

   b. Coating – Dual coating for optimum adhesion and embedment.
   c. Roundness – The glass beads will have at least 75 percent true spheres.
   d. Refractive index – Minimum 1.51 by oil immersion method.
   e. Air Inclusions – Less than 10 percent by visual inspection. 6. Have at least 80 percent true spheres.

4. Beads used in Temporary Pavement Markings. Meet the above or AASHTO M 247 Type II uniform gradation.

PART 3 - EXECUTION

3.1 PREPARATION

A. Line Control

1. Establish control points at 100 ft intervals on tangent and at 50 ft intervals on curves.

2. Maintain the line within 2 inches of the established control points and mark the roadway between control points as needed.
   a. Remove paint that is not placed within tolerance of the established control points and replace. Refer to this Section, Article 3.2, paragraph F.
   b. Maintain the line dimension within 10 percent of the width and length dimensions defined in Standard Drawings.

B. Remove dirt, loose aggregate, curing compounds, and other foreign material and follow manufacturer's recommendations for surface preparation.

3.2 APPLICATION

A. Apply Pavement marking paint at the following wet mil thickness:

1. 1. 20-25 wet mils for all longitudinal markings.
   a. Approximate application rate for required mil thickness requirements:
      1) 4 inch Solid Line – From 190 to 240 ft/gal
      2) 4 inch Broken Line – From 760 to 960 ft/gal
      3) 8 inch Solid Line – From 95 to 120 ft/gal. Use the following calculation to determine wet mil thickness if approximation is outside the range for the desired line type:
         a) 4 inch Solid Line – Wet Mils = (4812.516 ft3 / gal mil/ft) / (X ft/gal)
         b) 4 inch Broken Line – Wet Mils = (19250.064 ft3 / gal mil/ft) / (X ft/gal)
         c) 8 inch Solid Line – Wet Mils = (2406.258 ft3 / gal mil/ft) / (X ft/gal)
         d) Where X = application rate (meter readings or dipping tanks)

B. No additional payment for pavement markings placed in excess of required wet mils in thickness or exceeding dimensional requirements outlined in this Section.

C. Glass Sphere (Beads) – Apply at least 8 lb/gal of paint, the full length and width of line and pavement markings.

1. Calibrate bead guns and measure bead distribution according to this specification.

2. Do not apply glass beads to contrast lines (black paint).

D. Begin striping operations no later than 24 hours after notification by the Contracting Officer.

1. Apply two applications on new bituminous surfaces.
    a. Verify timing of second application with the Contracting Officer.
    b. Apply second coat of yellow longitudinal lines in opposite direction for better distribution and visibility of glass sphere (beads) for both directions of traffic.

E. Apply lines and pavement markings only when the air and pavement temperature are:

1. 50 degrees F and rising for Acrylic Water Based Paint.

2. Non-grooved lines and markings applied at temperatures below 50 degrees F are temporary and must be repainted, when temperature conditions are met.
    a. Do not remove earlier application.

3. Grooved lines and markings applied below 50 degrees F must be removed and reapplied when temperature conditions are met.

F. Remove Pavement Markings

1. Use equipment specifically designed for removal of pavement marking material.

2. Use one of these removal methods
    a. High pressure water spray
    b. Sand blasting
    c. Shot blasting

3. Do not use grinding without approval from the Contracting Officer.

4. Do not eliminate or obscure existing striping, instead of removal, by covering with black paint or any other covering.
    a. The Contracting Officer may approval for use of black paint or other obscuring material prior to installation for work durations shorter than “long term stationary” as defined in this Section, Article 1.4 and in the Temporary Traffic Control section of the MUTCD.

END OF SECTION 32 17 23

SECTION 32 31 29 – WOOD FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes constructing, removing, and resetting wooden fences and barbed wire farm/ranch gates.

1.2 SUBMITTALS

A. Certifications of certified wood for fences and gates.

PART 2 - PRODUCTS

2.1 FENCE POSTS

A. Wood: Conform to AASHTO M 168.
   1. Peel bark, except for red cedar posts and bracing, which do not require peeling. Trim knots flush with the surface and season the wood.
   2. For dimension lumber for fences or gates, use timber that is sound, straight, and reasonably without knots, splits, and shakes. Provide S4S finish.
   3. All line posts shall have a minimum diameter of 4-inches and be a minimum of 6-foot long.
   4. Use lumber that is certified wood with certifications though Forest Stewardship Council (FSC) or Sustainable Forestry Initiative (SFI).

B. Concrete: Conform to Section 03 30 00.

C. Steel: For line fence posts, conform to AASHTO M 281.

2.2 BARBED WIRE

A. Zinc-coated steel barbed wire shall conform to AASHTO M 280, (ASTM A 121), 12-1/2 gage with class I coating, or aluminum-coated steel barbed wire conforming to ASTM A 585 type I.

PART 3 - EXECUTION

3.1 REMOVE AND RESET FENCE

A. Remove existing fence and reset to approximately the same condition as the original fence. Salvage material in the existing fence and incorporate the material into the reset fence. When posts are set in concrete, remove concrete from old post and reset in new concrete. Replace fence material damaged beyond reuse. Firmly reset posts on new alignment. Space posts and attach the

horizontal members or wires to posts the same as the original fence. Furnish and use new material to fasten members or wires to posts.

3.2 POSTS

A. Excavate holes for posts, footings, and anchors as shown. Space posts at intervals shown for the type of fence being installed. Measure post spacing interval parallel to the existing ground slope. Set posts in a vertical position. Backfill post holes in 6-inch (150-millimeter) lifts. Tamp and compact each lift.

B. Wood posts may be driven in place if the method of driving does not damage the post. Metal posts may be driven. Set metal corner, gate, end, and pull posts in concrete.

C. Where solid rock is encountered without overburden, drill line post holes at least 14 inches (350 millimeters) deep and end, corner, gate, and pull posts at least 20 inches (500 millimeters) deep in the solid rock. Make the hole width or diameter at least 1 inch (25 millimeters) greater than the post width or diameter. Cut the post to the required length before installation or drill the hole deep enough to set the post at the required height. Set and plumb the post and fill the hole with grout. Thoroughly work the grout into the hole to eliminate voids. Crown the grout to drain water away from the post. Metal posts set in this manner do not require anchor plates and concrete footings.

D. Where solid rock is covered with soil or loose rock overburden, set posts to the plan depth or to the minimum depth into the solid rock as specified above, whichever is less. When the depth of overburden is greater than 12 inches (300 millimeters), use an anchor plate on steel line posts and backfill steel end, corner, gate, and pull posts with concrete from the solid rock to top of the ground. When the depth of overburden is 12 inches (300 millimeters) or less, anchor plates and concrete backfill are not required. Grout the portion of the post in solid rock.

E. Install corner posts at changes in alignment of 30 degrees or more. Where new fence joins an existing fence, set end or corner posts, as necessary, and attach in a manner satisfactory to the CO.

3.3 GROUNDING FENCES

A. At each location where an electric transmission, distribution or secondary line crosses a wood post fence, the contractor shall furnish and install a ground conforming to article 250 of the national electrical code. The ground rod shall be a 8 feet long, ½ inch minimum diameter driven at least 7.5 feet into the ground. The rod shall be connected to each wire with a minimum AWG no. 8 stranded copper wire. Grounding will not be paid for separately but shall be included in the work.

B. A metal line post shall be installed a maximum of every 500 ft. Along a wood post fence. The metal post shall be within 1 foot of the nearest wood post and shall be tied to each strand with a wire clamp.

3.4 BARBED WIRE GATE

A. Place barbed wire on the side of the post facing away from the road. On curved alignment, place the barbed wire on the post face on the outside of the curve. Tightly stretch and fasten barbed wire to the posts.

B. Splicing of barbed wire between posts is permitted provided not more than two splices, spaced at least 50 feet (15 meters) apart, occur in a run of fence. Use wrap or telephone type splices for the barbed wire with each end wrapped around the other wire for not less than six complete turns

C. The gate will have not less than 5 strands of barbed wire fixed at one end to a fence post and the other end to a short post. The short post sits into a loop of wire at the base of the fixed fence, the top will have another loop of wire or tensioning device.

3.5 FASTENING BARBED WIRE

A. End the woven wire and barbed wire at each end, corner, gate, and pull post. Wrap each line of barbed wire and each longitudinal wire of the woven wire around the post and then itself with at least four turns. Where wood posts are used, staple the wires tightly to the posts.

B. At line posts, fasten the woven wire to the post at top and bottom and at intermediate points not exceeding 12 inches (300 millimeters) apart. Fasten each strand of barbed wire to each line post. Use wire ties or clamps to fasten the wires to metal posts. Securely splice tie wires to the fence on both sides of the post so there are two loops behind the post and one loop in front. On wood line posts, drive U-shaped staples diagonally across the wood grain so that both points do not enter between the same grain. In depressions where wire uplift occurs, drive staples with points slightly upward. On level ground and over knolls, slope the points slightly downward. Drive the staples just short of actual contact with the wires to permit free longitudinal movement of those lines and to prevent damage to the protective coating.

C. At grade depressions, alignment angles, and other locations where stresses tending to pull posts from the ground or out of alignment are created, snub or guy the wire fence. Attach the guy wire to each strand of barbed wire and to the top and bottom wires of woven wire in a manner to maintain the entire fence in its normal shape. Attach the guy wire to a deadman anchor buried not less than 24 inches (600 millimeters) in the ground or to an approved anchor at a point that best serves to resist the pull of the wire fence. If necessary, to guy the fence in solid rock, grout the guy wire in a hole 2 inches (50 millimeters) in diameter and 10 inches (250 millimeters) deep. Deadman may also be fastened to posts. Place the deadman anchors at locations as directed.

D. Where required, install vertical cinch stays as shown. Twist the wire to permit weaving into the horizontal fence wires to provide rigid spacing. Weave barbed wires and the top, middle, and bottom wire of the woven wire as applicable, into the cinch stay.

E. Where existing fence intersects the new fence, cut the existing fence material or splice in kind, new material as necessary, and fasten each longitudinal wire of the woven wire and each strand of the barbed wire to a new end post in line with or immediately adjacent to the new fence line.

END OF SECTION 32 31 29

SECTION 32 32 53 - CATTLE GUARDS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes removal and construction of a cattle guard.

1.2 SUBMITTALS

A. Certifications of certified wood for pwings.

PART 2 - PRODUCTS

2.1 CATTLE GUARD

A. Fabricate structural steel for cattle guard in a fabricating plant that is certified under the AISC, Quality Certification Program. Furnish and fabricate fracture critical elements according to AASHTO, LRFD Bridge Design Specifications and Clause 12 of the AASHTO/AWS, Bridge Welding Code D1.5 (D1.5M).

B. Remove mill scale and foreign material from exterior surfaces of exterior girders of unpainted weathering steel by blast cleaning according to SSPC-SP6, Commercial Blast Cleaning. Then dry the surface and apply at least three uniform applications of water mist at 24-hour intervals to ensure uniform weathering.

C. Standard manufactured cattle guards may be used if approved. Furnish cattle guards with HS-20 (M18) loading rating according to AASHTO, LRFD Bridge Design Specifications. Provide suitable cleanouts. Submit drawings according to Section 01 33 23 “SUBMITTAL PROCEDURES”.

2.2 WINGS

A. Type of wing (timber or steel) shall be steel unless otherwise shown on the plans.

B. All timber shall be treated in conformance with ASSHTO M 133 and AWPA C14.

C. Wing posts may be made from 8-inch round native timber.

D. Use lumber that is certified wood with certifications though Forest Stewardship Council (FSC) or Sustainable Forestry Initiative (SFI).

PART 3 - EXECUTION

3.1 EXCAVATING AND BACKFILLING

A. Perform the work described under Section 31 20 00 “EARTH MOVING”. Excavate foundation to depth with sufficient space for proper installation of formwork.

B. When the cattle guard is to be installed on new embankment, complete and compact the embankment according to Section 31 20 00 “EARTH MOVING” before excavating for footing.

3.2 CONCRETE FOUNDATION

A. Concrete cattle guard foundations shall be Class B and may be cast-in-place or precast. Construct cast-in-place concrete foundations according to Section 03 30 00 “CAST-IN-PLACE CONCRETE”. Set cattle guard units in the foundation concrete before it hardens.

B. Reinforcing bars shall be #4, grade 60.

C. Finish stringer bearings to allow full bearing under each stringer. Firmly seat cattle guard on the concrete to prevent rocking.

3.3 CATTLE GUARD

A. Assemble and place guards as shown in the plans. Securely fasten the cattle guard to the foundation. Fasten the metal wings as shown in the plans. Connect fences and gates as shown in the plans. Weld according to AASHTO/AWS, Bridge Welding Code D1.5 (D1.5M).

B. When a cattle guard is to be installed in impervious material, adequate drainage shall be provided to insure against possible subgrade damage. Drainage details shall be as shown on the plans. An outlet pipe may be considered.

3.4 STRUCTURAL STEEL

A. All structural steel shall conform to AASHTO M 270 (ASTM A 709) Grade 36.

B. Welding shall conform to the AWS structural welding code and AASHTTO specifications for welding of structural steel highway bridges.

C. All hardware shall be galvanized in conformance with AASHTO M 111 or painted with zinc-rich paint meeting military specification DOD-P-21035.

3.5 PAINTING

A. Apply one shop coat to metal parts. Apply two additional coats in either the shop or in the field.

3.6 EVALUATION

A. Excavation and backfill for cattle guards will be evaluated under Section 31 20 00 “EARTH MOVING”.

B. Concrete work for cattle guards will be evaluated under Section 03 30 00 “CAST-IN-PLACE CONCRETE”.

END OF SECTION 323253

SECTION 33 42 00 - STORMWATER CONVEYANCE

PART 1 - GENERAL

1.1 SUMMARY

A. This work includes pipe, end sections, and fittings used to convey surface water and stormwater by gravity flow. Corrugated Steel Pipe shall be polymer coated and the inside and outside. Galvanized flared Steel End Sections shall have a painted or powder coated finish for corrosion protection as per the manufacturer's instructions.

1.2 QUALITY ASSURANCE

A. Submittals

1. Manufacturer's certificate of compliance.
2. Manufacturer's data sheets and installation instructions.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Pipe

1. General
   a. Provide pipe according to the size, material or interior roughness, and joint type specified.
      1) Meet the material requirements in Table 2-1.
      2) Meet the joint requirements of AASHTO PP 63 for silt-tight and leak-resistant joints.
      3) Determine the strength and thickness of the pipe required based on the cover over the pipe. Refer to the plans.
      4) Maintain the same type of pipe material, joint, strength, and thickness throughout the entire length of pipe.
      5) Submit the material, manufacturer literature, and proposed color of painted or powder coated flared Steel End Sections for CO review and approval.
   b. Internally label each section of pipe with the manufacturer's name or trademark, nominal diameter, and manufacture date. Include the pipe class, gauge, and coating according to the pipe material type.
      1) Place the pipe so that the location of the label is above the spring line of the pipe.

Table 2-1

Pipe Material Specifications
Interior Roughness and Material Type

Corrugated	
Polymer Coated Corrugated Steel Pipe and Pipe Arch	AASHTO M 245
Aluminum Corrugated Pipe and Pipe Arch	AASHTO M 196
Smooth	
Profile Wall Polyethylene (HDPE) Pipe	AASHTO M 294
Profile Wall Polyvinyl Chloride (PVC) Pipe	AASHTO M 304
Profile Wall Polypropylene Pipe	AASHTO M 330
Steel Reinforced Thermoplastic Ribbed Pipe	AASHTO MP 20
Polymer Coated Spiral Rib Steel Pipe and Pipe Arch	AASHTO M 245
Spiral Rib Aluminum Pipe and Pipe Arch	AASHTO M 196
Reinforced Concrete Pipe	AASHTO M 170
Elliptical Reinforced Concrete Pipe	AASHTO M 207

2. Metal Pipe – Steel and Aluminum
   a. Do not allow pipes of different types of metal to contact each other.
   b. Use rubber gaskets on all connecting bands. Refer to ASTM D 1056 for flat gaskets and ASTM C 443 for O-ring gaskets.
   c. Use bands with projections (dimple bands) only in extension of existing pipes or a field cut where annular corrugations do not exist.

B. Steel End Section

1. End Section: Galvanized steel sheeting according to AASHTO M 218.
2. Safety Bar for Safety End Section: Schedule 40 ASTM A 500 Class B steel pipe. Galvanize after fabrication according to AASHTO M 111.
3. Smooth Tapered Sleeve, when required: Galvanized steel sheeting according to AASHTO M 218.
4. Refer to S Series Standard Drawings in the plan set.

C. Corrugated-steel pipe and fittings

PART 3 - EXECUTION

3.1 INSTALLATION

A. Excavation and Backfill

1. Perform the work described under Section 31 20 00 “EARTH MOVING”.
2. Keep trenches free from water.
3. Grade and prepare the bottom of the trench to provide a firm and uniform bearing throughout the entire length of the pipe.
   a. Do not use blocking to bring the pipe to grade.
   b. Shape the pipe foundation and bedding to have recesses to fit any projecting hubs or bells.
4. Remove and relay or replace pipe that is out of alignment, not joined properly or damaged before placing backfill.

B. Furnish prefabricated steel end sections compatible with the adjoining pipe.

C. Prepare a smooth foundation free of rock and debris, capable of uniformly supporting the end section.

D. Follow manufacturer's recommendations for connecting pipes and for connecting pipe to end sections, concrete headwalls, catch basins, and similar structures.

1. Do not allow pipes of different types of metal to contact each other.

E. Place the end section at the same alignment and slope as the adjoining pipe.

F. Embed the toe plate for steel end sections.

G. Connect the end section to the adjoining pipe according to the S Series Standard Drawings in the plan set.

1. Use a 3 /8 inch neoprene flat gasket when connecting to a dissimilar metal. Refer to ASTM D 1056.

H. Backfill and grade slopes to match the end section.

I. Post Installation Pipe Inspection

1. Inspect pipes after installation of pipe, placement of backfill and before placing pavement or finished grade for deflection.
2. Inspection is not required for pipes less than 20 ft in length.
3. Notify the Contracting Officer at least 24 hours before performing an inspection. 5. Clean and flush the pipe with water immediately before the inspection.
   a. Remove and dispose material and debris from pipes.

4. Manual Inspection
   a. Perform manual inspection for pipes in the presence of the Contracting Officer.
      1) Follow OSHA requirements for inspecting confined entry spaces.
   b. Observe and document the following:
      1) Deflection - Take the following measurements every 10 ft along the length of the pipe to the nearest ¼ inch:

         a) Vertically from the crown to invert.
         b) Horizontally at the spring line.
         c) Two measurements, each diagonally at 45 degrees to the pipe springline.
      2) Cracks – Measure cracks using a device capable of measuring 0.01 inch.
      3) Joint Gaps – Measure the widest separation at each joint to the nearest ¼ inch.
      4) Damage.

3.2 FIELD QUALITY CONTROL

A. General

1. Each pipe is accepted for payment after verifying that the following criteria have been met:
   a. Alignment
   b. Deflection
   c. Joint gap
   d. Damage

2. Proposed resolutions for nonconforming pipes require the seal of a licensed Professional Engineer competent in the structural design of the pipe material being evaluated.

B. Alignment

1. Do not exceed the installation horizontal and vertical alignment tolerances in Table 3-1.

Table 3-1

Installation Alignment Tolerances		
Design Grade	**Horizontal**	**Vertical***
		inch/100 ft
> 1%	Not to exceed the pipe manufacturer's requirements	1 ½
0.5% - 1%		1
< 0.5%		½

* Increase tolerance by 50 percent for pipes with silt tight joints.

C. Deflection

1. Do not exceed a 5 percent shape change from the nominal diameter.
   a. Proposals for acceptance of pipes with a deflection greater than 7.5 percent will be rejected.

D. Joint Gap

1. Do not exceed the joint separation, measured along the length of pipe, in Table 3-2.
   a. Repair or replace joints that show visible signs of soil or water infiltration.

Table 3-2

Joint Gap Tolerances	
Nominal Diameter (inches)	**Separation (inches)**
12 to 36	0.75
42 to 48	1.00
54 to 90	1.25
96 to 144	1.75

E. Damage

1. Pipes are to be free from:
   a. Cuts, cracks, spalls, chips, or punctures.
      1) Cracks are allowable up to 0.01 inch in width for reinforced concrete pipe
   b. Loss or delamination of coatings.
   c. Exposed reinforcing steel.

d. Imperfect concrete mixing and casting such as honeycomb or open texture.

END OF SECTION 33 42 00

SECTION 33 43 00 – RIPRAP

PART 1 - GENERAL

1.1 DESCRIPTION

A. This work consists of placing loose and compacted riprap at the bottom of curb cut area and paved ditches, on slopes. The riprap material is incidental to the cost and quantity of the curb cut or pavement items (paid for under Concrete and Asphalt Contract Line Item).

B. This work also consists of placing loose and compacted riprap and geotextile at culvert outlets. The cost of the geotextile and riprap is incidental to the cost and quantity of the culvert pay item.

D_{50} is defined as the median rock diameter within a riprap mass for which 50 percent of the rocks are smaller and 50 percent are larger.

C. Rock diameter is defined as the equivalent diameter (average width) of a given rock.

1.2 SUBMITTALS

A. The rock source, gradation, and laboratory values for the properties in Table 2-1, for information.

B. Geotextile
   1. Manufacturer’s product data sheet and recommended installation instructions.

PART 2 - PRODUCTS

2.1 RIPRAP

A. Rock
   1. Angular, hard, durable, resistant to weathering and free from seams, cracks and other structural defects.
      a. Do not use shale, mudstone, or other rock that may break into smaller pieces in the process of handling and placing.
      b. Do not use concrete or asphalt rubble.
   2. Meet the properties listed in Table 2-1.

Table 2-1

Physical Properties		
Property	**Value**	**Test Method**
Specific Gravity	2.5 min	AASHTO T 85
Absorption	2% max	AASHTO T 85
Soundness of Aggregate using Sodium Sulfate or Magnesium Sulfate	12% max or 17.5% max	AASHTO T 104
Resistance to Degradation	40% max	AASHTO T 96

3. Well graded rock throughout the riprap layer to produce a dense mass. Refer to Table 2-2 for riprap gradation limits.
   a. Control gradation by sample measurement or by visual inspection, as determined by the Contracting Officer.

Table 2-2

Riprap Gradation Limits	
Rock Diameter Range (ft)	Percent of Gradation Smaller Than
$1.5D_{50}$ to $1.7D_{50}$	100
$1.2D_{50}$ to $1.4D_{50}$	85
$1.0D_{50}$ to $1.15D_{50}$	50
$0.4D_{50}$ to $0.6D_{50}$	15
$0.1D_{50}$	10

4. Provide a sample of color of rock to the CO prior to installation. Color should be native to Black Canyon of the Gunnison National Park and should be approved by the CO before placement.

2.2 EROSION CONTROL GEOTEXTILE

A. Use a Class 2 nonwoven drainage geotextile according to AASHTO M 288 with a 12 oz/yd^2 maximum roll value.

B. Protect the geotextile from direct sunlight, chemicals, mud, dirt, and debris during shipment and storage.

C. Labeling and Tagging
   1. Identify each package by a tag or label securely affixed to the outside of the roll on at least one end.
   2. Provide the following required information on the tag:
      a. Name of the geotextile manufacturer
      b. Brand name of the product, width, length, and package weight of geotextile.

PART 3 - EXECUTION

3.1 PREPARATION

A. Excavate and grade to provide a firm and uniform bearing surface. Refer to Specification Section 31 20 00 “EARTH MOVING”.

3.2 INSTALL DRAINAGE GEOTEXTILE

A. Place geotextile on areas that are smooth and free from projections or depressions.
   1. Do not drag the geotextile across the subgrade.
   2. Roll geotextile out as smoothly as possible in the direction of vehicle travel.

B. Do not operate construction equipment or traffic directly on geotextile.

C. Cover the geotextile with indicated cover material as soon as possible when placed for construction.
   1. Do not leave uncovered for more than five days.

D. Place cover material on the geotextile in a manner that the geotextile is not torn, punctured, or shifted.
   1. Use at least a 6-inch-thick cover layer or twice the maximum aggregate size, whichever is thicker.
   2. Do not end-dump cover material directly on the geotextile except as a starter course.

E. Limit construction vehicles in size and mass so rutting in the initial layer above the geotextile is not more than 3 inches deep or half the layer thickness, whichever is less.
   1. Do not turn vehicles on the first layer.

F. Install at locations shown.

G. Place and secure geotextile to provide direct contact against the excavated surface.

H. Overlap successive sheets of geotextile at least 1 ft in the down-gradient direction of flow.

I. Overlap geotextile at least 1 ft at the top of the trench, where applicable.

J. Place fill beginning with the sheets overlapped above subsequent sheets to hold geotextile in place.

K. Repair – Place patch over damaged area and extend 3 ft beyond the perimeter of the tear or damage.

3.3 LOOSE RIPRAP

A. Place rocks to provide a secure unsegregated dense mass.
   1. Distribute and manipulate the rocks so that the larger rocks are uniformly distributed, and the smaller rocks serve to fill the spaces between the larger rocks.

3.4 COMPACTED RIPRAP

A. Place rocks conforming to this section, paragraph 3.3.

B. Compact riprap to remove irregular surface protrusions larger than 3 inches.

END OF SECTION 33 43 00