

SPECIAL CONTRACT REQUIREMENTS
Schedule A, Option X

Beartooth Highway (U.S. 212) Reconstruction Project

The following Special Contract Requirements amend and supplement the *Standard Specifications for Construction of Roads and Bridges, on Federal Highway Projects (FP-03) Metric Version*, U.S. Department of Transportation, Federal Highway Administration.

SI (METRIC)⁽¹⁾ TO U.S. CUSTOMARY CONVERSION FACTORS (approximate)

To the table on page iv, amend the second line of the MASS and the second line of the ILLUMINATION portion of the table as follows:

Symbol	When You Know	Multiply By	To Find	Symbol
MASS				
kg	kilograms	2.2046	pounds	lb
ILLUMINATION				
cd/m ²	candela/m ²	0.2919	foot-Lamberts	fl

Section 101. – TERMS, FORMAT, AND DEFINITIONS

101.03 Abbreviations. Add the following:

API — American Petroleum Institute

101.04 Definitions. Add the following:

Admixture — Substance added to the grout to either control bleed and/or shrinkage, improve flowability, reduce water content, retard setting time, or resist washout.

Alignment Load (AL) — A nominal load applied to a micropile during testing to keep the testing equipment correctly positioned.

Bond Length — The length of the micropile that is bonded to the ground and which is conceptually used to transfer the applied axial loads to the surrounding soil or rock.

Casing — Steel pipe introduced during the drilling process to temporarily stabilize the drill hole. Depending on the details of the micropile construction and composition, this casing may be fully extracted during or after grouting, or may remain partially or completely in place, as part of the final pile configuration.

Centralizer — A device to centrally locate the reinforcing element(s) within the borehole.

Coupler — The means by which the load can be transmitted from one partial length of reinforcement to another.

Design Load (DL) — Anticipated final maximum service load in the micropile.

Micropile — A small diameter, bored, cast-in-place pile, in which most of the applied load is resisted by the steel reinforcement.

Micropile Contractor — The person/firm responsible for performing the micropile work. The micropile Contractor may be the Contractor or subcontractor.

Overburden — Non-lithified material, natural or placed, which normally requires cased drilling methods to provide an open borehole to underlying strata.

Post Grouting — The injection of additional grout into the bond length of a micropile after the Primary grout has set. Also known as regrouting or secondary grouting.

Proof Test — Incremental loading of a micropile, recording the total movement at each increment.

Reinforcement — The steel component of the micropile which accepts and/or resists applied loadings.

101.04 Definitions.

Roadway Prism Delete the text and substitute the following:

Roadway Prism — The volume defined by the area between the original terrain cross-section and the final design cross-section multiplied by the horizontal distance between the centroids (geometric center) of the area.

Add the following:

Tremie Grouting — The placing of grout in a borehole via a grout pipe introduced to the bottom of the hole. During grouting, the exit of the pipe is kept at least 10 feet below the level of the grout in the hole.

Section 103. – SCOPE OF WORK

103.02 Disputes. Delete the Subsection and substitute the following:

103.02 Disputes. Follow the requirements of FAR Clause 52.233-1 Disputes (Alternate I).

When requesting a CO's decision on an interpretation of contract terms for the recovery of increased costs, quantify the amount and, if required by FAR Clause 52.233-1 Alternate I, certify

the amount. Include an explanation of the interpretation of contract terms, the contract clause under which the claim is made, all supporting documentation, and adequate cost data to support the amount claimed.

103.03 Value Engineering. Delete the Subsection and substitute the following:

103.03 Value Engineering. Follow the requirements of FAR Clause 52.248-3 Value Engineering -Construction (Alternate I).

Before undertaking significant expenditures, provide the CO with a written description of the value engineering change proposal (VECP) concept. Within 14 days, the CO will inform the Contractor as to whether the concept appears to be viable or if the concept is unacceptable. If the CO indicates that the concept appears to be viable, prepare and submit the formal VECP proposal.

103.06 Issue Resolution. (Added subsection.)

Resolve project issues at the lowest authorized level, and in the most expedient manner possible. For those issues that cannot be resolved at the lowest authorized level, an Issue Escalation Matrix is included in this contract (See Table 103-1).

Resolve issues within the working days set forth in the Issue Escalation Matrix. Escalate issues not resolved within the working days established in the Matrix to the next higher level. An exception to this requirement may be observed when both parties agree to a longer period of time and extra time is needed for the development of facts.

Either party may request that an issue be escalated. Upon the request of either party, both parties shall escalate the matter. A request to escalate must be made in writing. Failure to meet the time periods set forth in the Matrix and any mutually agreed extension shall constitute grounds permitting the escalation of the issue.

Decision making is encouraged to be made at the lowest authorized level onsite. Recommendations, options, and ideas by all team members are requested. Decisions made at the lowest level possible will be supported by all management levels. Countermands of decisions will not be permitted, except where there is a conflict with code, regulation, law, the contract, or a change of critical facts or information which causes a re-evaluation of the resolution. Support of a countermand by the original decision team is critical. All Contractor and Government team members must understand why the change is necessary and must be able to support it.

**Table 103-1
Issue Escalation Matrix**

Contractor Representative	FHWA Representative	Time
On-site field management	Project Engineer	2 days
Off-site project manager	Construction Operations Engineer	5 days
Corporate Officer	Construction Engineer	10 days
President	Director of Project Delivery	20 days

Section 104. – CONTROL OF WORK

104.03 Specifications and Drawings.

Delete Subsection 104.03(a) and (b) and substitute the following:

(a) Construction drawings. Prepare drawings as necessary to construct the work. Drawings include, but are not limited to, layouts that show the relative position (vertical and horizontal as appropriate) of work to be performed, fabrication details for manufactured items and assemblies, installation and erection procedures, details of post-tensioning and other systems, detailed trench and excavation procedures that conform to OSHA requirements, traffic control implementation drawings, and methods for performing work near existing structures or other areas to be protected. Show all the drawing dimensions in United States customary units.

Limit drawings to a maximum size of 610 by 920 millimeters. Include on each drawing and calculation sheet, the project number, name, and other identification as shown in the contract.

Furnish the CO with 5 sets of drawings, an electronic copy of the drawings, and supporting calculations. Drawings will be reviewed in the order they are received. Allow 40 days for CO acceptance of railroad structure drawings and 30 days for acceptance of other structure drawings. If drawings are returned for revision, the time for acceptance starts over when the drawings are corrected and resubmitted. The CO may request additional specific drawings for unique situations in order to clarify layout, construction details, or methodology. Do not perform work covered by the drawings before the drawings are accepted. Obtain written approval before changing or deviating from the accepted drawings.

(b) Specific requirements for construction drawings.

(1) Furnish drawings for the following:

- (a) Site-specific layouts for all wall types and gabion installations;
- (b) Gabion and revet mattress details and installation procedures;

- (c) Forms and falsework for non-bridge concrete structures less than or equal to 1.8 meters in height;
 - (d) Fabrication drawings for bridge railings and parapets;
 - (e) Fabrication drawings for prestressed members;
 - (f) Fabrication and installation drawings for expansion joint assemblies;
 - (g) Fabrication drawings for bearing assemblies;
 - (h) Construction joint location and concrete deck placement sequences not shown on the plans;
 - (i) Erection diagrams for Soil-Corrugated Metal Structure interaction systems (multi-plate structures);
 - (j) Structural steel fabrication drawings;
 - (k) Utility hangar details;
 - (l) Fabrication and installation drawings for precast items; and
 - (m) Site-specific layouts for rockeries.
- (2)** Furnish drawings that bear the seal and signature of a professional engineer proficient in the pertinent design field for the following:
- (a) Erection plans;
 - (b) Reinforced soil slopes details;
 - (c) MSE wall and crib wall details;
 - (d) Details and installation procedures for proprietary wall systems;
 - (e) Temporary bridge structures for public use;
 - (f) Forms, shoring, and falsework for bridges less than or equal to 1.8 meters in height;
 - (g) Shoring systems and cofferdams greater than 1.8 meters in height;
 - (h) All shoring systems that support traffic loadings;
 - (i) Forms, shoring, and falsework for all structures greater than 1.8 meters in height;
 - (j) Post-tensioning systems;
 - (k) Ground anchors, soil nail, and rock bolt assembly details, layout, and installation and testing procedures;
 - (l) Tie back wall details;
 - (m) Alternate retaining wall details; *and*

(n) Bride demolition plans.

(3) Furnish drawings that bear the seal and signature of a professional engineer who is proficient in forms and falsework design and licensed in the state where the project will be constructed for the following:

- (a) Falsework for any structure with a span exceeding 5 meters;
- (b) Falsework for any structure with a height exceeding 4.3 meters; and
- (c) Falsework for structures where traffic, other than workers involved in constructing the structure, will travel under the structure.

Add the following:

(c) **As-built working drawings.** Prepare and furnish as-built working drawings prior to final acceptance. The Government will provide one set of 280 x 430 millimeter contract drawings to be used exclusively for recording the as-built details of the project. Mark plans on title sheet "As-Built Plans". Use red ink to record the information described below.

Note all additions or revisions to the location, character and dimensions of the prescribed work shown on the contract drawings. Location changes are to be shown in the same coordinate system used for the staking notes. Strikeout all details shown that are not applicable to the completed work. Check and initial all plan sheets that were incorporated into the completed work without change.

Retain the drawings at the project site and, as work progresses, continuously update them to reflect the as-built details. Submit a copy of the updated as-built drawings at least every 30 days to the CO for review for compliance with these specifications.

As a minimum, show the following information on the as-built drawings:

(1) Title Sheet

- (a) Name of contractor.
- (b) Name of Project Engineer.
- (c) Project completion date.
- (d) Revisions to project length.
- (e) Revisions to begin and end stations of project.
- (f) Revisions to index to sheets.
- (g) Strikeout any schedules or options not awarded.
- (h) A note stating "All work was constructed as designed unless otherwise noted."

(2) Typical section(s)

- (a) Revisions in dimensions.
- (b) Revisions in materials.
- (c) Revisions in station ranges.
- (d) Revisions to begin and end stations of project, and length of project.
- (e) Revisions to station equations.
- (f) Revisions to slope ratio and curve widening tables.
- (g) Revisions to any notes.

(3) Summary of Quantities and Tabulation Sheets

- (a) Revisions to all quantities, locations, notes/remarks, including totals.
- (b) Strikeout unused pay items.
- (c) Revisions to application rates.
- (d) Revisions to location, type, end treatments, riprap, skew, on drainage summary.

(4) Control Sheets

- (a) Show any control that was removed, destroyed, established, according to subsections 107.02, paragraph 2; 152.02, paragraph 2; and 152.03.
- (b) Use a unique naming convention for newly established control points. Do not reuse CFL control point numbers.

(5) Plan and profile and layout sheets

- (a) Revisions to the alignment; grades, elevations and stationing of intersection PIs; station equations and superelevation.
- (b) Major changes in the construction limits; particularly changes requiring additional design, additional right of way, or contract modifications. (Show information on plan and profile, layout sheets, and right of way plans if applicable.).
- (c) Revisions in location, type and grade of road approaches.
- (d) Revisions in locations of sub-excavation and roadway obliteration.
- (e) Location, size and type of underdrains.
- (f) Location, number and type of horizontal, lateral, trench and blanket drains.
- (g) Revisions to culvert diameter, length, type, stationing, skew, riprap and end treatments.

- (h) Length of culvert extension, skew, and offset from centerline to the ends of extended culverts.
- (i) Channel changes.
- (j) Location of monuments and permanent references replaced according to subsection 107.02.
- (k) Location, length and type of fencing.
- (l) Location, length, stationing and type of walls.
- (m) Location, length, stationing and end treatment of roadside design features, including, but not limited to, guardrail, guardwall, signs, fences, gates, etc.
- (n) Revisions in location of pavement markings.
- (o) Revisions to parking areas or turnouts location.
- (p) Revisions in location, type and length of curbs, sidewalks, and accessible ramps.
- (q) Revisions to any notes.
- (r) Revisions to permanent erosion control measures.

(6) Structural Sheets

- (a) Stationing of bridge ends.
- (b) Micropile locations, depths, inclination, bedrock depth and composition details.
- (c) Revisions to footing and seal elevations.
- (d) Any changes in plan or dimensions including any major changes in reinforcing.

(7) Standards, Details, and Specials

Revisions to notes, dimensions, locations, and materials.

No direct payment will be made for preparing and furnishing as-built working drawings. A retention of 1/10th of 1% of payment due will be withheld from project pay estimates if the Contractor has not kept current the designated set of as-built plans. In addition, a retention of 1/10th of 1% of the contract amount paid to date will be withheld at the end of the project until the set of as-built plans has been submitted to and accepted by the Project Engineer. The final completed as-built working drawings must be submitted to and accepted by the Contracting Officer before final acceptance will be granted on the project.

Section 105. – CONTROL OF MATERIAL**105.01 Source of Supply and Quality Requirements.** Add the following:

Submit samples of materials for quality verification testing for materials required to conform to Sections 703, 704, and 705.

Materials containing petroleum-based solvents such as cutback asphalts and traffic paints may be restricted from use by local laws or ordinances in certain geographic areas. Upon presenting proof of such restrictions, alternate materials considered acceptable to the CO may be substituted for the materials specified in the contract.

105.02 Material Sources.**(a) Government-provided sources.** Add the following:

The Ghost Creek material source located 13.97 km west of the project and rock cuts are available for use on this project at the contractor's option.

The material may be used to produce the following construction materials:

- Roadway embankment
- Structural backfill
- Unclassified borrow
- Riprap class 2, 3 and 4
- Special rock embankment
- Individual boulders
- Aggregate base
- Aggregate-topsoil course
- Superpave pavement

Each material type produced must meet the aggregate quality requirements specified in the contract.

If the Contractor elects to use the Ghost Creek material source submit a Material Source Development Plan. Use Geotechnical reports to develop the Material Source Development plan. The plan will be approved by the CO prior to performing work within the Government-provided source. The Material Source Development Plan will include the method to best optimize all the material to produce the aggregate types required in the contract. The Contractor will perform all work necessary to produce acceptable material including site development, preparation, erosion control and reclamation. The Material Source Development Plan must address, but is not limited to, the following:

- Reclamation plan
- Erosion control plan

- Optimization and source development plan to utilize material source for applicable construction material types

The Contractor will be responsible to ensure all materials meet the specifications prior to being incorporated into the project.

(b) Contractor-located sources. Add the following to the end of the first paragraph:

For Contractor-located, non-commercial sources, secure environmental clearances according to Subsection 107.10.

Water for this project is potentially available at the Beartooth Lake, Long Lake, Little Bear Creek, and Little Bear Lake. A permit for these locations has been obtained on previous projects (HPP 4-1(6)). Comply with all requirements outlined in the permits for temporary water use. Use the Beartooth Lake boat ramp for access at Beartooth Lake. Configure the boat ramp to allow continuous public use of the ramp during the loading of the water. Repair the boat ramp after use as approved by the CO.

105.04 Storing and Handling Material. Add the following after the third sentence of the second paragraph:

For Contractor-located, non-commercial staging, storing, and material handling areas, secure environmental clearances according to Subsection 107.10.

Forest Service Special Use Permits (SUP) for all areas within the clearing limits and for non-commercial staging, storing, and material handling areas have been obtained and are included in the Appendix. For Contractor-located, non-commercial staging, storing, and material handling areas outside of the areas covered by the SUP and on USFS property, evaluate the environmental documentation for the project to determine if sensitive resources exist. Obtain a FS SUP. Obtain the SUP prior to beginning work by contacting the SNF Staff Recreation Officer, Shoshone National Forest, 808 Meadow Lane, Cody, Wyoming 82414. The telephone number is (307) 527-6241. SUPs may contain work restrictions and/or stipulations that significantly impact types, methods, and amounts of work, material handling, or storage allowed in these areas. In addition to those stipulations required by the FS in SUPs, reclamation of areas used for staging, storing, or material handling will be as directed by the CO, and may include restoring the terrain to natural contours and applying topsoil, seed, mulch, and erosion controls, in accordance with the applicable provisions of these specifications.

Add the following:

The Contractor may use locations (as identified on the title sheet and site plan) for staging areas. These staging area locations have been cleared environmentally and are included in the FS SUP obtained by FHWA. A FS operations plan for any staging, storage, or aggregate production is required. Submit operation plans to the CO for approval prior to use of each site and upon change of operations at any site. Locate additional staging areas and equipment and material

storage facilities at sites with minimum visibility from the road, where possible. If the Contractor elects to use private land, the Contractor is responsible for obtaining, environmentally clearing, and reclaiming any private property staging and waste sites.

The Ghost Creek site is also available for the storage and production of aggregate materials for this project. Commercial sources are acceptable.

Transplant wetland topsoil, salvaged wetland and upland sod, and salvaged willows immediately after salvaging unless storage is approved by CO.

Store plant materials to ensure survival and health, when storage of topsoil, salvaged sod, salvaged willows, and other plant materials is unavoidable. Supply all necessary water to plant materials to ensure health and survival. Create planting beds in stockpile areas in which to temporarily plant salvaged willows. Place salvaged sod chunks adjacent to one another so that moisture is maintained between sod chunks. Place subsoil material around the edges of salvage sod to keep the edges from drying. Plant roots must at no time become dry or be exposed to air for more than 10 minutes.

Section 106. – ACCEPTANCE OF WORK

106.01 Conformity with Contract Requirements. Delete the text and substitute the following:

Follow the requirements of FAR Clause 52.246-12 Inspection of Construction.

References to standard test methods of AASHTO, ASTM, GSA, and other recognized standard authorities refer to the methods in effect on the date of solicitation for bids.

Perform all work to the lines, grades, cross-sections, dimensions, and processes or material requirements shown on the plans or specified in the contract.

Incorporate manufactured materials into the work according to the manufacturer's recommendations or to these specifications, whichever is more strict.

Plan dimensions and contract specification values are the values to be strived for and complied with as the design values from which any deviations are allowed. Perform work and provide material that is uniform in character and reasonably close to the prescribed value or within the specified tolerance range. The purpose of a tolerance range is to accommodate occasional minor variations from the median zone that are unavoidable for practical reasons.

When standard manufactured items are specified (such as fence, wire, plates, rolled shapes, pipe conduits, etc., that are identified by gauge, unit mass, section dimensions, etc.), the identification will be considered to be nominal masses or dimensions. Unless specific contract tolerances are noted, established manufacturing tolerances will be accepted.

The Government may inspect, sample, or test all work at any time before final acceptance of the project. When the Government tests work, copies of test reports are furnished to the Contractor upon request. Government tests may or may not be performed at the work site. If Contractor testing and inspection is verified by the Government, the Contractor's results may be used by the Government to evaluate work for acceptance. Do not rely on the availability of Government test results for process control.

The number of significant figures used in the calculations will be according to ASTM E 29, absolute method.

Acceptable work conforming to the contract will be paid for at the contract unit bid price. Four methods of determining conformity and accepting work are described in Subsections 106.02 to 106.05 inclusive. The primary method of acceptance is specified in each Section of work. However, work may be rejected at any time it is found by any of the methods not to comply with the contract.

Remove and replace work that does not conform to the contract, or to prevailing industry standards where no specific contract requirements are noted, at no cost to the Government.

(a) Disputing Government test results. If the accuracy of Government test results is disputed, promptly inform the CO. If the dispute is unresolved after reasonable steps are taken to resolve the dispute, further evaluation may be obtained by written request. Include a narrative describing the dispute and a proposed resolution protocol that addresses the following:

- (1) Sampling method
- (2) Number of samples
- (3) Sample transport
- (4) Test procedures
- (5) Testing laboratories
- (6) Reporting
- (7) Estimated time and costs
- (8) Validation process

(b) Alternatives to removing and replacing non-conforming work. As an alternative to removal and replacement, the Contractor may submit a written request to:

- (1) Have the work accepted at a reduced price; or
- (2) 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.

Where sample/testing procedures make reference to AASHTO, ASTM, or other standards (designated as FLH T), the procedure as modified in the Materials Manual shall govern. Where the specifications make reference to AASHTO Test T11, "Procedure B - Washing Using a Wetting Agent" shall be the procedure followed.

Where the specifications make reference to AASHTO Test T310, "Direct Transmission Method of In-Place Nuclear Density and Moisture Content" shall be the procedure followed.

Reference to the Materials Manual means the Federal Lands Highway "Field Materials Manual, U.S. Department of Transportation, Federal Highway Administration," dated October 2008, and all amendments and supplements thereto. Copies are available upon request by e-mail to cflcontracts@dot.gov, or fax to (720) 963-3360 and located on our website at <http://www.cflhd.gov/materials>.

106.03 Certification. Add the following after the second paragraph:

See Table 106-3 for schedule for full or partial acceptance by material certification. Submit certification and sample of material for testing as required.

106.05 Statistical Evaluation of Work and Determination of Pay Factor (Value of Work).

(b) Acceptance. Delete the last sentence of the second paragraph and substitute the following:

If a lot is concluded or terminated with fewer than three samples, the samples will be combined with those of an adjacent lot. In the event there is no adjacent lot, the material will be accepted according to Subsection 106.04.

(c) Statistical evaluation. Delete the second paragraph and substitute the following:

The number of significant figures used in the calculations will be according to ASTM E 29, absolute method.

Table 106-2 Pay Factor.

The Pay Factor 1.03, category I row: Delete the value 84 in the n=9 column and substitute the value 94.

The Pay Factor 0.75, category II row: Delete the value 35 in the n=3 column and substitute the value 25.

Table 106-3 Schedule For Full or Partial Acceptance by Materials Certification. Add Table 106-3 following Table 106-2.

Table 106-3
Schedule For Full or Partial Acceptance by Materials Certification

Section	Description	Material	Material Property Or Specification	Frequency	
				Certification	Sample
306	Dust Palliative	Magnesium Chloride, Emulsified Asphalt, Lignin Sulfonate, Calcium Chloride	As specified	1 per shipment	First shipment
308	Minor Crushed Aggregate	Crushed Aggregate	Source, Quality and Gradation	1 per source	1 per source
404 and 417	Minor Hot Asphalt Concrete, Minor Cold Asphalt Mix	Aggregate Asphalt Mix	Source quality, Gradation, Stability, and Grade	1 per mix	1 per source
634 and 635	Permanent Pavement Markings, Temporary Traffic Control	634.02 as applicable, 635 as applicable	As specified	1 per source	-----
701	Hydraulic Cement	Portland Cement, Blended Hydraulic Cement and Masonry Cement	AASHTO M 85, M 240, and ASTM C 91	1 per shipment	1 per 100 tons
702.01	Asphalt Material	Asphalt Cement	AASHTO M 20, M 226, MP 1 or as applicable	1 per shipment	1 per shipment
702.02	Asphalt Material	Cut-back Asphalt	AASHTO M 81 or M 82 as applicable	1 per shipment	1 per shipment
702.03	Asphalt Material	Emulsified Asphalt	AASHTO M 140 or M 208 as applicable	1 per shipment	1 per shipment
702.05	Asphalt Material	Asphalt Materials used for Damproofing and Waterproofing Concrete Surfaces	As specified for each type of asphalt material	1 per shipment	-----
702.06	Recycling Agent	As specified	As applicable	1 per shipment	1 per shipment

Section	Description	Material	Material Property Or Specification	Frequency	
				Certification	Sample
702.08	Antistrip	As specified	As applicable	1 per shipment	-----
706	Concrete and Plastic Pipe	As specified	As applicable	1 per shipment	-----
707	Metal Pipe	Metal Pipe as specified	As applicable	1 per shipment	-----
708	Paint	As specified	As applicable	1 per batch/lot	1 sample for quantities >100L
709	Reinforcing Steel and Wire Rope	As specified	As applicable	1 per shipment	For 709.01 & 709.03 submit 3 1- meter bars of each size and grade of bar furnished. 709.02 submit 1 2-meter length for each size furnished
710	Fence and Guardrail	As specified	As applicable	1 per shipment	-----
711	Concrete Curing Material and Admixtures	As specified	As applicable	1 per material source per material type	-----
712	Joint Material (all)	As specified	As applicable	1 per shipment	-----
713	Roadside Improvement Materials (all)	As specified	As applicable	1 per shipment	-----
714	Geotextile and Geomembrane Drain	As specified	As applicable	1 per shipment	1 per project per type
715	Piling	As specified	As applicable	1 per shipment	-----
716	Material for Timber Structures	Timber and Hardware	As applicable	1 per shipment	-----

Section	Description	Material	Material Property Or Specification	Frequency	
				Certification	Sample
717	Structural Metal	As specified	As applicable	1 per shipment	717.01(e) minimum 6 per shipment for each size used. 717.10 1 per project
718	Traffic Signing and Marking (all)	As specified	As applicable	1 per shipment	-----
720	Structural Wall and Stabilized Materials (all)	As specified	As applicable	1 per shipment per material type	-----
721	Electrical and Illumination Material (all)	As specified	As applicable	1 per shipment per material type	-----
722	Anchor Material	As specified	As applicable	1 per shipment per material type	-----
725	Miscellaneous materials	As specified	As applicable	1 per shipment per material type	-----

Section 107. – LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC**107.01 Laws to be Observed.** Add the following:**Section 401 and 404 of the Clean Water Act.**

Comply with the terms and conditions of the 404 permit and with the terms and conditions, if any, specified in the 401 certification. Comply with the terms and conditions of any permits that are issued for the performance of work within the jurisdictional waters of the U.S.

The U.S. Army Corps of Engineer's has authorized the discharge of dredged or fill material by Permit Number 199840159. Construct the project consistent with the terms and conditions of the permit. A copy of the requirements is contained in the Appendix to these SCRs.

National Pollutant Discharge Elimination System (NPDES) in Wyoming

Comply with the requirements of the Wyoming Construction General Permit (CGP) for Large Construction Activities WYR10-0000 for erosion and sediment control due to storm water runoff. The permit is located in the Appendix and at:

http://deq.state.wy.us/wqd/WYPDES_Permitting/WYPDES_Storm_Water/stormwater.asp

(a) General. Designate a qualified Erosion Control Supervisor according to Subsection 157.03.

Obtain a separate NPDES permit associated with industrial activity for any mobile asphalt and concrete plants that provide material for the project. Provide a copy of the permit and acknowledgement letter to the CO for their records. Storm water discharge from these activities can be covered by this permit if the plants are dedicated only to this project, equipment is removed and the affected areas are reclaimed after construction, and there is no potential to discharge storm water to class 1 water.

(b) Preparation of SWPPP. Use the latest version of the WY DEQ specified SWPPP template. The latest version of the SWPPP as of September 1, 2012 is found in the Appendix. Verify that this is still the latest version of the template by visiting their website (see link above). The Beartooth Highway HPP 4-1(6) project SWPPP is available for reference. If used, modify the information from the HPP 4-1(6) SWPPP, as required, for the specific project limits and requirements of the current project. Prior to beginning construction, obtain approval from the CO on the draft SWPPP for the project.

When the SWPPP is accepted by the CO and signed by both the CO and the Contractor, it will be the document in force on the project. Do not perform any ground disturbing activities including clearing and grubbing or earthwork until the SWPPP has been accepted by the CO. Implement the SWPPP as required throughout the construction period.

Modify the erosion control details and layout sheets included in the plans, as necessary, to accommodate project site conditions and proposed construction operations and include them in the SWPPP.

To comply with the NPDES Permit, jointly review the draft SWPPP with the CO and agree to any needed revisions. Jointly approve and sign the revised SWPPP consistent with Part 10.7 of the CGP. When the SWPPP is approved and signed by the CO and Contractor, it will be the document in force on the project. Implement the SWPPP as required throughout the construction period. Update the SWPPP to comply with the CGP and ensure that it is effective in eliminating and minimizing pollutants in storm water runoff from the site.

Place the SWPPP and all updates in a three-ring binder so that completed inspection forms and other records may be inserted. Maintain a current copy of the SWPPP, including a copy of the permit, NOI, acknowledgement letter from WYDEQ, and all associated records and forms at the job site throughout the duration of the project. Make the SWPPP available for public inspection and for the inspection and use of the CO.

Maintain all related erosion control elements in proper working order throughout construction.

Sign the certification form in the SWPPP acknowledging that the requirements of the CGP are understood. Ensure that all subcontractors are familiar with the requirements of the CGP and sign the certification form.

At the completion of the project, provide the CO with the SWPPP, including inspection forms and other records.

(c) Erosion Controls. Implement soil erosion controls according to the SWPPP and Section 157. Install and maintain controls following the manufacturer's specifications/guidance and good engineering practices.

Implement temporary stabilization measures of exposed soil areas where further work is not expected to be implemented for 14 days or more.

Visible or measurable erosion/sediment which leaves the construction site as a result of inadequate or ineffective SWPPP design or maintenance of BMPs is prohibited.

(d) Controls for Other Pollutants. List the quantities of petroleum products and hazardous material used for this project in the SWPPP. Implement controls to eliminate the discharge of pollutants (other than sediment) into storm water, such as pollutants from materials stored onsite. Describe the spill prevention and material management controls and practices, including storage methods for chemicals and construction materials in the SWPPP.

Describe the practices to be implemented that will provide adequate containment of petroleum spills and prevent any spilled material from entering waters of the state or municipal storm water systems. Also, include the practices that will be used for addressing a spill including the methods

of handling and disposing of spilled products and contaminated soil. A spill prevention, control, and countermeasures plan is required if the volume of oil (including fuel) in a single location exceeds 1,320 gallons. The shell volume is the total of all containers with a capacity of 55 gallons or more.

Locate machinery servicing and refueling areas away from streambeds and washes to reduce the possibility of impacting these areas by accidental spills or discharge.

Describe the practice(s) that will be implemented to contain concrete wash water and prevent it from entering surface waters and/or storm drains. Do not discharge concrete wash water to waters of the state or to storm water systems.

Describe the BMPs to control storm water pollution from portable concrete or asphalt batch plants covered under this permit.

(e) “Good Housekeeping” Practices and Requirements. Specify the Contractor’s “good housekeeping” practices and requirements in the SWPPP. These include vehicle wash-down areas, methods for recovering sediments transported off of the construction site, onsite and offsite tracking control, protection of equipment storage and maintenance areas, and sweeping of highways and roadways related to hauling activities.

Take precautions and implement measures to prevent pollution of streams, lakes, reservoirs and other surface waters with litter, construction debris, fertilizers, fuels, oil, bitumens, calcium chloride, magnesium chloride, Portland cement, fresh Portland cement concrete, sanitary wastes, muddy water, chemicals or other harmful materials. Do not discharge these materials into channels leading to any stream, lake or reservoir.

Locate machinery servicing and refueling areas away from streambeds and washes to reduce the possibility and minimize the impacts of accidental spills or discharge.

Remove non-waste materials such as used cans, oils, machine and equipment parts, paint, hazardous materials, plastic and rubber parts, discarded metals, and building materials from the construction site and dispose of at an approved landfill.

Where the Contractor’s working area encroaches on a running or intermittent stream, construct and maintain adequate barriers to prevent the discharge of any contaminants into the stream.

Do not operate mechanical equipment in running streams unless approved in writing by the CO. Fording of running streams with construction equipment will not be permitted. Obtain approval from the CO to use temporary bridges or other structures whenever crossings are necessary.

Immediately clear ephemeral drainages, intermittent and perennial streams, lakes and reservoirs of all work items, debris or other obstructions inadvertently placed thereby or resulting from construction operations.

Install silt fence and erosion and sediment control measures as shown in the plans in all construction areas that contribute to wetlands and other aquatic resources prior to construction.

(f) Inspections and Maintenance. During construction, inspect disturbed areas and storm water outfalls to assess if measurable quantities of sediment or other pollutants are being transported offsite, control measures, areas used for storage of materials and locations where vehicles enter or exit the site, at least once every 14 calendar days and within 24 hours after the end of a storm or snow melt event of greater than 13 millimeters (0.5 inches). During seasonal shutdowns inspect the site at least once per month. Inspections are not required in severe weather conditions or during winter when melting conditions do not exist. Monitor rainfall with a rain gauge accurate to the nearest 3 millimeters (0.125 inches) of rain. Correct deficiencies in pollution control structures or procedures immediately. Summarize and record the measures taken to correct the deficiencies in the SWPPP.

Document inspections and maintenance activities on forms that include the information provided in Part 9.7 of the CGP. Sign inspection forms consistent with Part 10.7 of the CGP. Keep the inspection forms and record of maintenance activities in the SWPPP notebook throughout the construction period.

(g) Revisions to the SWPPP. Revisions to the SWPPP may be necessary during construction to make improvements or to respond to unforeseen conditions noted during construction or site inspections. For that purpose, specify in the SWPPP the mechanism whereby revisions may be proposed by the Contractor or the CO and incorporated into the plan, including review and approval of minor changes. Jointly approve and sign each revision to the SWPPP before implementation. Modify the plan whenever there is a change in design, construction, operation, or maintenance that changes the potential for the discharge of pollutants into state waters. Modify the plan if it is ineffective in eliminating or minimizing pollutants present in storm water. Implement approved modifications immediately after deficiencies are noted.

(h) Dewatering. Construction site dewatering under this permit is limited to storm water and minor amounts of ground water. The latter is defined in Part 8.8 of the CGP.

Implement treatment(s) for turbid and sediment-laden water and discharge BMPs so that the discharge does not violate water quality standards, cause erosion and scouring at the discharge point or adversely affect downstream landowners. Describe the treatments/BMPs that will be used to meet these requirements in the SWPPP.

(i) Notice of Intent (NOI). The Government will file the NOI upon receipt of the completed and approved SWPPP from the contractor. The CGP requires that the NOI and complete SWPPP be submitted thirty days prior to ground disturbing activities. Do not perform any ground disturbing activities, including clearing and grubbing, or earthwork until the acknowledgement letter has been received.

Post a copy of the NOI and acknowledgement letter on the construction site bulletin board throughout the duration of the project.

(j) Inspections and Revisions to the SWPPP. Perform inspections as required in the CGP. Document inspections and retain records in the SWPPP.

Revisions to the SWPPP may be necessary during construction to make improvements or to respond to unforeseen conditions noted during construction or site inspections. For that purpose, specify in the SWPPP the mechanism whereby revisions may be proposed by the Contractor or the CO and incorporated into the plan, including review and approval of minor changes. Jointly approve and sign each revision to the SWPPP before implementation. Implement approved changes according to the General Permit.

Place the SWPPP and all updates in a three-ring binder so that completed inspection forms and other records may be inserted. Maintain a current copy of the SWPPP, including a copy of the permit, NOI, and all associated records and forms at the job site throughout the duration of the project. Make the SWPPP available for public inspection and for the inspection and use of the CO.

At the completion of the project, provide the CO with the SWMP, including inspection forms, logs, monitoring reports, and any other information added during the project.

107.02 Protection and Restoration of Property and Landscape. Delete the sixth paragraph and substitute the following:

Before beginning work in an area, contact the local Utility Locator Service, at the phone number shown in the plans, to have all utilities located. Protect utilities from construction operations. Cooperate with utility owners to expedite the relocation or adjustment of their utilities to minimize interruption of service, duplication of work, and delays.

Add the following:

Minimize disturbance and protect stream bank vegetation except where its removal is absolutely necessary for completion of the work. Dispose of any vegetation, debris, or other material removed during construction at some location out of the stream channel or adjacent wetland areas where it cannot re-enter the channel during high stream flow or runoff events. Revegetate all cut and fill slopes in stream channel that will not be protected with riprap with appropriate species to prevent erosion. Clear all areas to be filled of all vegetation debris and other materials that would be objectionable to the fill. Place, compact, and subsequently protect all fill areas from erosion.

Restore all temporarily impacted wetlands to original condition and grade immediately following construction.

The Beartooth Highway Reconstruction project is in a location that contains natural resources that must be avoided at all times, such as wetlands, fens, and FS species of concern. Construction activities outside of the clearing limits for any reason are not allowed without approval from the CO. Allow a minimum of two weeks for amendment of the SUP for work

outside the construction limits. Impacts that result from unauthorized construction activities outside of the construction limits, and any remediation, fines, or other costs or punishment according to federal and state law associated with those impacts are the responsibility of the Contractor.

Stop construction immediately and notify the CO if historic properties, including but not limited to artifacts and human remains, are discovered during implementation of the proposed construction or if unanticipated effects on previously identified historic properties occur.

107.03 Bulletin Board. Delete the text and substitute the following:

107.03 Bulletin Board. Furnish a weatherproof bulletin board of suitable size and construction for continuous display of posters and other information required by the contract. Erect and maintain the bulletin board at a conspicuously accessible location on the project and remove and dispose of it after final acceptance.

Display each of the following documents on the bulletin board:

- (a) “Equal Opportunity” poster, according to FAR Clause 52.222-26 Equal Opportunity;
- (b) “Notice” that the project is subject to Title 18, U.S. Criminal Code, Section 1020, FHWA Form 1022;
- (c) “Notice to Employees” poster, WH-1321, regarding proper pay;
- (d) “Right to Safe and Healthy Workplace” poster, according to Title 29, Code of Federal Regulations, Part 1903;
- (e) “General Wage Decision” contained in the contract;
- (f) Company equal employment opportunity policy, according to Title 41, Code of Federal Regulation, Part 60-741.44;
- (g) Emergency phone numbers (In areas where 911 is not available), according to Title 29, Code of Federal Regulation, Part 1926.50(f);
- (h) “Family and Medical Leave Act” poster, WH-1420, according to Title 29, Code of Federal Regulation, Part 825.300(a);
- (i) “Employee Polygraph Protection Act” poster, WH 1462; and
- (j) Employee Rights Under The National Labor Relations Act, according to Executive Order 13496.

107.10 Environmental Protection. Delete the text and substitute the following:

107.10 Environmental Protection. Submit a Spill Prevention, Control, and Countermeasure (SPCC) plan for sites that meet the requirements of 40 CFR Part 112. Refer to EPA checklist at the following web address:

http://www.epa.gov/emergencies/docs/oil/spcc/guidance/G_Bulk_Storage_Checklist.pdf

Submit and follow the Hazardous Spill Plan when an SPCC plan is not required. Develop a plan describing what actions will be taken in case of a spill and incorporate preventative measures to be implemented (such as the placement of refueling facilities and the storage and handling of materials).

Submission of either plan must be made at least 2 days before beginning work.

(a) Spills of Petroleum Products or Hazardous Materials. Properly clean up, mitigate, and remedy, if necessary, all spills of petroleum products, hazardous materials, or other chemical or biological products released from construction, fleet, or other support vehicles, or stationary sources. Respond in accordance with federal, state, and local regulations.

Immediately report to the CO any spill of petroleum products or a hazardous material. Report the spill to the appropriate federal, state, and local authorities, if the spill is a reportable quantity.

(b) Water pollution. Do not operate mechanized equipment or discharge or otherwise place any material within the wetted perimeter of any waters of the U.S. within the scope of the Clean Water Act (33 USC § 1251 et seq.). This includes wetlands unless authorized by a permit issued by the U.S. Army Corps of Engineers according to 33 USC § 1344, and, if required, by any State agency having jurisdiction over the discharge of material into the waters of the U.S. In the event of an unauthorized discharge:

- (1) Immediately prevent further contamination;
- (2) Immediately notify appropriate authorities; and
- (3) Mitigate damages as required.

Comply with the terms and conditions of any permits that are issued for the performance of work within the wetted perimeter of the waters of the U.S.

Separate work areas, including material sources, by the use of a dike or other suitable barrier that prevents sediment, petroleum products, chemicals, or other liquid or solid material from entering the waters of the U.S. Use care in constructing and removing the barriers to avoid any discharge of material into, or the siltation of, the water. Remove and properly dispose of the sediment or other material collected by the barrier.

(c) Vehicles and equipment. All vehicles and equipment entering the project area must be clean of noxious weeds and free from oil leaks and are subject to inspection. Wash all construction equipment to thoroughly remove all dirt, plant, and other foreign material prior to entering the project. Particular attention must be shown to the under carriage and any surface where soil containing exotic seeds may exist. These efforts are critical to prevent the introduction and establishment of non-native plant species into the project area. Make arrangements for the CO to inspect each piece of equipment before entering the project. The CO will maintain records of inspections. Equipment found operating on the project that has not been inspected, or has oil leaks will be shut down and subject to citation.

In general, when gasoline, diesel fuel, antifreeze, hydraulic fluid or any other chemical contained within the vehicle is released to the pavement or ground, proper corrective, clean-up, and safety actions specified in the SWPPP must be immediately implemented. All vehicles with load rating of 2 tons or greater should carry, at minimum, enough absorbent materials to effectively immobilize the total volume of fluids contained within the vehicle.

Repair oil leaks immediately on discovery. Do not use equipment that is leaking. Have oil pans and absorbent material in place prior to beginning repair work. Have the “on scene” capability of catching and absorbing leaks or spillages of petroleum products including antifreeze from breakdowns or repair actions with approved absorbent materials. Keep a supply of acceptable absorbent materials at the job site in the event of spills. Sand or soil are not approved absorbent materials.

Use oil pans and absorbent materials to prevent leaks, spills and draining petroleum fluids from falling onto bare ground and paved surfaces during servicing of equipment. Dig up soils contaminated with such fluids, place in appropriate safety containers, and dispose of according to state and/or federal regulations.

(d) Environmental Clearances.

(1) Contractor-Selected, Non-Commercial Areas. Contractor-selected, non-commercial areas include, but are not limited to, material sources, disposal sites, waste areas, haul roads, and staging areas. (A commercial source is a current operating concern, which has in the recent past provided same-type materials or services). These requirements do not apply for areas identified by the Government as having previously received clearance.

Prior to construction activities in contractor-selected, non-commercial areas, provide the following to the CO and the FHWA Environmental section (12300 West Dakota Avenue, Lakewood, CO 80228/Fax 720-963-3610):

(a) A report with documentation, according to the Secretary of the Interior’s Standards and Guidelines for Archeology and Historic Preservation, to determine if prehistoric or historic buildings, structures, sites, objects, or districts listed or eligible for listing in the National Register of Historic Places (NRHP) are present and if they will be affected by the proposed activity. Include information identifying the location, total land area, and type of activity proposed. The FHWA will review this documentation. The FHWA will

coordinate with the State Historic Preservation Officer (SHPO) and other parties, which will require the following time frames:

- (1) Coordination on a “no effect” determination may require 30 days or longer.
 - (2) Coordination on eligibility and affects may require 45 days or longer.
 - (3) Coordination on mitigation of adverse effects may require 60 days or longer.
- (b) Written documentation that such activities will not affect any “Waters of the U.S.” as defined by the U.S. Army Corps of Engineers. Provide documentation by an individual capable of performing wetland delineations according to the 1987 Corps of Engineers’ manual and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region. Documentation of effects to wetlands or other Waters of the U.S. will be submitted to the CO and to the FHWA Environmental section. If wetlands are affected, coordination with the Corps of Engineers may require 45 days or longer.
- (c) Written documentation that such activities will not affect any species protected under the Endangered Species Act (ESA). Provide documentation prepared by a biological specialist. The written documentation will include a “no effect,” a “may affect-is not likely to adversely affect,” or a “may affect-is likely to adversely affect,” determination according to Section 7 of the Endangered Species Act. Submit the documentation to the CO and the FHWA Environmental section. If the determination is “may affect-is not likely to adversely affect” or “may affect-is likely to adversely affect,” the FHWA will coordinate with the U.S. Fish and Wildlife Service (FWS), which will require the following time frames:

- (1) “May affect-is not likely to adversely affect” may require 45 days or longer.
- (2) “May affect-is likely to adversely affect” may require 150 days or longer.

Contract time will not be increased due to the submittal and approval process for the above three items.

(e) Environmental commitments. The Federal Highway Administration CO, in cooperation with the Shoshone National Forest and Yellowstone National Park will oversee the construction of the project to ensure all environmental commitments detailed in the plans and special contract requirements are met. Provide immediate corrective measures as directed by the CO when notification is given that the work is out of compliance.

Environmental and safety awareness training will be provided by the FHWA and Shoshone National Forest for all construction employees working on-site. This training is mandatory and will be provided in the following form:

- (1) Working in Bear Country DVD (22 minutes in length)
- (2) Staying Safe in Bear Country DVD (48 minutes in length)

(3) General Environmental Requirement (Checklist)**(4) Grizzly Bear Requirement (Checklist)**

The Environmental Responsibilities Checklist (Checklist) is contained in the Appendices to these SCRs. Provide each employee and sub-contractor employee with a copy of the DVDs and Checklist and submit written proof to the CO that each employee has viewed the DVDs and read and understands the Checklist.. Provide all new employees with the complete environmental training prior to their presence on the project site. No employee will be allowed on the project site until completion of the environmental training and understanding of the environmental commitments.

The Federal Highway Administration, in conjunction with the Shoshone National Forest representatives will monitor vegetation cover and implement contingency and maintenance plans until vegetation cover is 70 percent of the original background vegetation cover in accordance with the NPDES permit requirements and fulfilled by the contractor.

Prepare and submit a weed management plan for approval by the CO. Implement the approved weed management plan. Implement inspections and spot controls every three weeks to prevent weed establishment. Maintain records of inspections. Monitor vegetation changes in the work site resulting from ground disturbance and develop a plan to remove exotic forbs in the disturbed post-construction areas. Use the best available scientific-based technology (e.g., USDA plants database, SNF resource specialist, etc.) to attempt to prevent exotic clover (*Trifolium hybridum*) from growing in the disturbed areas.

If off-site aggregate sources are required, use only certified weed free materials sources as approved by the CO.

Prior to work or placement of embankment in wetland areas, place Geotextile, Type II-A separation fabric over the wetland area. Follow manufacturer's recommendations for geotextile placement.

Comply with the Grizzly Bear Management Protection Plan (GBMPP) that addresses project facilities such as the staging areas, gravel pit areas, and construction area.. A copy of the GBMPP is included in the Appendix to these SCRs. The GBMPP provides actions, guidelines, and procedures to assure compliance with regulations and best management practices in order to prevent human/bear conflicts and to minimize injuries if involved in an encounter with a bear.

Provide bear resistant waste containers at the Ghost Creek Materials source. Empty these containers once every three days. Coordinate these activities with waste disposal at any other locations to ensure all waste is hauled off the site on a regular basis.

Comply with Forest Service regulations and the environmental Checklist in the conduct of all activities. All Contractor and sub-contractor employees will be required to complete the environmental training that includes grizzly bear awareness information. The Contractor's full cooperation in meeting grizzly bear management goals and objectives of the USFS will be a condition to receiving authorization to continue to operate pursuant to the SUP.

Report all grizzly bear sightings to the CO immediately who will in turn report to the Forest Officer in charge and the Wyoming Game and Fish Department.

In the event of a human/bear conflict, or in order to prevent an imminent potential conflict, the CO may order an immediate temporary cessation of all project activity in the immediate area of the conflict or potential conflict. Comply with such action immediately. The cessation will remain in effect until such time as the appropriate authorities have been contacted and any risk to humans and bears has been successfully resolved in accordance with Interagency Grizzly Bear Guidelines.

Report all road kill on or near the road to the CO immediately. Remove large carrion in the wildlife crossing area (from the Ghost Creek area to just before the Beartooth Lake Outlet Bridge) prior to opening the road in the spring and thereafter as soon as any carrion the size of a marmot (*Marmota* sp.) or larger is discovered during the construction activities. Dispose of deer and smaller animals in the Fox Creek Campground Bear Resistant dumpsters. Remove larger animal carcasses to a state approved local landfill. There is a fee for disposal of larger animal carcasses. Develop and implement a system of monitoring carcasses as approved by the CO in cooperation with the Shoshone National Forest, from the beginning of construction in the spring and ending when the road is closed for the season. Submit all monitoring reports at the end of each construction season to the CO.

107.11 Protection of Forests, Parks, and Public Lands. Add the following:

The Shoshone Forest Service fire prevention plan involving emergency curtailment of operations is below and is in effect on this project. The CO will order the suspension of burning and other operations when directed to do so by the Shoshone National Forest. No adjustment in the contract completion date will be made for partial or total suspensions of burning operations.

Fire Precautions.

1. Smoking and Lunch Fires. Smoking is prohibited except inside a building, developed recreation site, vehicle, or while seated in an area of at least three feet in diameter that is barren or cleared of all flammable materials.

The building of camp, lunch, warming and other fires within the construction limits and vicinity is prohibited except at the Fox Creek Work Camp.

2. Spark Arrester and Mufflers. Operating or using any internal combustion engine, on any timber, brush, or grass covered land, including trails and roads traversing such land, without a spark arrester, maintained in effective working order, meeting either (I) Department of Agriculture, Forest Service standard 5100, "SPARK ARRESTERS FOR INTERNAL COMBUSTION ENGINES," (current edition); or (II) the Society of Automotive Engineers (SAE) recommended Practices J335, "MULTIPOSITION SMALL ENGINE EXHAUST

SYSTEM FIRE IGNITION SUPPRESSION," (current revision) and J350, 36 CFR 261.52(j), is prohibited.

Equip passenger carrying vehicles, pickups, medium and large highway trucks (80,000 GVW) with a factory designed muffler system which is specified for the make and model of the respective vehicle/truck or with a muffler system that is equivalent or that exceeds factory specifications.

Properly install and continually maintain in serviceable condition exhaust systems.

3. Fire Extinguishers and Tools on Equipment. While in use, provide each internal combustion engine including tractors, trucks, yarders, loaders, welders, generators, stationary engines, or comparable powered equipment with at least the following:

- (a) One fire extinguisher, at least 5#ABC with an Underwriters Laboratory (UL) rating of 3A - 40BC, or greater.

- (b) One shovel, sharp, size O or larger, round-pointed with an overall length of at least 48 inches.

- (c) One axe, sharp, double bit 3-1/2#, or one sharp pulaski.

Mount extinguishers, shovels, axes, and pulaskis so as to be readily available from the ground. Maintain tools in a serviceable condition.

4. Power Saws. Provide each gasoline engine power saw with one chemical-pressurized fire extinguisher of not less than 8-ounce capacity by weight, and one size O or larger, round-pointed shovel with an overall length of at least 48 inches. Maintain the extinguisher, and shovel in good working order. Make immediately available for use at all times extinguisher and power saw operator. Do not affix the extinguisher to the saw. Make a shovel readily available to the operator of the saw at all times. Having the shovel with the gas can used to refuel the saw may be considered "readily available" if not more than 200 feet from the saw. During periods of critical fire danger, Forest Service may prescribe other precautionary measures.

Any fueling or refueling of a power saw must be done in an area which has first been cleared of material which will carry fire. Move the power saw at least 10 feet from the place of fueling or refueling before starting.

5. Blasting and Welding. The use of fuses in blasting is not permitted except near power lines where the danger of accidental detonation is present, and then only by special written permission of Forest Service. Whenever the relative humidity falls below 50 percent, place a watchman at each point where blasting is done who will remain on duty for at least one hour after blasting is finished, and who will be equipped with a shovel and a water-filled backpack can equipped with hand pump. Discontinue blasting during periods when the relative

humidity falls below 20 percent, unless authorized, with special provisions, in writing by Forest Service. Blasting is not permitted in any area not cleared to mineral soil without advance written approval of Forest Service and with such special precautions as may be required.

Do not use Prima Cord in clearing operations, and in other areas where timber has been felled and slash not burned.

Unless otherwise directed in writing by Forest Service, clear for 10 feet around any piece of equipment being welded all flammable material. In addition, provide a fire extinguisher of a size and type designed to extinguish a fire in the flammable materials surrounding the spot being welded.

In order to determine the relative humidity, (a) provide and maintain weather instruments, that will measure relative humidity, in the area where blasting will occur; or (b) provide communications to obtain weather data from Forest Service.

Store explosives in a locked box marked "Explosives" at all times. Store powder and blasting caps in separate boxes.

6. Storage of Flammables. Store gasoline, oil, grease and other highly flammable material in either a separate building, or at a site where all debris is cleared within a radius of 25 feet. Locate storage buildings or sites a minimum distance of 50 feet from other structures. Adequately post storage buildings to warn of the flammables and to prohibit smoking in or around the building.
7. Camp Fire Protection. Keep the grounds around all trailers, buildings, other facilities constructed or placed on or near the clearing limits free of flammable material for a distance of at least 20 feet from the wall of such structure. Burning of such flammable material must be as prescribed by Forest Service in writing. The building of camp, lunch, warming and other fires within the construction limits and vicinity is prohibited except at the Fox Creek Workcamp.

Equip stovepipes of all wood burning stoves with suitable roof jacks and serviceable spark arresters. Locate stovepipes no closer than 2 feet from any wood or other flammables unless adequately protected by metal or asbestos shield.

Section 108. – PROSECUTION AND PROGRESS

108.01 Commencement, Prosecution, and Completion of Work. Add the following:

The construction season is from approximately Memorial Day weekend through October 15, weather permitting. There are two shoulder seasons. The first shoulder season is from

approximately April to Memorial Day; the second shoulder season is from mid-October to mid-November.

The Beartooth Highway is not plowed by the Yellowstone National Park Maintenance or opened to traffic until Memorial Day. Plowing of the highway prior to Memorial Day is allowed to gain access to the project site at the Contractor's option. Coordinate the snow removal operations with the NPS Maintenance staff and use existing closure gates or place road closed signs and barricades as directed by the CO to prohibit public access.

The Yellowstone National Park performs seasonal maintenance activities along the Beartooth Highway from Cooke City via Coulter Pass to the Long Lake gate. These seasonal activities are scheduled for completion on 11/03/13 and 11/02/14. Adjust work schedules to comply with these dates. Coordinate with Yellowstone National Park prior to these dates according to Section 156.05.

Ensure the private in-holding, located south of the Ghost Creek Materials source, has access at all times during the course of the project.

Limit operations as follows:

- Road closures are allowed between 8:00 pm and 8:00 am Monday through Thursday nights.
- No road closures are allowed between 8:00 am Friday morning to 8:00 am Monday morning. Limit other delays according to Section 156.
- No road work on July 17, 2013. Accommodate transporting bicycles and riders using vehicles with trailers or other approved method through the construction zone.
- Submit a safety plan describing lighting conditions and safety precautions for each location of night time work. Do not begin a night time work activity until the plan has been approved by the CO. Once the work is underway, the CO may order additional lighting or safety precautions at no additional cost to the Government.
- The right to work at night is contingent upon the Contractor's ability to provide a safe work environment and perform work which satisfies the contract requirements. The right to work at night may be rescinded for any work activity if the CO determines that safety or quality problems are a result of working in night time conditions.
- The following work activity is not permitted at night:
 - (a) Rock staining.
- No night time closures or night work are allowed from midnight to 6:00 am September 1 through winter shutdown.
- Limit night time noise construction activities as directed by the CO near Top of the World Store and the Beartooth Lake Campground, when they are open to public use. The use of exhaust brakes (Jake brakes) will not be permitted.

- During night time closures, cease all operations immediately if emergency ingress/egress is required at Beartooth Lake Campground, Island Lake Campground and the Top of the World Store.
- No blasting is permitted from September 1 through winter shutdown at the Ghost Creek materials source.
- Pre-work meetings have been established to provide coordination between the CO, agency representatives, and the contractor. Coordination with agency representatives by the CO will be conducted to review and approve methods, materials, and processes for various construction items. The CO will then guide and approve the work based on this input by agency representatives.
- At the pre-construction meeting, initial training materials will be distributed for the environmental requirements required on the project according to Section 107.10 (e).
- Prior to the start of any clearing and/or grubbing operations, schedule and attend a site meeting with the CO to determine which vegetation, rock formations, or other features located along the tentative clearing limits are to remain and which are to be removed.
- Before starting grading operations submit a topsoil handling plan detailing proposed topsoil salvage and placement methods, specific windrowing and stockpiling locations, and topsoil placement sequencing as related to anticipated completion of the cuts and fills. Also discuss landscaping plans and details, slope shaping and sculpting methods, roadway obliteration details, and wetland mitigation plans. Request changes to the approved plan in writing. Implement only the current approved plan.
- Notify the CO two weeks prior to beginning blasting operations.
- A pre-work meeting will be held by the CO prior to the start of micropile installation to clarify construction requirements, coordinate the construction schedule and activities, and identify contractual relationships and delineation of responsibilities amongst the prime Contractor and the various Subcontractors.
- Notify the CO at least two weeks prior to starting construction areas with specific landscaping plans.
- Notify the CO three weeks prior to starting any work on dismantling the existing stone masonry structures including bridge piers and abutments and culvert headwalls.

Perform no work except to maintain traffic control devices, erosion control devices, the roadway driving surface, and to control dust during the listed Federal holidays and surrounding days:

- Memorial Day Weekend: 12:00 Noon Friday to 6:00 am Tuesday.
- Independence Day: 12:00 Noon July 3 to 6:00 am July 5.
If July 4 falls on a weekend, Friday, or Monday, do not work the weekend.
- Labor Day Weekend: 12:00 Noon Friday to 6:00 am Tuesday.
- Thanksgiving: 12:00 Noon Wednesday to 6:00 am Monday.

- Christmas/New Years Holiday: 12:00 Noon December 23 to 6:00 am January 2. If December 23 or January 1 falls on a Monday, do not work the adjacent weekend and do not work on December 23. If January 1 falls on a Friday, do not work the weekend.

Schedule at least 2 non-work days out of every 14 calendar days. The selected non-work days do not need to be consecutive, but they must be scheduled. Provide at least 2 weeks notice before changing the scheduled days off.

Exemptions to scheduled days off may be granted by written approval from the CO for specific project operations and/or for periods of limited duration.

Completion Dates: The completion date for Schedule A is October 18, 2013. If Option X is awarded, add seven calendar days to completion date.

Add the following:

A Notice to Proceed must be issued before commencement of any work. The count of contract time will begin upon issuance of the Notice to Proceed and shall run continuously until final construction completion.

Section 109. – MEASUREMENT AND PAYMENT

109.01 Measurement of Work. Delete the first paragraph and substitute the following:

109.01 Measurement of Work. Unless otherwise specified, measure when the work is in place and complete according to the contract requirements. Measure the actual work performed, except do not measure work outside the design limits or other adjusted or specified limits (staked limits). Measure structures to the lines shown on the plans or to approved lines adjusted to fit field conditions.

Delete the fifth paragraph and substitute the following:

Submit measurement notes to the CO within 24 hours of completing the work that is in place and complete according to contract requirements. For on-going work, submit measurement notes daily. When work is not complete, identify the measurement as being an interim measurement. Submit the final measurement when the installation is completed. Measurement notes form the basis of the Government's receiving report (see Subsection 109.08(d)). For lump sum items, submit documentation to support invoiced progress payment on a monthly basis.

109.02 Measurement Terms and Definitions.

(b) Cubic meter (m³).

(1) Cubic meter in place. Delete paragraph (a) and substitute the following:

(a) Take cross-sections of the original ground and use design or staked templates to determine end areas. Do not measure work outside of the lines or slopes established by the CO.

(l) Square meter (m²). Delete the text and substitute the following:

(l) Square meter (m²). Longitudinal and transverse measurements for area computations will be made on a plane parallel to the surface being measured. No deductions from the area computation will be made for individual fixtures having an area of 1 square meter or less. Do not measure overlaps.

109.06 Pricing of Adjustments. Delete the second paragraph and substitute the following:

If agreement on price and time cannot be reached, the CO may make a unilaterally determination.

(a) Proposal. Delete the subsection and substitute the following:

(1) General. Submit a written proposal for each line item of the work or a lump sum for the total work. Identify the major elements of the work, the quantity of the element, and its contribution to the proposed price. Provide further breakdowns if requested by the CO. Except when precluded by the FAR, include a reasonable profit reflecting the efficiency and economy of the Contractor and subcontractors in performing the work, the contract risk type, the work difficulty, and management effectiveness and diversity.

When price is based on actual costs, profit is based on the estimated cost of the work and may not exceed the statutory limit of 10 percent of the total cost. Due to the limited risk in this type of pricing arrangement, a lower profit percentage may be indicated.

(b) Post-work pricing. Delete the paragraph and substitute the following:

(b) Post-work pricing. When a contract modification is not forward priced, it requires a change order and supplemental agreement reflecting the resulting equitable adjustment. When negotiating the price of a contract modification after all or most of the work has been performed, furnish the following:

(1) Direct costs. Delete paragraph (c)(3) and substitute the following:

(3) Compute standby costs from acceptable ownership records or when actual costs cannot be determined, according to CEOES.

Delete paragraph (e) and substitute the following:

(e) *Production rates.* Provide actual hours of performance, on a daily basis, for each labor classification and for each piece of equipment. Provide production rate information reflecting the actual work occurring on an approved contractor daily record document.

(2) Overhead. Delete the second paragraph and substitute the following:

Limit Contractor overhead applied to subcontractor payments to 5 percent unless a higher percentage is justified.

(3) Profit. Delete the second paragraph and substitute the following:

For work priced after all or most of the work is performed, profit is limited by statute to 10 percent of the total cost. Post-work pricing is considered a cost plus fee contract. Due to the limited risk in post-work pricing, a lower profit percentage may be indicated by a profit analysis according to FAR Part 15.404-4 Profit.

109.08 Progress Payments.

(b) Closing date and invoice submittal date. Delete the text and substitute the following:

Submit invoices to the designated billing office by the 7th day after the closing date. Invoices received by the designated billing office after the 16th day following the closing date will not be accepted for payment processing that month. Include late, unprocessed invoice submittals in the following month's invoice.

(e) Processing progress payment requests.

(1) Proper invoices. Delete the title and text and substitute the following:

(1) Invoices received by the 7th day following the closing date.

(a) Proper invoices. If the invoice meets the requirements of Subsection 109.08(c), and the quantities and unit prices shown on the Contractor's invoice agree with the corresponding quantities and unit prices shown on the Government's receiving report, the invoice will be paid.

(b) Defective invoices. If the invoice does not meet the requirements of Subsection 109.08(c), or if any of the quantities or unit prices shown on the Contractor's invoice exceed the corresponding quantities and unit prices shown on the Government's receiving report, the invoice will be deemed defective and the Contractor so notified according to FAR Clause 52.232-27(a)(2). Defective invoices will not be corrected by the Government and will be returned to the Contractor within 7 days after the Government's designated billing office receives the invoice.

Revise and resubmit returned invoices by the 18th day following the closing date. The CO will evaluate the revised invoice. If the invoice still does not meet the requirements of Subsection 109.08(c), the Contractor will be so notified according to FAR Clause 52.232-27(a)(2), and no progress payment will be made that month. Correct the deficiencies and resubmit the invoice the following month.

If the revised invoice meets the requirements of Subsection 109.08(c), but still had quantities or unit prices exceeding the corresponding quantities and unit prices shown on the Government's receiving report, the Government's data for that item or work will be used.

The Contractor's invoice, as revised by the Government's receiving report, will be forwarded for processing by the 23rd day following the closing date. The Contractor will be notified by the 23rd day following the closing date of the reasons for any changes to the invoice.

(2) Defective invoices. Delete the title and text and substitute the following:

(2) Invoices received between the 8th and 16th day following the closing date.

(a) Proper invoices. If the invoice meets the requirements of Subsection 109.08(d), and the quantities and unit prices shown on the Contractor's invoice agree with the corresponding quantities and unit prices shown on the CO's receiving report, the invoice will be deemed proper and forwarded for processing within 7 days of receipt.

(b) Defective invoices. If the invoice does not meet the requirements of Subsection 109.08(d), the invoice will be deemed defective, the Contractor so notified according to FAR Clause 52.232-27(a)(2), and no progress payment will be made that month. Correct the deficiencies and resubmit the invoice the following month.

If the invoice meets the requirements of Subsection 109.08(d), but has quantities or unit prices exceeding the corresponding quantities and unit prices shown on the Government's receiving report, the Government's data for that item of work will be used. The Contractor's invoice, as revised by the Government's receiving report, will be forwarded for processing within 7 days of the Government's receipt of the invoice. The Contractor will be notified of the reasons for any changes to the invoice.

(f) Partial payments. Delete the subsection and substitute the following:

(f) Partial payments. Progress payments may include partial payment for material to be incorporated in the work according to FAR Clause 52.232-5(b)(2), provided the material meets the requirements of the contract and is delivered on, or in the vicinity of, the project site or stored in acceptable storage places.

Partial payments for stockpiled manufactured material (aggregates) will be based on Contractor process control test results. If test results show the material to be out-of-specification, or in "reject" where statistical evaluation procedures are used, no payment for stockpiled materials will be made.

Partial payment for material does not constitute acceptance of such material for use in completing items of work. Partial payments will not be made for living or perishable material until incorporated into the project.

Individual and cumulative partial payments for preparatory work and material will not exceed the lesser of:

- (1) 80 percent of the contract bid price for the item; or
- (2) 100 percent of amount supported by copies of invoices submitted.

The quantity paid will not exceed the corresponding quantity estimated in the contract. The CO may adjust partial payments as necessary to protect the Government.

Add the following:

(g) Retainage. Follow the requirements of FAR Clause 52.232-5 Payments under Fixed Price Construction Contracts.

(1) Satisfactory progress includes performance of all work under the contract including submittals, schedules, certifications, reports, and drawings. When satisfactory progress has not been made, the CO may retain a maximum of 10 percent of the amount of the progress payment until satisfactory progress has been made.

(2) After substantial completion of the contract, the CO may retain an amount adequate for protection of the Government.

Section 151. – MOBILIZATION

Payment

151.03 Delete subsections (b) and (c) and substitute the following:

(b) When 5 percent of the original contract amount is earned from bid items (not including mobilization), 50 percent of the mobilization item, or 5 percent of the original contract amount, whichever is less, will be paid.

(c) When 10 percent of the original contract amount is earned from bid items (not including mobilization), 100 percent of the mobilization item, or 10 percent of the original contract amount, whichever is less, will be paid.

Section 152. – CONSTRUCTION SURVEY AND STAKING

Construction Requirements

152.02 General. Delete the first paragraph and substitute the following:

The Government will furnish to the Contractor one copy of each of the following information:

- 3D coordinates and offset distance from centerline for subgrade and surface course finishing stakes at 20-meter intervals and miscellaneous intermediate stations.
- Slope stake books containing centerline grade and slope staking information at 20-meter station intervals and miscellaneous intermediate stations and at 10-meter station intervals on curves with radii of 115 meters.

- Computer listings containing: horizontal alignment, vertical alignment, earthwork quantities, and staking details showing superelevation template data and slope information.

The Government will provide files for downloading 3D data. Following is the information that will be provided electronically:

- 3D coordinates of control points.
- 3D coordinates of grade finishing stakes.
- 3D coordinates of slope stakes.

The Government has performed the following:

- Establish basic survey control points for vertical and horizontal control of the project.
- Set centerline stakes, take cross-sections, and set reference hubs at 20-meter intervals and miscellaneous intermediate stations from Station 49+900 to Station 50+790 for Schedule A and Station 49+331 to Station 49+900 for Option X. The reference hub work was completed in 2004.

Delete the second sentence of the second paragraph and substitute the following:

Reestablish missing terrain cross-section reference hubs, control points, and stakes before slope staking begins.

Add the following:

Furnish a practicable schedule of staking activities with the construction schedule submitted according to Section 155. Include the dates and sequence of staking requirements.

152.03 Survey and Staking Requirements.

(b) Roadway cross-sections. Delete the text and substitute the following:

Take roadway cross-sections when required to re-catch slope stakes according to 152.03(c). Take roadway cross-sections normal to centerline. Along each cross-section, measure and record points at breaks in topography, but no farther apart than 5 meters. Space the points so that the maximum variation in vertical distance from a straight line between two consecutive points and the ground line does not exceed ± 0.2 meters. Measure and record points to at least the anticipated slope stake and reference locations. Reduce all cross-section distances to horizontal distances from centerline.

Submit one printed copy and one electronic file of the cross-sectional data in GEOPAK ASCII text format: station, offset, elevation, north coordinate, east coordinate, p-code text format.

Include a file header that defines the data type of the column. (Contact Central Federal lands Survey Manager, at 720-963-3700 for more information on the format.) Include one observation per line in the submitted files showing the following data:

Station (nominal), offset from centerline, elevation, north coordinate, east coordinate, p-code (Feature code: RH for reference hub, CL for centerline).

152.03 Survey and Staking Requirements.

(e) Centerline reestablishment. Delete the text and substitute the following:

Reestablish centerline from instrument control points as necessary to construct the work. The CO may require the reestablishment of centerline, at no cost to the government, when construction survey and staking work does not meet the tolerances stated in Table 152-1.

Reestablishment of centerline may be ordered by the CO and paid for under Section 623 for purposes other than to control the work.

(f) Grade finishing stakes. Delete the third paragraph and substitute the following:

The maximum longitudinal spacing between stakes is 10 meters when the centerline curve radius is less than or equal to 75 meters. When the centerline curve radius is greater than 75 meters, the maximum longitudinal spacing between stakes is 20 meters. The maximum transverse spacing between stakes is 10 meters. Reset grade finishing stakes as many times as necessary to construct the subgrade and each aggregate course. Use brushes or guard stakes at each stake.

(g) Culverts. Delete the first paragraph and substitute the following:

Verify, in the field, the approximate location of each individual culvert with the CO prior to surveying, designing, and staking culverts. Use the “Guide for Designing and Staking Culvert in the Field”, dated January 9, 1996, issued by the U.S. Department of Transportation, Central Federal Lands Highway Division, Lakewood, CO, as a guide to the work in this section.

Perform the following:

(4) Add the following:

(a) For single skewed culverts, also submit a plotted field design cross section, normal to roadway centerline, at each end section. Plot the offset and elevation of natural ground at the end section and at all proposed template break points between centerline and the end section. Ensure the template design embankment slope is not exceeded.

(b) For multiple skewed culverts, also submit a plotted field design cross section, normal to roadway centerline, at the end sections (left and right) nearest to the shoulder. Plot the offset and elevation of natural ground at the end section and at all

proposed template break points between centerline and the end section. Ensure the template design embankment slope is not exceeded.

(5) Add the following:

Plot at a scale of 1:100.

Add the following:

(8) When the field design has been approved, set culvert survey stakes, reference stakes, and stake inlet and outlet ditches to make the culvert, including end treatments (e.g., drop inlets) functional.

(9) Adjust slope stakes to provide for catch basins (and transitions into and out of catch basins) which correspond to the final culvert location and design. If the culvert was moved from location shown in the plans, review the slope stakes in the vicinity of the plan location and adjust the slope stakes to remove the planned catch basin.

(l) Miscellaneous survey and staking. Delete the text and substitute the following:

Perform all surveying, staking, recording of data, and calculations necessary for establishing the layout, control, and measurement required to construct the project. Perform the work in such a manner as to ensure the contract work is constructed in the proper location and to the required tolerances. Where staking increments are not identified, propose appropriate staking increments to the CO for acceptance.

Measurement

152.05 Delete the fourth paragraph and substitute the following:

Do not measure miscellaneous survey and staking.

Add the following:

Reestablishing missing Government-set terrain cross-section reference hubs, control points, and stakes will be measured under Special labor, Hired survey services when it is paid by the hour. No payment will be made for re-establishing missing hubs, control points, or stakes after construction operations have begun.

Section 153. – CONTRACTOR QUALITY CONTROL

Section 153 Delete the entire Section and substitute the following:

Description

153.01 This work consists of obtaining samples for process control testing, performing process control tests, providing quality control inspection, exercising management control to plan and

implement construction processes that are systematic, consistent, and effective; ensuring that work conforms to the contract requirements; and documenting quality control activities and results. See FAR Clause 52.246-12 Inspection of Construction.

Construction Requirements

153.02 Contractor Quality Control Plan. At least 14 days before the start of on-site work, submit a written quality control plan (QCP) for acceptance. Do not perform any on-site work without an approved quality control plan.

Submit the following with the quality control plan:

(a) Process control sampling and testing. List the material to be tested by pay item, tests to be conducted, the location of sampling, the frequency of testing, the person(s) responsible for performing the sampling and testing, laboratory testing facilities to be used for process control and project testing, and the proposed reporting formats. Furnish the names, to the CO, of personnel who will be responsible for on-site inspection and testing duties, provide a description of the work that each tester and inspector will be assigned, and experience with the work assigned. Perform process control testing in accordance with Table 153-1, schedule of minimum sampling and testing for process control. Where no minimums are specified, submit proposed tests to be performed and the proposed sampling and testing frequencies.

(b) Inspection/control procedures. Address each of the subjects shown for each phase of construction:

(1) Preparatory phase.

(a) In a preparatory phase meeting, review the contract requirements for the work; the process for constructing the work; and the plan for inspecting, testing, measuring, and reporting the work. Include the project superintendent, the quality control supervisor (QCS), the foreman for the work to be performed, and the CO in the meeting. Schedule and conduct a preparatory meeting for each type of work to be performed at least one week prior to beginning the work.

(b) Ensure compliance of component material to the contract requirements.

(c) Coordinate all submittals including certifications.

(d) Ensure capability of equipment and personnel to comply with the contract requirements. Provide training as necessary.

(e) Ensure preliminary testing and inspection is accomplished.

(f) Coordinate surveying and staking of the work.

(2) Start-up phase.

(a) In a start-up phase meeting, review the contract requirements and the processes for constructing the work with the personnel who will be performing the work. Invite the

CO, project superintendent, QCS, testers, and inspectors of the work being performed, and the personnel directly supervising and performing the work. Review the planned testing, inspection, and reporting requirements with the quality control personnel responsible for the testing and inspection. Explain the reporting procedures to be used when defective work is identified. Conduct a start-up meeting for each type of work to be performed upon beginning the work.

(b) Inspect and test start-up of work at a frequency sufficient to establish confidence in the work process.

(c) Establish a detailed testing schedule based on the production schedule.

(3) Production phase.

(a) Conduct intermittent or continuous inspection during construction to identify and correct deficiencies.

(b) Conduct inspections to ensure that planned construction processes are consistently followed and the processes are effective in producing work that complies with the contract requirements.

(c) Inspect, test, and report completed work before requesting Government inspection. Compare the work to the contract requirements and evaluate acceptability of the work produced.

(d) Inspect the work, materials or assemblies accepted under Subsection 106.03 to ensure that all the work and materials comply with contract requirements. Furnish the results of inspections, along with product or commercial certification as applicable, to the CO prior to incorporating the materials into the work.

(e) Sample and test aggregates and/or aggregate/asphalt mixtures accepted under Subsection 106.03, for conformity with the product certification a minimum of one time per pay item.

(f) Provide feedback on processes and deficiencies, identify root causes of deficiencies, and make timely and effective changes to work processes to prevent repeated deficiencies.

(c) Description of records. List the records to be maintained. Identify the format for reporting results, materials certifications and the procedures to be used to maintain inspection records.

(d) Personnel qualifications. Furnish competent and effective quality control personnel to perform the activities required by the QCP and this Section.

Document in the QCP the name, authority, relevant experience, and qualifications of the QCS with overall responsibility for managing the inspection and testing requirements of this section.

Document in the QCP the names, authority, and relevant experience of all personnel directly responsible for inspection and testing.

(1) Quality Control Supervisor. The QCS is responsible for supervising quality control personnel; monitoring inspection, sampling, and testing for all phases of the work; identifying deficiencies; and taking appropriate corrective action. Designate a full-time, on-site QCS who will be immediately available during all phases of the work and has the authority to act for the Contractor on quality-related matters. The QCS may not perform primary testing and inspection except when approved in writing by the CO for infrequent and limited activities and as long as all of the work on the project is well-managed, in control, and is receiving the level of testing and inspection required by the contract. Designate a QCS who possesses one of the following credentials:

(a) 2 years direct experience supervising or managing highway construction quality control or quality assurance programs for state or federal projects, or

(b) 3 years of experience as: (a) a construction project manager on highway construction projects, or (b) a construction superintendent on highway construction projects, or (c) a federal or state highway construction project engineer, resident engineer, or equivalent, or

(c) NICET Level III certification in highway construction or highway materials or equivalent, or

(d) A degree from a 4-year construction management, construction engineering, or similar program, and having at least 3 years experience as (a) a highway construction contractor foreman, project engineer, or equivalent, or (b) a federal or state highway construction lead inspector or equivalent.

(2) Inspectors. Furnish inspectors having training commensurate with the scope, complexity, and type of work being inspected, and having at least 2 years of experience inspecting the type of work being inspected and performing the types of inspections to be performed.

(3) Testers. Furnish testers having 1 year or more of recent job experience in the type of sampling and testing required by the contract, and one of the following:

(a) NICET Level II certification in highway materials, or State (SHA) or industry certification-related sampling and testing equivalent to the sampling and testing to be performed for this contract,

(b) WAQTC or other nationally accepted certification program for intended sampling and testing responsibilities,

(c) At least 1 year of current or previous employment by an AASHTO accredited laboratory performing sampling and testing equivalent to the sampling and testing to be performed for this contract.

The CO may require a demonstration of proficiency in sampling and testing capabilities. One or more proficiency samples may be provided by the Government to verify basic qualifications. Provide the results of the proficiency samples to the CO within 48 hours of receipt of the material.

(e) Subcontractors and suppliers. Include the work of all subcontractors. If a subcontractor is to perform work under this Section, explain how the subcontractor's inspection plan will interface with the Prime Contractor first tier subcontractors and lower tier subcontractors and organizations, and the CO. Include the work of major suppliers and suppliers of structural and geotechnical services and materials.

Modifications or additions may be required to any part of the plan that is not adequately covered. Acceptance of the quality control plan will be based on the inclusion of the required information. Acceptance does not imply any warranty by the Government that the plan will result in consistent contract compliance. It remains the responsibility of the Contractor to demonstrate such compliance.

Supplement the plan for changes in the contract as work progresses and whenever quality control or quality control personnel changes are made.

153.03 Sampling and Testing. Perform sampling and testing required by Table 153-1 and by the accepted QCP.

(a) Sample Splitting. Schedules and times or locations for obtaining on-site split samples for Government use will be provided by the CO using a procedure for random sampling. In addition, sample any material that appears defective or inconsistent with similar material being produced, unless such material is voluntarily removed and replaced or otherwise corrected according to Subsection 106.01

(b) Testing. If the Government-furnished field laboratory bid option is not exercised by the CO, furnish a laboratory equipped with all test equipment necessary to satisfy the requirements of the contract. Ensure test equipment has been checked, calibrated, standardized and/or otherwise verified in accordance with AASHTO and ASTM standards by an individual qualified to do this work. Ensure mobile laboratories receive an equipment inspection after the laboratory has been moved to its permanent location on the project site and anytime it is moved thereafter. Inspect equipment within 45 days of actual use in project testing and at least once a year thereafter. Do not use equipment that has not been inspected or is found to be deficient. Mark deficient equipment and take it out-of-service until it is repaired or replaced and shown by subsequent inspection to perform as required. Maintain records documenting these inspections in the laboratory. Provide certification(s) stating the equipment conforms to testing requirements and provide evidence of current inspection.

The CO may require the Contractor to perform testing to demonstrate acceptable equipment and an acceptable level of technician competence. The CO may also check equipment and inspection records to verify condition. Repair or replace equipment not meeting applicable requirements. Keep laboratory facilities clean and maintain equipment in proper working condition. Provide the CO unrestricted access to the laboratory for inspection and review.

(c) Certifications. For materials or work accepted by certification in accordance with 106.03, review all certifications to insure compliance with the requirements of the contract prior to

incorporating materials into the work and provide a signed copy of the reviewed certification(s) to the CO. According to FAR Subpart 46.407, materials or work without proper certification will be rejected in writing, and payment for such material or work will be withheld until proper certification has been provided to the CO.

153.04 Records. Maintain complete testing and inspection records by pay item number and make them accessible to the CO.

For each day of work, prepare an "*Inspector's Daily Record of Construction Operations*" (Form FHWA 1413) or an approved alternate form. Report inspection results in detail, including deficiencies observed and corrective actions taken. Identify locations of work and labor and equipment used, including actual hours worked, to perform each item of work. When submitting test results on material being incorporated into the work, report test results within the reporting times indicated in the sampling and testing requirements at the end of each section or as specified in the contract. Include the following certification signed by the QCS with overall responsibility for the inspection system:

"It is hereby certified that the information contained in this record is accurate and that all work documented herein complies with the requirements of the contract. Any exceptions to this certification are documented as a part of this record."

Submit the record and certification within 24 hours of the work being performed. If the record is incomplete, in error, or otherwise misleading, a copy of the record will be returned with corrections noted. When chronic errors or omissions occur, correct the procedures by which the records are produced.

Maintain linear control charts that identify the project number, pay item number, test number, each test parameter, the upper and lower specification limit applicable to each test parameter, and the test results. Use the control charts as part of the quality control system to document the variability of the process, to identify production and equipment problems, and to identify actions to improve processes or quality.

Post control charts in an accessible location and keep them up-to-date. Cease production and make corrections to the process when problems are evident.

153.05 Acceptance. The Contractor's quality control system will be evaluated under Subsection 106.02 based on the demonstrated effectiveness of the quality control system to result in the use of systematic, consistent, and effective work processes; accurate, adequate, and timely documentation of quality control activities; the construction of work that conforms to the contract requirements; the identification of root causes of problems; the timely implementation of planned changes to work processes to prevent repeated deficiencies; the reliable identification and documentation of defective work; and the consistent tracking of defective work through correction.

Performance of the work may be stopped in accordance with Subsection 108.05, either in whole or in part, for failure to comply with the requirements of the Section. The Government may charge to

the Contractor the cost of any additional inspections required when the work being inspected is found not to comply with contract requirements during the initial inspection. Work stop orders, due to recurring deficiencies of work required by this Section, will be rescinded after the Contractor demonstrates to the CO that changes were made to the quality control plan and system which resulted in the correction of those deficiencies. There will be no adjustment in the contract time, or payments to the Contractor for any impacts, delays or other costs due to any periods of work stoppage resulting from failure to comply with the requirements of this Section.

Measurement

153.06 Measure contractor quality control according to Subsection 109.02.

Payment

153.07 The accepted quantities will be paid at the contract price per unit of measurement for the Section 153 pay item listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Progress payments for Contractor quality control will be paid as follows:

- (1) 25 percent of the item amount, not to exceed 0.5 percent of the original contract amount, will be paid after the contractor quality control plan is accepted; all testing facilities are in place; qualified quality control supervisor, inspection, and sampling and testing personnel are in position to provide quality control activities; and the work being inspected or tested has started.
- (2) 65 percent of the total lump sum will be prorated for payment based on the completed portion of the total work not including the original 25 percent completed under (1) above.
- (3) Payment of the remaining 10 percent of the lump sum will be paid when all inspections, test results, submittals, and reports are complete and accepted.

Table 153-1
Schedule of Minimum Sampling and Testing For Process Control
 (to be performed by the Contractor)

Section(s): 204, 208, 209.

Material	Property or Characteristic	Test Method or Specification	Frequency	Sampling Point
Embankment Construction Composition of Roadbed in Cuts	Classification and Moisture/Density	AASTHO M 145 AASHTO T 99 or AASHTO T 180 (minimum of 5 proctor points).	1 per material/type.	Source of material.
	In-place density and moisture content	AASHTO T 310	2 per lift, but not less than 2 every 800 cubic meters.	Compacted embankment, subgrade as applicable.
	R-value	AASHTO T 190 (Tested by FHWA Central Lab).	1 per 700 meters, or change in material type.	Sample depth: 0-300 mm.
Bedding/Backfill for Structures and Culvert Pipe	Classification and Moisture/Density	AASTHO M 145 AASHTO T 99 or AASHTO T 180 (minimum of 5 proctor points).	1 per material/type.	Source of material.
	In-place density and moisture content	AASHTO T 310	1 per 15 meters/lift. Minimum 2 per lift.	Compacted bedding or backfill as applicable.

Table 153-1
Schedule of Minimum Sampling and Testing For Process Control
 (to be performed by the Contractor)

Section(s): 255.

Material	Property or Characteristic	Test Method or Specification	Frequency	Sampling Point
Select wall backfill 704.13(a) and Wall backfill 704.13(b)	Gradation and liquid limit	AASHTO T 11 AASHTO T 27 AASHTO T 89 AASHTO T 90	1 per material/type	Source of material
	Moisture Density	AASHTO T99, Method C ⁽¹⁾	1 per material/type	Source of material
	In-place density and moisture content	AASHTO T 310	For MSE walls: 1 per 300-mm lift per 75-meters of wall length (minimum of 2 per lift)	Compacted backfill

⁽¹⁾ A minimum of 5 points are required for moisture density test.

Table 153-1
Schedule of Minimum Sampling and Testing For Process Control
 (to be performed by the Contractor)

Section(s): 301, 303, 304, 305, 306, 308.

Material	Property or Characteristic	Test Method or Specification	Frequency	Sampling Point
Subbase, Base Course Aggregate	Gradation (301)	AASTHO T 11 AASTHO T 27	2 per day	Crusher belt
Stabilization and Aggregate Topsoil Courses	Moisture/Density	AASHTO T 99 or AASTHO T 180 (minimum of 5 proctor points)	1 per source of material	Source of material
	In-place density and moisture content	AASHTO T 310 or ASTM 2950	2 per lift at 300-meter intervals, alternating lanes	Compacted aggregate
	Plasticity index (aggregate surfacing only)	AASHTO T 90	2 per day	Crusher belt
	Gradation (304 materials processed in place)	AASHTO T 11 AASHTO T 27	1 per 300 meters	Processed material
Magnesium Chloride and Calcium Chloride	Specific Gravity	Hydrometer	1 per shipment	Transport vehicle

Note: Density and Moisture calculations AASHTO T 310...Density corrections based on moisture for recycled materials containing asphalts, or aggregates containing MgCl or CaCl will be made based on samples taken from each test site and oven-dried in the laboratory.

Table 153-1
Schedule of Minimum Sampling and Testing For Process Control
 (to be performed by the Contractor)

Section: 401.

Material	Property or Characteristic	Test Method or Specification	Frequency	Sampling Point
Superpave Hot Asphalt Concrete Pavement	Gradation	AASTHO T 11 AASHTO T 27	2 per day per stockpile	Crusher belt (during production) and Cold Feed or Hot Bins (as applicable during production of hot mix)
	Moisture content of aggregates	AASHTO T 255	1 per day	Cold Feed (during production of hot mix)
	Compaction	ASTM D2950	Test strip, first day of production to establish roller pattern: 12 per 500 meters, then 3 per 500 meters	In place, after compaction
	Placement temperature	Thermometer	As directed	Behind laydown machine
	Surface tolerance	Straight edge and FLH T 504	During and after compaction	See Subsection 401.16
Aggregate	Fine aggregate angularity	AASHTO T 304, Method A	1 per day	Cold Feed

Table 153-1
Schedule of Minimum Sampling and Testing For Process Control
 (to be performed by the Contractor)

Section(s): 402, 403, 404, 405, 408.

Material	Property or Characteristic	Test Method or Specification	Frequency	Sampling Point
Asphalt Concrete Pavement	Gradation	AASTHO T 11 AASHTO T 27	2 per day per stockpile	Crusher belt (during production) and Cold Feed or Hot Bins (as applicable during production of hot mix)
Open-Graded Asphalt Friction Course	Moisture content of aggregates	AASHTO T 255	1 per day	Cold Feed (during production of hot mix)
Asphalt Base Course	Compaction	ASTM D2950	Test strip, first day of production to establish roller pattern: 12 per 500 meters, then 3 per 500 meters	In place, after compaction
	Placement temperature	Thermometer	As directed	Behind laydown machine
	Surface tolerance	Straight edge and FLH T 504	During and after compaction	See Subsection 401.16

Table 153-1
Schedule of Minimum Sampling and Testing For Process Control
 (to be performed by the Contractor)

Section(s): 409, 410.

Material	Property or Characteristic	Test Method or Specification	Frequency	Sampling Point
Chip seal aggregate	Gradation	AASTHO T 11 AASHTO T 27	2 per day	Production belt or spreader discharge
Slurry seal aggregate	Moisture content of aggregates	AASHTO T 255	1 per day	Stockpile or spreader discharge
Asphalt binder Emulsified asphalt	Placement temperature	Thermometer	Prior to each days production, followed by 2 each day	Distributor truck

Table 153-1
Schedule of Minimum Sampling and Testing For Process Control
 (to be performed by the Contractor)

Section(s): 416, 418.

Material	Property or Characteristic	Test Method or Specification	Frequency	Sampling Point
Continuous Cold Recycled Asphalt Base Course Foamed Asphalt Stabilized Base Course	Gradation	AASTHO T 27 (maximum size only)	1 per 500 meters	Recycled material prior to compaction
	Moisture content	FLH T 515	Minimum 1 per 500 meters alternating lanes (as necessary to comply with contract requirements)	In place after compaction and prior to compaction to determine total moisture.
	In-place density	ASTM D2950	1 per 500 meters, alternating lanes (1 value will be equal to the mean of 3 in-place tests, and as necessary to comply with contract requirements)	In place after compaction

Note: Density and Moisture calculations ASTM D 2950...Density corrections based on moisture for recycled materials containing asphalts, or aggregates containing MgCl or CaCl will be made based on samples taken from each test site and oven-dried in the laboratory.

Table 153-1
Schedule of Minimum Sampling and Testing For Process Control
 (to be performed by the Contractor)

Section(s): 501, 552, 601.

Material	Property or Characteristic	Test Method or Specification	Frequency	Sampling Point
Concrete	Gradation and fineness modulus	AASTHO T 11 AASHTO T 27	1 per day	Aggregate, before batching
	Moisture	AASHTO T 255	1 per day/stockpile	Aggregate, before batching
	Slump	AASHTO T 119	1 per 25 cubic meters, minimum 1 per day	See note
	Air content	AASHTO T 152	1 per 25 cubic meters, minimum 1 per day	See note
	Unit weight	AASHTO T 121	1 per 25 cubic meters, minimum 1 per day	See note
	Temperature	Thermometer	1 per 25 cubic meters, minimum 1 per day	See note
	Making test specimens for compressive strength	AASHTO T 23	1 set per 25 cubic meters, minimum 1 set per day	At point of discharge

Note: If an extended set admixture is used for the sole purpose of extending discharge times, sampling and testing will be performed by the Contractor at point of batching and discharge location to ensure compliance with Subsection 552.08.

Section 154. – CONTRACTOR SAMPLING AND TESTING**Construction Requirements****154.02 Sampling.** Add the following:

Perform the initial curing of all concrete test cylinders. Provide for transporting the government verification cylinders to the FHWA-Central Federal Lands Highway's Laboratory unless other testing facilities are authorized by the CO.

Label each concrete mold with the name and number of the Project, the cylinder number, date molded, location of the sample, and the test age (i.e. – 7, 14, or 28 days). Label the mold after casting and the cylinder after stripping to ensure the sample can be identified throughout the entire curing process.

Provide the required cylinder molds.

154.03 Testing. Add the following:

Where Process Control Sampling and Testing frequencies in Table 153-1 are identical to the Sampling and Testing Tables for all applicable work the Process Control Samples may be used for acceptance.

Add the following subsections:

154.03A Field Laboratory (Government-Furnished). Refer to the "Notice to Bidders" in the bid proposal for information regarding the option to use a Government-Furnished field laboratory.

If the bid option "Item 15401-0000, Contractor Testing, Using Government Furnished Field Laboratory" is **exercised**, the government will provide, for the Contractor's use, a mobile field laboratory, including testing equipment as follows:

- Pine AFG1A Gyrotory Compactor
- NCAT Thermolyne Ignition Oven
- AASHTO T 209 Rice Vacuum Equipment
- AASHTO T 166 Bulk Specific Gravity of Compacted Mix Equipment
- Convection Oven
- Liquid Limit Machine and Grooving Tool
- 30,000 Gram Balance
- 12,000 Gram Balance
- 4,600 Gram Balance (readable to 0.01)

- Platform Scale
- Mechanical Compactor (Moisture Density) and Accessories
- 8-inch Sieve Shaker and Sieve Stack
- 12-inch Sieve Shaker and Sieve Stack
- Drill Press with Muller
- Large Sample Splitter
- Small Sample Splitter

Provide any additional equipment or facilities necessary to fulfill the requirements of the Contract.

Transport the laboratory from 12300 West Dakota Avenue, Lakewood, CO to the point of use and return the laboratory to the same Lakewood address upon completion of the work. The trailer will be available upon issuance of Notice to Proceed and must be returned no later than 14 days following final acceptance of the contract. Contact the CFLHD Equipment Depot at **(720) 963-3459 or (720) 963-3384** for specific directions to the laboratory storage location.

Assume responsibility for the replacement of any and all missing or damaged equipment and for the repair of any damage to the laboratory. **Replacement cost for missing or damaged equipment or facilities will be deducted from any remaining monies owed the Contractor. If sufficient funds are not available under the Contract for such retention, the Contractor agrees to make payment directly to the Government for any damaged or missing equipment or facilities.**

Specifics:

Furnished equipment will be inspected by the Government by checking, standardizing, calibrating and/or verifying, as appropriate, in accordance with applicable AASHTO and ASTM standards. The Government equipment inspection will be completed after the laboratory has been moved to its permanent location on the project site prior to actual use in project testing and at least once a year thereafter. Notify the CO at least 30 days in advance of intent to use the testing equipment on the project so that Government equipment inspection can be scheduled and performed. Assume responsibility for additional equipment inspections prior to the Government's yearly inspection if the mobile laboratory is moved. Maintain records documenting these inspections in the laboratory.

Maintain equipment in proper operating condition. Do not use equipment that is found to be deficient or defective. Mark deficient or defective equipment and take it out-of-service and immediately notify the CO. If Government-furnished testing components fail through no fault or negligence of the Contractor, the Government will replace or repair the equipment in the most expeditious manner practicable. Requests for time extension and/or delay damages will not be granted for delays of less than 48 hours for any one occurrence, or for cumulative delays amounting to less than 5 (five) days in any one 365-day period. Requests for time

extensions or damages due to equipment-related delays caused by equipment misuse or other Contractor fault will not be granted.

- Furnish water to the Government-provided field laboratory which is clear and free of oil, acid, rust, alkali, sugar, and vegetable substances. Furnish 120/240-volt, 60-cycle, single-phase current adequate to operate all of the Government field laboratory facilities at all times as required by the CO. Supply enough power to support a 200 amp service panel. Equip the power supply with a regulator that limits the voltage of the power furnished to the laboratory to not less than 220 volts and not more than 240 volts.
- All equipment provided by the Government and replaced by the Contractor will remain with the laboratory and will become the property of the Government.
- Use of the laboratory is limited to testing materials in connection with this contract.

154.03B Field Laboratory (Contractor-Furnished). If the Government-furnished field laboratory bid option is not exercised, furnish a laboratory equipped with all test equipment necessary to satisfy the requirements of the contract.

The sampling and testing services of a commercial laboratory meeting or exceeding the requirements described herein may be used if all contract sampling and testing requirements are satisfied by the use of the commercial facility.

Ensure test equipment has been checked, calibrated, standardized and/or otherwise verified in accordance with AASHTO and ASTM standards by an individual qualified to do this work. Ensure mobile laboratories receive an equipment inspection after the laboratory has been moved to its permanent location on the project site and anytime it is moved thereafter. Inspect equipment within 45 days of actual use in project testing and at least once a year thereafter. Do not use equipment that has not been inspected or is found to be deficient. Mark deficient equipment and it take out-of-service until it is repaired or replaced and shown by subsequent inspection to perform as required. Maintain records documenting these inspections in the laboratory. Provide certification(s) stating the equipment conforms to testing requirements and provide evidence of current inspection.

The CO may require the Contractor to perform testing to demonstrate acceptable equipment and an acceptable level of technician competence. The CO may also check equipment and inspection records to verify condition. Repair or replace equipment not meeting applicable requirements. Keep laboratory facilities clean and maintain equipment in proper working condition. Provide the CO unrestricted access to the laboratory for inspection and review.

Section 155. – SCHEDULES FOR CONSTRUCTION CONTRACTS**Construction Requirements**

155.02 General. Delete the third paragraph and add the following:

Use the Critical Path Method (CPM) construction scheduling method for this project.

155.05 Written Narrative. Add the following:

(j) List anticipated monthly and cumulative contract earnings (including, for schedule updates, any contract modifications) for each month from the beginning of construction operations through the completion of the work. Calculate and list each month's anticipated earnings through the close of business on the date provided by the CO as the cut-off date for monthly project pay estimates.

155.06 Schedule Updates. Add the following:

On a weekly basis, provide construction activity and traffic control plan updates to the CO for incorporation into the Public Information Program (PIP).

The update should contain at a minimum:

- (a) Construction activities and expected noise levels planned for the following week.
- (b) Anticipated traffic delays for each of the major activities and the duration of the expected delays.
- (c) Scheduled night work activities and closures.
- (d) Locations of the construction activities identified by either mileposts or project feature such as the Long Lake, etc.
- (e) Anticipated surface condition information at each location of work.

Provide the information in a bullet format for the major activities, clearly defining the work. Provide a hardcopy and electronic version to the CO for inclusion in the PIP. Designate a project spokesperson to provide detailed project updates every Friday to the CO no later than 12:00 PM (noon) for transmittal to the Public Information Program Officer.

The PIP officer will review the traffic control plan updates submitted as they relate to other Beartooth Highway project closures and delays and advise the CO of conflicts that may cause undue public delays or inconveniences over the reach of the entire highway. In some instances, the CO may require the Contractor to alter proposed traffic control plans to prevent or mitigate this conflict.

Section 156. – PUBLIC TRAFFIC**Construction Requirements**

156.03 Accommodating Traffic During Work. Delete the first paragraph and substitute the following:

Accommodate traffic according to the contract traffic control plan, MUTCD, Section 635, and this Section. An alternate traffic control plan may be submitted for acceptance according to Subsection 104.03. Submit alternate traffic control plans at least 30 days before intended use.

Add the following:

Maintain safe access to all approach roads, access roads, campgrounds, Top of the World Store, and trail access locations during construction. Maintain safe access to parking areas and pullouts during construction where possible.

Allow immediate access to emergency vehicles.

Provide advance notice of traffic control or scheduling changes to the CO as required to update the Public Information Program when changes are anticipated.

No road work on July 17, 2013. Accommodate transporting bicycles and riders using vehicles with trailers or other approved method through the construction zone on July 17, 2013.

Notify and coordinate with all users of the Beartooth Lake Campground, Island Lake Campground, and the Top of the World Store (if open) when night closures of the highway are anticipated. Furnish and maintain a sign at the entrance to the Beartooth Lake Campground and the Island Lake Campground which provides appropriate information and advance notice as approved by the CO.

Employ the following measures to assure safe driving conditions:

- (a) Preserve and maintain existing paved surfaces as long as reasonably possible.

156.04 Maintaining Roadways During Work.

(a) Add the following:

Do not construct diversions outside of the clearing limits or use alternate route detours without the approval of the CO.

(g) Add the following:

Develop an employee communication protocol for contractor/public interaction and submit it to the CO for approval. Limit unauthorized communication between workers and the public.

156.05 Maintaining Roadways During Non-Work Periods. Add the following:

In the event of shoulder season plowing and winter shut down periods, provide a safe and passable condition and configuration for snow grooming equipment and the operation of snowmobiles, taking into consideration historical snow depth conditions and public snowmobile trail locations and use patterns. Provide a minimum one-lane width of 4.3 meters throughout the project length for snowmobile trail grooming. Provide winter snowmobile access across Long Lake/Canyon Creek until the bridge has been constructed.

Prior to winter shutdown, coordinate with Yellowstone National Park maintenance through the CO for final snow staking of the highway and work zones to remain over the winter for installation of temporary snow poles. Installation and supply of temporary snow poles will be by the National Park Service. Prior to winter shutdown, coordinate with the Yellowstone National Park Maintenance through the CO to provide specific hazard markers or signing for breaks in the pavement or other hazards to snow plowing that are to be left over the winter.

Complete all preparation activities for a winter suspension by mid-October. These activities include placing and compacting surfacing on all roadbed where pavement has been removed, placing topsoil on all disturbed areas except exposed bedrock, seeding and mulching on all disturbed areas except exposed bedrock, and installing and fortifying temporary and permanent erosion control devices as shown on the plans or as directed by the CO.

During periods of extended work shutdowns at anytime, allow no delays to public traffic and maintain the roadway open to either alternate one-way traffic with a minimum travelway width of 4.0 meters, or two-lane traffic with a minimum travelway width of 6.0 meters.

156.06 Limitations on Construction Operations.

(b) Delete the text and substitute the following:

For shoulder drop-offs 75 millimeters or less, provide "Low Shoulder" warning signs. For shoulder drop-offs in excess of 75 millimeters, provide a 1V:3H fillet with "Shoulder Drop-Off" warning signs. Complete the construction of shoulders adjacent to traffic lanes to the same elevation within 14 days.

(c) Delete the first sentence and substitute the following:

For alternate one-way traffic control, provide a minimum lane width of 4.0 meters. For two-way traffic, provide a minimum roadway width of 6.0 meters except when directing traffic on the existing roadway with an approximate width of 5.5 meters.

(i) Delete the text and substitute the following:

Limit construction-caused delays to public traffic from 8:00 am to 8:00 pm to a maximum of 30 minutes per passage through the project.

156.08 Traffic and Safety Supervisor.

Delete the first paragraph and substitute the following:

Provide a traffic and safety supervisor who is certified by the State highway agency or other acceptable certification program. Furnish the traffic safety supervisor's name, address, and 24-hour telephone number(s) at the preconstruction conference. At all times during the contract, including periods of suspensions and work stoppages, perform all of the following:

Measurement and Payment

156.10 Add the following:

Hauling, placement, and spreading of salvaged existing pavement material for temporary surfacing will not be measured for payment.

**Section 157. – SOIL EROSION CONTROL
Material**

157.02 Add the following:

Slope drainage pipe	706.08(d)
Gravel bags	713.14A
Prefabricated filter insert	713.16B
Concrete masonry unit	725.09(c)

Construction Requirements

157.03 General. Delete the Subsection and substitute the following:

157.03 General. Provide permanent and temporary erosion control measures to minimize erosion and sedimentation during and after construction according to the contract erosion control plan, contract permits, Section 107, and this Section. Contract permits amend the requirements of this Section. Do not modify the type, size, or location of any control or practice without approval.

Standard erosion and sediment control devices are provided in the contract. Detail site-specific measures for controlling erosion and sediment as part of the Storm Water Pollution Prevention Plan (SWPPP). Submit the SWPPP to the CO for acceptance prior to implementation. Provide working drawings and associated data. Allow 7 days for acceptance of the drawings or a return

for corrections. Do not begin any ground disturbing work until the plan has been accepted. Include all data and plan updates pertaining to erosion and sediment control in the SWPPP for the project. Include the following in the detailed design:

- (a) Address contractual requirements for storm water runoff permits, environmental commitments and other permit requirements here or in Subsection 107.01 and 107.10.
- (b) Location of each proposed erosion or sediment control measure.
- (c) Type of each erosion or sediment control measure. If standard measures provided in the contract do not fit the field conditions, propose alternatives at least 30 days prior to installation.
- (d) Quantities of proposed temporary erosion and sediment control devices to be implemented during construction.
- (e) A schedule detailing coordination of erosion and sediment control measures with the various construction operations or stages. Include the furnishing, installation, maintaining, and removing of temporary devices and the installation of permanent erosion control features.
- (f) A schedule outlining the proposed schedule of clearing and grubbing, excavation, embankment, and culvert operations such that the area of disturbed or erodible material is minimized. Schedule the work such that temporary and permanent erosion measures can be incorporated at the earliest practical time.
- (g) Construction methods used in various items of work to minimize erosion.

When temporary erosion or sediment control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as part of the work in a timely manner, provide temporary measures at no cost to the Government.

When erosion control measures are not functioning as intended, immediately take corrective action.

At the preconstruction conference, designate in writing an Erosion Control Supervisor (ECS) who is qualified and responsible for implementing the requirements of this Section. Include a resume with previous erosion and sediment control experience and education.

157.04 Controls and Limitations on Work.

Delete the second paragraph and substitute with the following:

Construct manageable sections that reflect changes in vegetation. Sequence construction so that salvaged upland sod, salvaged wetland sod, and salvaged willows are placed immediately

following harvesting. Wetland topsoil or salvaged sod may be stockpiled in isolated instances only with written approval of CO. Do not stockpile topsoil or salvaged sod for more than 30 days, except stockpiling of topsoil stripped at the Ghost Creek Material Source may be longer than 30 days, as necessary for material processing requirements, as approved by the CO. Apply temporary soil tackifier to all slopes not being worked after seven days as work progresses to minimize soil loss.

157.06A Stabilized Construction Entrance. Before placing the geotextile fabric, clear the area of all trash and debris, grading and compacting the ground to a uniform plane. Overlap adjacent ends of geotextile fabric a minimum of 300 millimeters.

Maintain stabilized construction entrances to minimize tracking of soil and sediment onto existing public roads. Replenish or replace aggregate material as the aggregate becomes clogged with sediment.

157.11 Temporary Turf Establishment. Add the following:

Apply temporary soil tackifier to exposed slopes at a rate of 131 kilograms/hectare. Provide a tackifier that is water-soluble granular power composed of hydrocolloids. Provide J3000 or approved equal. Asphalt emulsion is not an acceptable soil tackifier.

157.12 Inspection and Reporting. Add the following:

Monitor the turbidity of waters adjacent to the project. Take turbidity measurements using an HF-DRT 15CE turbidimeter or equivalent upstream of the project and 150 meters downstream of the area of the highest turbidity. If the measurements show an increase of 10 NTU or more, immediately suspend operations in the vicinity of the problem area and modify the erosion control measures to eliminate the cause of the high turbidity. Include turbidity readings, locations, and actions taken, if any, in inspection reports. Also provide documentation of meter calibration. See section 107.01 (f) for frequency and events for measurement requirements.

Add the following:

Inspect all disturbed and temporarily stabilized areas of the project as required by the Construction General Permit (CGP). Provide copies of reports of all inspections and monitoring performed to the CO within 24 hours of the inspection. Refer to the CGP for current monitoring and inspection requirements.

157.14 Acceptance. Add the following:

Soil erosion control will be evaluated under Subsection 106.02 based on the demonstrated ability of the erosion and sediment control measures to result in minimal soil erosion, sedimentation and siltation, and turbidity increases within or adjacent to the project limits. Failure to maintain devices properly and in a timely manner may result in non-compliance and devices will be rejected until they are brought into compliance.

Payment

157.16 Delete the text and substitute the following:

The accepted quantities will be paid at the contract price per unit of measurement for the Section 157 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Progress payments for erosion and sediment control measures will be made as follows:

- (a) 25 percent of the unit bid price will be paid upon installation.
- (b) An additional 50 percent of the unit bid price will be prorated based on total work complete.
- (c) Payment of the remaining 25 percent of the unit bid price will be paid when the temporary erosion control and sediment measures are removed from the project.

Section 201. – CLEARING AND GRUBBING

Description

201.01 Delete the text and substitute the following:

This work consists of minor clearing and all grubbing within the clearing limits based on the dimensions shown in the plans, adjusted to fit field conditions as directed by the CO for Schedule A. Major clearing was initiated during the summer of 2004 and was completed in 2005. Major work elements include the removal of existing stumps that remain from the previous clearing project.

Provide equipment capable of excavating small, isolated pockets of soil, and working around areas of designated vegetation or tree stumps to remain, and placing material on slopes and in pockets on rock ledges. The project requires non-conventional methods to excavate, stockpile, and place the conserved material due to the limited amount of material available for topsoil in the project area and the need to establish the best growing medium possible to revegetate the roadside.

Construction Requirements

201.03 General. Add the following:

The CO will either approve the clearing limits as staked or direct the Contractor specifically how to adjust the clearing limits to preserve existing vegetation, rock formations, or other features. When directed, re-catch slope stakes at new slope ratio in accordance with Subsection 152.03(b).

If clearing limits are increased, an amendment to the SUP will be required according to Section 105.04.

Install temporary fencing or silt fence prior to grubbing operations in all sensitive locations as shown on the plans, or designated by the CO. Maintain temporary fencing for the duration of the contract and remove upon completion of construction activities.

Refer to Subsection 157.11 for temporary turf establishment in cleared areas.

201.04 Clearing. Add the following:

Stockpile the quantity of logs for use in landscaping as described in Section 647, Roadside Development. Do not push trees over with heavy equipment, disturb root systems, or perform grubbing operations not in compliance with Section 201.05 until topsoil is conserved.

Salvage trees along the clearing limit that are a minimum of 4.5 m in length and 300 mm in diameter for use as landscaping logs. Leave these trees in place as the clearing progresses to minimize handling. Preserve large trees, including whitebark, pine, in the wildlife crossing areas as identified in the plans.

Remove all woody vegetation prior to topsoil salvaging except as identified in section 201.05.

201.05 Grubbing. Delete the first paragraph and substitute the following:

Remove and dislodge topsoil from removed stumps. Grub deep enough to remove stumps, branches, tree and shrub roots, and buried logs.

Minimize scarring and damage to the exposed surface of existing surface rocks located within the construction limits if the rocks are to be used in revegetation and landscape work.

In wetland and riparian areas, leave willow roots intact, and salvage willow roots along with topsoil according to Section 624 and 626.03. Cut willows within 900 mm of the ground surface.

Delete subsection (b) and substitute the following:

(b) Grub all embankment areas. Undisturbed stumps less than 600 millimeters in diameter may be left in place if they protrude less than 150 millimeters above the original ground and will be covered with more than 1 meter of embankment. Remove all other stumps.

Add the following:

(e) Conserve topsoil according to 204.05 prior to grubbing operations.

(f) Conserve topsoil from all grubbed stumps.

Payment

201.09 Add the following:

Payment for Equipment hours for topsoil removal from stumps will be paid for under Item 62201-0350 Backhoe. Payment for Equipment hours for grubbing will be paid for under Item 62201-1300 Bulldozer and Item 62201-3150 Hydraulic Excavator with thumb attachment.

Section 202. – ADDITIONAL CLEARING AND GRUBBING**Description****202.01** Delete the first sentence and add the following:

This work also consists of leaving landscaping logs inside the construction limits along the forest edge for use as landscaping logs identified in Section 647, Roadside Development.

This work consists of clearing and grubbing as directed by the CO.

Construction Requirements**202.04 Selective Clearing.** Add the following:

In selected locations within the construction limits, stands of trees and shrubs or individual trees and shrubs must be left in place when, at the discretion of the CO, such stands or individuals do not interfere with grading or construction operations. Clear select trees as directed by the CO for placement on slopes or for site specific landscaping construction.

Adjust the clearing and grubbing limits, and adjust the slope stakes at the ends of cut slopes and embankments within the transition area to adequately provide for slope warping. The CO will approve final slopes.

Section 203. – REMOVAL OF STRUCTURES AND OBSTRUCTIONS**Description****203.01** Add the following:

This work also includes the removal of the existing Long Lake Outlet Bridge and all associated facilities in these locations.

Material**203.02** Add the following:

Shoring and bracing

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Construction Requirements**203.03 Salvaging Material.** Add the following:

Remove stone masonry from existing structures so as not to damage or mark the stone. Remove and handle stone masonry in accordance with Section 620.03.

Stockpile existing bridge rail at the NPS maintenance yard, located approximately 11.17 kilometers (6.9 miles) west of the project, as directed by the CO for use by the NPS.

Remove and salvage signs as designated on the plans and permanent sign summary and as directed by the CO for use by the FS.

203.04 Removing Material. Add the following:

Remove all structures completely from the stream channel at the conclusion of the construction and restore the area to a natural appearance.

Remove the Long Lake Outlet Bridge ½ at a time as the work progresses. Redirect the stream underneath the remaining structure to eliminate any falling materials from entering the water.

The existing bridge elements may have lead-based paint coating(s). Comply with the required Federal, State, and local regulations.

Add the following:

(a) Concrete Removal by Mechanical Impact Methods. Saw cut approximately 19 millimeter deep along all boundaries of repair areas.

Use power-driven hand tools to remove existing concrete with the following restrictions:

- (1) Do not use jack hammers heavier than 15 kilograms.
- (2) Do not operate jack hammers and mechanical chipping tools at an angle in excess of 45° from the surface of the slab.
- (3) Do not use chipping hammers heavier than nominal 7-kilogram class to remove concrete from beneath reinforcing bar.

Where the bond between existing concrete and reinforcing steel is destroyed, remove all concrete adjacent to the steel to provide at least 19 millimeter clearance for the new concrete to bond to the steel.

Use hand tools (hammers and chisels) to remove final particles of concrete or to achieve the required depth.

After removal of deteriorated and unsound concrete, sandblast all exposed structural steel, reinforcing steel, and concrete surfaces that will be in contact with repair material. Remove all rust and foreign material. Clean the sound concrete surface by flushing with a high-pressure water jet or oil-free compressed air.

(b) Reinforcing Steel. Do not cut or damage reinforcing steel designated to remain in place. Repair or replace all damaged or severely deteriorated bars.

Clean all exposed reinforcing steel that is to remain in place. Remove all rust and corrosive products, including oil, dirt, concrete fragments, laitance, loose scale, and other coatings that may destroy or inhibit the bond with new concrete.

If cleaned reinforcing steel will be exposed for more than 7 days, protect the steel from corrosion and contamination. If the steel becomes corroded or contaminated, clean the steel immediately before the concrete pour.

203.05 Disposing of Material.

(a) Remove from project. Add the following:

Secure environmental clearances according to Subsection 107.10.

(b) Burn. Add the following:

Burn material from clearing operations at Ghost Creek material source located 13.97 km west of the project as directed by the CO in cooperation with the Shoshone National Forest.

(c) Bury. Delete the text.

Measurement

203.07 Add the following:

Measurement for payment of the Removal of Pipe Culverts includes the pipe culvert, end sections, headwalls, and inlets.

Payment

203.08 Add the following:

Payment for the salvaging of the existing bridge masonry, including stockpiling, will be paid under Item 620, Stone Masonry.

Payment for the salvaging of the existing bridge rail will be paid under Item 55601-0900.

Section 204. – EXCAVATION AND EMBANKMENT**Description****204.02 Definitions.****(a) Excavation.** Add the following:**(4) Excavation and embankment.** Add the following:

Topsoil refers to the uppermost soil horizon, usually darker in color, in which the majority of roots grow. It is usually found in the top 50 to 450 mm. In areas where there is no darker layer, treat the top 50 to 100 mm as topsoil.

Material**204.03** Add the following:

Geotextile

714.01

Construction Requirements**204.04 Preparation for Roadway Excavation and Embankment Construction.** Add the following:

Place Geotextile Fabric Type II (A-C) separation material over wetland areas for protection. This operation is required in those areas where embankment may be temporarily placed on wetlands to complete the work.

Prior to beginning excavation operations, including topsoil removal, arrange for a pre-excavation conference. Coordinate attendance with the CO and all applicable subcontractors. Prepare to discuss the following:

- 1) Topsoil Handling Plan
- 2) Landscaping plans and details
- 3) Slope shaping and sculpting methods

- 4) Roadway obliteration details
- 5) Wetland Mitigation Plan

204.05 Conserved Topsoil. Delete the first sentence and substitute the following:

Prior to topsoil removal, present a topsoil removal and stockpile plan to the CO for approval. Stockpile topsoil in stockpile locations, as approved by the CO. Stockpiled topsoil will be no higher than 1.2 meters, except stockpiling of topsoil stripped at the Ghost Creek Material source may vary in height, as necessary for material processing requirements, as approved by the CO. Topsoil will be placed before winter, and will be placed on the finished slopes at locations near those from which it was removed.

Conserve topsoil from the roadway excavation and from embankment foundation areas to the extent and depth determined by the CO (as shown in the grading summary). Salvage topsoil within tree stumps to the extent possible.

Nonconventional methods will be required in the removal and stockpiling of topsoil in some areas. Use equipment capable of excavating small isolated pockets of topsoil. Do not compact or drive upon topsoil during removal. Do not mix topsoil with subsoils or with topsoils from other areas, as approved by the CO.

204.06 Roadway Excavation.

(b) Rock cuts. Add the following:

When blasting rock, use the controlled blasting methods according to Subsection 205.08(c). Preserve all depressions resulting from blasting operations which may serve as soil pockets as described on plan Special M626-9.

204.07 Subexcavation. Delete the third sentence and add the following:

Prevent unsuitable material from becoming mixed with the backfill, using separation geotextiles when directed by the CO or as defined in the plans for specific subexcavation locations. In wetland areas, utilize backfill that meets the requirements of Section 704.03 (c).

204.09 Preparing Foundation for Embankment Construction. Add the following:

(e) Embankments constructed on wetlands. Ensure that backfill placed in wetlands has similar permeability to adjacent soil and maintains the existing subsurface groundwater flows. Backfill that allows more subsurface flow than existing material on the site will not be accepted. Backfill that inhibits ground water flow to a greater extent than native soil also will not be accepted. Utilize backfill meeting the requirements of Section 704.03 (c). Utilize Geotextile Fabric Type II-(A) to maintain existing sub-surface flows.

204.13 Sloping, Shaping, and Finishing.

(a) Sloping. Add the following paragraph:

Leave all slopes with roughened surfaces as they are being constructed and according to landscape treatment details shown in the plans. Leave irregular pockets in boulder-laden slopes and rock slopes, as applicable, for deposition of topsoil and planting materials. Leave rock slopes with a natural form and appearance without scaling or drilling marks.

(1) Earth slopes. Adjust the material within the fill slopes to obtain varying and undulating contoured slope, rounding at the toe of fills, and to flatten selected slopes to blend with existing land forms or promote revegetation. Do not round slopes in wetlands.

Locate conserved landscaping boulders on slopes according to Section 251.

Locate conserved snags and trees on slopes according to Section 647.

(2) Rock slopes. Construct rock slopes to simulate surrounding rock outcrops. Consider aesthetics, safety, and constructability when determining methods to shape slopes. Refer to the Landscaping Details in the roadway plans for specific landscaping techniques. Proposed rock cut limits and the use of soil pockets are to be reviewed and approved by the CO on a site-specific basis. Leave rock slopes with a natural form and appearance without drilling marks. Round material overlaying solid rock to the extent practical. Pursuant to Sections 205 and 563, stain all newly exposed rock slope surfaces as directed by the CO. Preserve segments of large rock outcrops with jagged edge appearance and planting pockets suitable for placement of topsoil, seed, and plants. Locations of rock slopes are identified in the grading summary in the plans.

(c) Shaping. Delete the text and substitute the following:

Construct slopes generally to the staked slope ratios, but steepen and flatten slopes randomly and intermittently to simulate the irregularity of the existing terrain. Sculpt slopes to produce irregular ledges, shelves, and planting pockets suitable for placement of topsoil and vegetation by steepening the nominal slope ratio in staggered locations. Shaping opportunities will be identified by the CO as the work progresses

Leave boulders undisturbed that are firmly in place and protruding from the cut slopes. Some rock outcrops and boulders may be left in place to create natural pockets for vegetation.

204.14 Disposal of Unsuitable or Excess Material. Add the following:

Do not sell, donate, or otherwise remove materials from National Forest Lands without a permit from the U.S. Forest Service and the approval of the CO.

Secure environmental clearances according to Subsection 107.10.

Measurement**204.16****(a) Roadway Excavation.**

(1) Include the following volumes in roadway excavation:

(e) Delete the text and substitute the following:

Conserved topsoil stripped from cuts.

(h) Delete the text and substitute the following:

Conserved material taken from stockpiles and used in Section 204 work except topsoil measured under Section 624. Only materials required to be conserved by the CO are eligible for measurement under this item.

(2) Do not include the following in roadway excavation: Add the following:

(m) Conserved topsoil stripped from fills.

Add the following:

(g) Subexcavation. Measure subexcavation by the cubic meter in its original position.

Payment

204.17 Add the following:

Payment for Item 20401 is limited to ten percent of the plan quantity of excavation in the cut until the slope rounding in that cut is completed.

Payment for conserving topsoil operations will be considered subsidiary to Item 20401-0000, Roadway Excavation. Payment for equipment hours for sloping, shaping and finishing will be considered subsidiary to Item 20401-0000. Payment for the construction of fill slope terraces will be made under Item 62201-0350, Backhoe or Item 62201-3000, Hydraulic Excavator. Payment for the placement of geotextile will be made under Item 20701-0700, Earthwork Geotextile, Type II-A and Type II (A-C).

Section 205. – ROCK BLASTING**Description**

205.01 Delete the text of this Subsection and substitute the following:

The rock cuts for the Schedule A project on the Beartooth Highway are approximately 1.5 to 6.5m from Station 49+340 to 50+100 LT and 1.5 to 4 m from Station 49+960 to Station 50+530 RT. The techniques detailed in the specification were created for the more extensive rock cuts west of the project in the Beartooth Ravine but apply to this project. The Beartooth Highway project will require carefully planned and uniquely adapted blasting approaches to achieve engineered road cuts which are both structurally sound and aesthetically pleasing.

Obliterate all visible drill hole marks in newly exposed rock surfaces. Obtain approval of obliteration of the drill marks from the CO. Scale blasted area of loose rock and debris. Pick up and dispose of all blasting caps, lead wire, and other material associated with each blast. Treat newly exposed rock surfaces with rock stain, as described in Section 204 and 563.

Construct cut faces to have a natural, rather than artificial, appearance to the fullest extent practicable. Identify and use specific measures applicable to blasting that will enable the final cut faces to blend with the form, line, color and texture of the existing rock formations of the surrounding landscape. Controlled blasting will be required in order to utilize the existing geologic structure properly and to minimize back-break beyond the trim line.

Following are specific blasting objectives:

- (1) Minimize blast damage beyond the trim line. Blast damage is defined to include widening and loosening of existing joints or foliation, displacement of blocks of intact rock, and creation of new fractures.
- (2) Utilize the natural geologic bedding planes and joint structure in a predicted and controlled manner to form the final cut.
- (3) Blast and scale to the trim lines to produce stable faces such that the subsequent rock fall and associated maintenance costs are minimized.
- (4) Preserve or create sufficient irregularities in the rock faces to allow for pockets and ledges for special revegetation, as shown on the plans, prescribed in Section 204, or as directed by the CO. Accomplish the creation of ledges and a rough, natural appearance by incorporation of these features in the blast plan, and not by overshooting and selective removal of damaged rock.
- (5) Remove drill hole scars or machine scaling equipment scars in the final cut faces.
- (6) Prevent fly rock from landing in wetlands.
- (7) Prevent damage to the natural environment outside the clearing limits from fly rock, operation of equipment, or other construction related causes in accordance with Subsection 107.02.
- (8) Conduct all blasting, scaling, and cleanup work in accordance with Sections 108 and 156, ensuring traffic safety at all times.

Controlled blasting consists of the controlled use of explosives and blasting accessories in carefully spaced and aligned drill holes to produce specific free surfaces or shear planes in

the rock along the predetermined excavation backslope. Controlled blasting techniques include cushion blasting or variations of cushion blasting, as approved by the CO, but do not generally include pre-splitting. Pre-splitting may only be used for temporary excavations in rock that will eventually be covered or further excavated using cushion blasting techniques. The CO may require the use of controlled blasting to form the faces of slopes, even if the slopes could be formed by non-blasting methods. Use controlled blasting methods to minimize damage to the rock backslope to help insure long-term stability.

For cushion blasting, controlled blast holes are defined as the first row of drill holes (normally within 0.6 m of the plane forming the final cut face), as shown on the approved blasting plan.

Production blasting consists of the main fragmentation blasting resulting from more widely spaced production holes drilled through the main excavation area. Detonate production holes in a controlled delay sequence. Use production blasting methods which prevent escape of material beyond the construction limits shown on the plans and in accordance with Subsection 107.02.

Construction Requirements

205.03 Regulations.

(b) Storage, security, and accountability. Delete the subsection and substitute the following:

Bureau of Alcohol, Tobacco, and Firearms (BATF), 27 CFR Part 555, Commerce in Explosives.

205.05 Blasting Plans.

(a) General blasting plan. Add the following:

(6) Methods for and locations of explosive storage.

(7) Methods to be employed for traffic control and other public safety precautions in the use, storage, and transportation of explosives.

(8) General methods and approach to blasting which account for the full range of geologic settings and physical conditions present on the project. Describe how the specific blasting plans will account for various cut geometries, rock types, access problems, categories of fracturing and jointing, and required face contours.

(9) Equipment intended to be used in support of blasting operations.

(10) Method of containment to prevent rock material from escaping the construction limits, and contingency measures for unanticipated rock fall.

Do not deliver explosives to the project until the General Blasting Plan is accepted.

(b) Site-specific blasting plans. Add the following:

Comply with Special M 626-9, Landscaping Details. Limit the volume of individual blasts to that which can be contained within the construction limits. Comply with Subsection 204.06(a) of these special contract requirements.

- (5) Specific fly rock control measure.
- (6) Estimated quantities of volume of rock in-place and length of both production and controlled blast drill hole.
- (7) Location and attitude of significant fracturing, rock type changes, faulting, and any special circumstances to be accounted for in the plan.

The CO may require modifications of any blasting plans over the duration of the project. Obtain approval by the CO for any modifications in the blasting plans, including changes in drilling pattern or depth, loading, or initiation occasioned by the review of the drilling behavior or subsequent blasting performance.

205.07 Test Blasting. Delete the last paragraph and substitute the following:

Do not drill ahead of the test shot area until the test section has been excavated and results evaluated by the CO. If test blasting results are unsatisfactory, in the opinion of the CO, adopt such revised methods as are necessary to achieve the required results. A test blast is unacceptable when it results in fragmentation beyond the final rock face, fly rock, overbreak, damage to the final rock face, or overhang. All costs incurred by the Contractor in adopting revised blasting methods necessary to produce an acceptable test shot are considered as a subsidiary obligation to the work.

If at any time during the progress of the work the methods of drilling and blasting do not produce the desired slope and rock face, conduct additional test blasting until a suitable drilling and blasting method is determined. Extra cost resulting from this requirement is considered as a subsidiary obligation to the work.

205.08 Blasting.

(a) General. Add the following after the fourth paragraph:

Blast during daylight hours and in accordance with Section 108. Do not leave loaded holes overnight. Plan daytime blasting schedules, quantities, and clearance times in accordance with maintenance of traffic requirements described in Section 108 and 156.

Add the following after the seventh paragraph:

Preserve existing rock outcrops outside the clear zone and within construction limits to vary cut face slope, composition, color, and texture. Undulate or roughen cut face slopes to match adjacent rock outcrops and landforms. Manipulate blasting patterns to create rock surfaces,

terraces, and ridges similar to undisturbed rock faces and outcrops. Shape cut faces to blend with adjacent undisturbed rock faces. Create soil pockets within the terraces and ridges of cut faces to accommodate and promote revegetation. Locate, size, and shape the soil pockets to replicate the planting areas of undisturbed rock faces.

205.09 After Blast Reports. Add the following:

(b) Blasting logs that include the following:

(3) Name of the blasting foreman and the date and time of the blast.

After mucking operations for each blast, measure the excavated slopes to determine overbreak quantities. Measurement may be done after each individual blast or after a series of blasts in the cut, as requested by the CO. Incorporate these quantities as part of the final blasting report.

The blasting plan submittal and blasting report are for quality control and record keeping purposes. Review of blast design and techniques by the CO do not relieve the Contractor of responsibility for adequacy, safety, proper supervision, and compliance with these SCRs, when implemented in the field.

Section 207. – EARTHWORK GEOTEXTILES

Measurement

207.07 Delete the text of this subsection and substitute the following:

207.07 Measure the Section 207 items listed in the bid schedule according to Subsection 109.02.

Section 208. – STRUCTURE EXCAVATION AND BACKFILL FOR SELECTED MAJOR STRUCTURES

Construction Requirements

208.04 General. Delete the second sentence of the fourth paragraph and replace with the following:

Remove shoring and bracing to at least 0.5 meter below the surface of the finished ground. Provide weep holes to allow for drainage when shoring and bracing are allowed to remain in place.

Measurement

208.13 Delete the text of this Subsection and substitute the following:

Measure the Section 208 items listed in the bid schedule according to Subsection 109.02 and the following:

Measure structural excavation and backfill by the cubic meter in its original position. Determine the limit as shown on the plans. Do not include the following volumes in structure excavations:

- (a) Material excavated beyond the limits as shown on the plans.
- (b) Any material included within the staked limits of the excavation, such as contiguous channel changes and ditches, for which measurement is covered under other sections;
- (c) Water or other liquid material;
- (d) Material excavated before measurements of the original ground; or
- (e) Material re-handled, except when the contract specifically requires excavation after embankment placement.

Section 209. – STRUCTURE EXCAVATION AND BACKFILL

209.12 Acceptance. Add the following:

Structural excavation (walls) work will be evaluated under Subsections 106.02 and 106.04.

Measurement and Payment

209.13 Add the following:

Do not measure structural excavation (walls) for payment.

Section 211. – ROADWAY OBLITERATION

Description

211.01 Add the following:

Adjust slopes in the horizontal and vertical planes to blend into existing, adjacent natural ground.

(a) **Method 1.** Add the following:

Excavate existing pavement surface, base and subbase material to 75 mm below the surface of original ground contours or as identified in the cross sections and the wetland mitigation plans. Also, refer to detail M211-A in the plans for roadway obliteration details. Place topsoil to

approximate original ground contours. Remove and dispose of the existing pavement surface material as approved by the CO.

Measurement

211.05 Add the following:

Do not measure areas within slope stake limits under roadway obliteration.

Measure material excavated from an obliterated roadway and used for new construction or in separate obliteration locations under Section 204.

Section 251. – RIPRAP

Description

251.01 Add the following:

This work also consists of furnishing and placing landscape boulders and riprap within the project, as shown in the plans and as directed by the CO.

Material

251.02 Add the following:

Select Granular Backfill

704.10

Construction Requirements

251.04 **Placed Riprap.** Add the following:

Furnish materials and incidentals necessary to install riprap mixed with topsoil. Provide topsoil, to be mixed with riprap, conforming to the requirements as described below. Install riprap mixed with topsoil at riprap rundowns or as directed by the CO.

Place riprap with topsoil so that a uniform mixture of soil and riprap is achieved that eliminates voids. Mix 25 to 35% topsoil, by volume, with stockpiled riprap, then place the mixture in a layer of approximate 150 mm thickness. Consolidate by large vibratory equipment or backhoe bucket to create a tight, dense interlocking mass. Wet the topsoil, as necessary, to encourage void filling. Fill any large voids with rock and small voids with topsoil. Place the top layer in a similar manner, but such that the top surface of the rocks is largely the size of the 150 mm and a smooth plane is created. Cover the top surface with 75 mm of topsoil.

(a) Landscape boulders. Comply with Miscellaneous Details, Specials M626-8 and 9, and Landscape Plan 6 in the plans for the placement of boulders. During roadway excavation leave boulders exposed that are unearthed during construction on slopes, as directed by the CO. Limit damage to boulders from equipment, and place boulders to hide equipment handling marks and with lichen or weathered surface facing up.

(b) Parking Area Boulders. Select landscape boulders that vary in size from 0.1 m³ (0.5m cubed) to 3.4m³ (1.5m cubed) unless a specific size is shown in the plans. Install boulders in the locations and approximate sizes requested by the CO.

(c) Riprap Class 4. Comply with Specials M251-A in the plans for riprap Class 4 placed at the Long Lake Outlet Bridge. Place 1 – 1.5 m boulders interspersed in riprap revetment. Boulders are to make-up 20% of total rock volume.

Table 251-1 Sampling and Testing Requirements. Delete reference to the material type Mortar and substitute the material type Grout in the first column.

Measurement

251.08 Add the following:

Measure Landscape boulders by the each. Do not measure boulders less than 1 m³ for payment.

Do not measure boulders for riprap Class 4. This material will be subsidiary to Item 25101-4000, Placed Riprap, Class 4 and Item 25101-4000 Placed Riprap, Class 4 (with soil).

Section 252. – SPECIAL ROCK EMBANKMENT AND ROCK BUTTRESS

Delete the text of this section and substitute the following:

Section 252. – ROCKERY, SPECIAL ROCK EMBANKMENT, AND ROCK BUTTRESS

Description

252.01 This work consists of constructing rockeries at the locations and to the dimensions shown on the plans. Rockeries are formed of interlocking, dry-stacked rocks without reinforcing steel, mortar, or concrete. Rockeries may be constructed as either single structures or in tiers.

Special rock embankment work consists of furnishing and placing hand-placed or mechanically-placed rock in fill sections. Rock buttress work consists of furnishing and placing hand-placed or mechanically-placed rock in cut sections.

Special rock embankments and rock buttresses are designated as hand-placed or mechanically-placed.

Material

252.02 Conform to the following Subsections:

Granular rock backdrain	703.03(c)
Foundation fill	704.01
Rock for special rock embankment	705.04
Rock for buttresses	705.05
Rock for rockeries	705.07
Plastic pipe	706.08(d) and (e)
Geotextile	714.01

Construction Requirements

252.03 Rockery.

(a) Qualifications. Prior to the start of rockery construction, submit the following:

- (1) References citing satisfactory completion of at least three (3) rockeries of similar height and face area. Include photographs of completed rockeries.
- (2) A summary of the experience of the primary equipment operator responsible for placement of base, facing, and cap rocks.

(b) General. Survey the rockery according to Section 152 and verify the limits of the rockery installation. Prepare and submit installation drawings according to Subsection 104.03.

The following definitions apply to rockery construction:

- (1) **Base Rock:** The base rock is the lowermost rock in the rockery, and bears directly on the foundation fill.
- (2) **Rock Face:** The rock face comprises the bulk of the rockery and rocks used in the face are stacked above the base rock.
- (3) **Cap Rock:** The cap rock is the uppermost rock in the rockery section and “caps” the rockery.

(c) Rockery Foundation Excavation. Perform the work under Section 209. Excavate a foundation trench at least 300 millimeters below the bottom of the rockery, running the full length of the proposed rockery. Deeper embedment may be required where a toe slope is present or where a leveling pad is specified. Excavate the foundation to a minimum width equal to the specified base rock width, B (see Rockery Design Table in plans), plus 300 millimeters to include the granular rock backdrain behind the rockery. Conform to the following:

(1) Excavate the foundation in sections such that the rockery can be constructed in one shift or one day's work, unless shoring is provided for the purpose to support the excavation.

(2) Exercise care during excavation of the back cut (temporary cut slope).

(d) Rockery Erection. Place the first course of rock (base rock) on compacted foundation fill. Compact the foundation fill according to Subsection 209.08. As the rockery is constructed, place the rocks so that there are no continuous joints in either the vertical or lateral direction.

Avoid placing rocks which have shapes that create voids with a linear dimension greater than 300 millimeters.

Except in isolated cases, place each rock so that it bears on at least two rocks below it. Locate at least one bearing point a distance no greater than 150 millimeters from the average face of the rockery.

The allowable tolerance for base rock widths is 150 millimeters; however, do not place two or more consecutive base rocks with a width less than specified on the plans.

Slope the top surface of each rock towards the back of the rockery at an inclination of at least five (5) percent.

Construct the exposed face of the rockery with a face batter of 1H:4V.

The minimum rockery thickness is based on minimum base rock width, as specified on the plans, and allowable face batter.

Securely place rocks so that they are unable to be moved with a pry bar after the rockery is complete.

(e) Voids. Where voids with a linear measurement of 150 millimeters or greater, in any dimension, exist in the face of the rockery, chink the voids with smaller rock.

(1) If there is no rock contact within the rockery thickness, chink the void with a smaller piece of rock.

(2) Chinking rocks do not provide primary structural support for the overlying rock.

(3) Grout chinking rocks that are able to be moved or removed by hand. Do not allow grout to be readily visible from the face of rockery.

(f) Rockery Drainage. Install the granular rock backdrain between the rockery and the back cut face being supported. The granular rock backdrain layer is at least 300 millimeters thick, measured horizontally from the back of the base rock to the face of the back cut. Place granular rock backdrain concurrent with rockery so that at no time is either more than 600 millimeters higher than the other.

- (1) Separate the granular rock backdrain from the back cut by non-woven geotextile. Overlap the non-woven geotextile at least 300 millimeters at all seams.
- (2) Place a 100 millimeter diameter perforated drain pipe as shown in the plans. Surround the pipe on all sides by at least 100 millimeters of granular rock backdrain material.
- (3) Connect the perforated drain pipe to a non-perforated collector pipe at a spacing not to exceed 30 meters center-to-center. Connect the collector pipe to a controlled drain outlet, such as a storm drain, or outlet to a slope.
- (4) Do not connect collector pipes to systems designed for storm water retention in accordance with Best Management Practices design unless approved by the CO.
- (5) Cap the granular rock backdrain with at least 300 millimeters of native, relatively impermeable soil. Place non-woven geotextile between the native, relatively impermeable soil and the granular rock backdrain.

252.04 Special Rock Embankment and Rock Buttress Construction. Perform the work under Section 204 or 209 as required.

Place the rock in a stable orientation with minimal voids. Offset the rock to produce a random pattern. Use spalls smaller than the minimum rock size to chock the larger rock solidly in position and to fill voids between the large rock.

Construct the exposed face of the rock mass reasonably uniform with no projections beyond the line of the slope that are more than 300 millimeters for mechanically-placed rock or 150 millimeters for hand - placed rock.

252.05 Acceptance. Rock for rockery, special rock embankment, and rock buttress will be evaluated under Subsection 106.02.

Construction of rockery, special rock embankment, and rock buttress will be evaluated under Subsections 106.02 and 106.04.

Geotextile will be evaluated under Section 207.

Structure excavation and backfill will be evaluated under Section 209.

Measurement

252.06 Measure Section 252 items listed in the bid schedule according to Subsection 109.02 and the following as applicable.

Measure special rock embankment and rock buttress by the cubic meter in place.

Payment

252.07 The accepted quantities, measured as provided above, will be paid at the contract price per unit of measurement for the pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Section 305. – AGGREGATE-TOPSOIL COURSE

Material

305.02 Delete the requirement for aggregate and substitute the following:

Aggregate

703.05

305.04 Mixing, Placing, and Compacting. Delete the text of this Subsection and substitute the following:

Mix topsoil with aggregate on the road foreslopes in place. Place 25 mm of salvaged topsoil over aggregate. Mix topsoil into the upper 25 mm of the aggregate using a rake, harrow, or other equipment. Mixing with power equipment is an acceptable method of application. Remove all equipment tracks. Seed with seed mixes shown in the revegetation plans

Section 308. – MINOR CRUSHED AGGREGATE

Construction Requirements

308.06 Acceptance Delete the second paragraph and substitute the following:

Construction of roadway aggregate courses will be evaluated under Subsections 106.02 and 106.04. Method 2 compaction will be evaluated under Section 106.04. Sample material from the windrow or roadbed after processing but prior to compaction at the frequency shown in Table 308-1. Submit samples to the CO for verification. Materials that do not meet the approved certification will be considered unacceptable.

Delete Table 308-1 and substitute the following:

Table 308-1
Sampling and Testing Requirements

Material or Product	Type of Acceptance (Subsection)	Property or Characteristic	Test Methods or Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
Crushed aggregate ⁽¹⁾	Measured and tested for conformance (106.04)	Moisture-Density	AASHTO T180 Method D ⁽³⁾	1 for each aggregate supplied.	Production output or stockpile.	---	Before using in work
		Gradation ⁽²⁾	AASHTO T11 and T27	1 for each 1000 t.	From the windrow or roadbed after processing.	---	Before placing next layer
		In-place density and moisture content	AASHTO T310 or other approved procedures	1 for each 1000 t.	In-place completed compaction layer.	---	Before placing next layer

⁽¹⁾ Sampling and testing required for roadway aggregate.

⁽²⁾ Use only sieves indicated for the specified gradation.

⁽³⁾ Minimum of 5 points per proctor.

Delete Section 401 and substitute the following:

Section 401. – SUPERPAVE ASPHALT CONCRETE PAVEMENT

Description

401.01 This work consists of constructing one or more courses of asphalt concrete pavement using hot or warm mix asphalt (HMA or WMA).

The mix design method is designated as Superpave. Superpave HMA and WMA asphalt concrete pavement nominal maximum size aggregate size is designated as shown in Tables 401-1. Equivalent single axle loads (ESAL) or number of gyrations at design (N_{Design}) is designated as shown in Tables 401-1.

Aggregate grading is designated as shown in Table 703-4.

A minimum of one percent lime is required in the asphalt concrete mixture.

Pavement roughness is type III as shown in Subsection 401.16.

Asphalt binder grade is PG 64-28. The Pressure Aging Vessel test temperature shall be 100°C.

401.02 Conform to the following Subsections:

Material

Aggregate	703.07
Antistrip additive	702.08
Asphalt binder	702.01
Mineral filler	725.05
Recycled asphalt pavement	703.19

Construction Requirements

401.03 Composition of Mix (Job-Mix Formula). Furnish mixes of aggregate, asphalt binder, recycled asphalt pavement (RAP), and additives that meet the applicable material requirements and the appropriate design parameters in Table 401-1 and are capable of being placed and compacted as specified.

Compact specimens with the gyratory effort corresponding to the design ESAL level of 0.3 to <3 million. Volumetric mix properties will be determined at N_{design} according to AASHTO T 312 and R 35. Use a gyratory compactor which meets the internal angle requirement according to AASHTO T 312.

If more than 1.0 percent hydrated lime is proposed in the JMF provide AASHTO T 283 tests results showing the additional lime is necessary to meet the minimum tensile strength ratio requirements in Table 401-1.

Apply all mix design requirements for HMA to the development of the WMA mix design. Submit modifications to the WMA technology according to the WMA Appendix of AASHTO R 35 for approval by the CO.

Table 401-1
Superpave Asphalt Concrete Pavement Design Requirements, AASHTO R 35

Design ESAL (Million)	Gyratory Compaction Level (% Theoretical Maximum Specific Gravity, G_{mm}) AASHTO T 312 ⁽⁶⁾			Minimum Voids-in-the Mineral Aggregate (VMA), % ⁽¹⁾				Voids Filled with Asphalt (VFA), % ⁽³⁾	Minimum Hveem Stabilometer value	Dust- to- Binder Ratio ⁽⁴⁾	Minimum Tensile Strength Ratio, AASHTO T 283 ⁽⁵⁾
	Nominal Maximum Size Aggregate ⁽²⁾			25 mm	19.0 mm	12.5 mm	9.5 mm				
	$N_{initial}$	N_{design}	N_{max}								
< 0.3	6 ($\leq 91.5\%$)	50 (96.0%)	75 ($\leq 98.0\%$)	12.0	13.0	14.0	15.0	70.0 - 80.0	30	0.8 -1.6	0.80
0.3 to 3	7 ($\leq 90.5\%$)	75 (96.0%)	115 ($\leq 98.0\%$)					65.0 - 78.0			
3 to 30	8 ($\leq 89.0\%$)	100 (96.0%)	160 ($\leq 98.0\%$)					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⁾ For 25 millimeters nominal maximum size aggregate mixtures with <0.3 million ESALs, provide a VFA ≥ 67.0 percent.

⁽⁴⁾ Dust to binder ratio is the effective asphalt content divided by the total percent of material passing the 75 μm sieve. Dust includes lime, bag house fines, and other mineral matter.

⁽⁵⁾ Specimens shall be 100 millimeters in diameter. Note that AASHTO T 283 requires a freeze-thaw cycle.

⁽⁶⁾ Use AASHTO T 166 regardless of the volume of water absorbed.

(a) Recycled asphalt pavement use. Up to 20 percent RAP material by mass may be used in the job-mix formula (JMF).

(b) Baghouse fines. If used, document how baghouse fines are reintroduced and measured. Submit target values for the percent of baghouse fines reintroduced to the JMF if they are a separate stockpile.

(c) Submission. Submit written JMFs and all associated material with Form FHWA 1641 for verification at least 30 days before control strip and production. Include the location of all commercial mixing plants to be used and a separate JMF for each plant. Include a signed statement prepared by the testing laboratory that certifies the proposed JMF meets the requirements of the contract and can be compacted in the field during production to meet contract requirements. For each JMF, submit the following:

(1) Aggregate and mineral filler.

(a) Target values:

(1) Target value for percent passing each specified sieve size for the aggregate blend.

(2) Designate target values within the gradation band specified for the nominal maximum size aggregate grading shown in Table 703-12.

(b) Source and percentage of each stockpile to be used.

(c) Average gradation of each stockpile from process control tests.

(d) Representative samples from each stockpile. Use split samples of material taken at the same time samples are taken for testing by the Contractor's laboratory.

(1) 300 kilograms of aggregates proportioned by each stockpile according to the JMF.

(2) 5 kilograms of mineral filler if proposed for JMF.

(e) Results of aggregate quality tests performed within one year of the submittal date. For aggregate quality tests, see Subsection 703.07.

(2) Asphalt binder.

(a) Target asphalt binder content by total weight of mixture.

(b) Five 4-liter cans of the asphalt binder to be used in the mix.

(c) Test results from the manufacturer meeting AASHTO M 320 for the asphalt binder including a temperature-viscosity curve. Provide the laboratory mixing and compaction temperatures and maximum plant mixing temperature.

(d) Material safety data sheets.

(3) Antistrip additives. If part of the JMF:

(a) One kilogram of lime anti-strip additive.

- (b) Name of product.
- (c) Manufacturer.
- (d) Dosage rate.
- (e) Material safety data sheet.

(4) Recycled asphalt pavement material. If part of the JMF, submit:

- (a) Optional sheet for RAP on Form FHWA 1641.
- (b) Source and percentage of RAP material.
- (c) 50-kilogram representative sample of each RAP stockpile.

(5) Warm mix technology and additive information.

- (a) Four liter sample of WMA additive and methodology for incorporating into mix design process.
- (b) WMA manufacturer's recommendations for usage and established target rate for the additive.
- (c) Documentation of at least three successful past WMA technology field applications including project type, project owner, tonnage placed, mix design, mixture volumetrics, performance, and locations of the asphalt plants.
- (d) Temperature range for laboratory mixing and compacting.
- (e) Asphalt binder performance grade test data for WMA additive percentage proposed for use, if applicable.
- (f) Compatibility of WMA additive with asphalt binder and anti-stripping agent.
- (g) Temperature range for field mix production, delivery, lay-down and compaction.

(d) Verification. The verification process will start when all required documentation and materials have been received. The CO will review and may perform design verification testing. If verification testing is performed, the information supplied in the Contractor's design must agree with the verification test results within the tolerances shown below. Once the JMF is verified for use, mix production for the control strip can begin.

(1) Aggregate gradations. Representative aggregate and RAP samples from each stockpile are combined according to the Contractor's recommendation for stockpile percentages. The Contractor's combined gradation results are verified if the CO's results for each sieve are within the Contractor's target values plus or minus the following tolerances:

Sieve Size	Tolerance, % (\pm)
25 mm	3.0
19 mm	3.0
12.5 mm	3.0
9.5 mm	3.0
4.75 mm	3.0
2.36 mm	3.0
600 μ m	2.0
300 μ m	2.0
75 μ m	1.0

(2) RAP asphalt binder content and gradation. The Contractor's RAP asphalt binder content results are verified if the CO's result for each stockpile is within ± 0.75 percent by total mass using AASHTO T 308. Submit the RAP dry gradation, burned gradation, asphalt content, and specific gravity information as shown on the RAP data sheet of FHWA Form 1641.

(3) Bulk specific gravity of aggregate (G_{sb}). The Contractor's coarse and fine G_{sb} is verified if the CO's results are within 0.038 for AASHTO T 85 and 0.066 for AASHTO T 84.

(4) Voids in the mineral aggregate (VMA). The Contractor's VMA result is verified if the CO's result is above the minimum specification limit in Table 401-1.

(5) Voids filled with asphalt (VFA). The Contractor's VFA result is verified if the CO's result is within the specification limit in Table 401-1.

(6) Hveem stabilometer value. The Contractor's Hveem stabilometer value is verified if the CO's result is above the minimum specification of 30.

(7) Air voids (V_a). The Contractor's V_a result is verified if the CO's result at the same design asphalt binder content is between 3.0 and 5.0 percent.

(8) Tensile strength ratio (TSR). The Contractor's TSR result is verified if the CO's result is above 0.80.

(e) Changes and resubmissions. If a JMF is rejected or any source of material is changed, submit a new JMF for verification. Up to 30 days may be required to evaluate a change after receipt of all required documentation and material. Approved changes in target values will not be applied retroactively for payment.

The CO will deduct all JMF evaluation costs resulting from the following:

- (1) Contractor-requested changes to the approved JMF.
- (2) Contractor requests for more than one JMF evaluation.
- (3) Additional testing necessary due to the failure of a submitted JMF.

401.04 Mixing Plant. Use mixing plants conforming to AASHTO M 156.

(a) 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 3 stockpiles with different gradations.

(b) Batch plants.

(1) 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 pavement material to produce a mix of uniform temperature within the range specified in the approved JMF.

(c) WMA plant modifications.

(1) Modify the mixing plant as required by the manufacturer to introduce the WMA technology. Interlock the WMA additive delivery system with the automated proportioning system.

(2) Comply with manufacturer's recommendations for incorporating additives and WMA technologies into the mix. Comply with manufacturer's recommendations regarding delivery and storage of additives.

(3) Modify the plant burner and drum flights to operate at lower production temperatures.

401.05 Equipment.

(a) Pavers. Furnish 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 concrete mix in widths at least 300

millimeters 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 smooth finished surface without segregating, tearing, shoving, or gouging the mat.
- (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.

(b) Materials Transfer Vehicle (MTV). Use an MTV with storage and remixing capabilities on all mainline construction when placing asphalt concrete mixtures. The MTV will independently remix and deliver mixture from the hauling equipment to the paving equipment.

Furnish an MTV with the following capabilities:

- (1) An unloading system to receive mixtures from the hauling equipment.
- (2) A minimum storage capacity of 11.8 tonnes with a remixing system in the MTV storage bin.
- (3) A discharge conveyor to deliver the mixture to the paver hopper.
- (4) The MTV system cannot exceed maximum legal loadings on structures.

Acceptable Material Transfer Vehicles are:

- (5) Barber Greene MTV-3500
- (6) Roadtec SB-1500
- (7) Roadtec SB-2500

Pick-up machines, hopper inserts, and material transfer devices are not considered MTVs.

In the event the MTV malfunctions during paving operations, the Contractor must suspend paving, however mix in transit and stored in the silo at the time of breakdown may be placed without the use of an MTV. Do not resume mix placement until the MTV is operational.

401.06 Surface Preparation. Clean the existing surface of all loose material, dirt, or other deleterious substances by approved methods, as applicable. Apply an asphalt tack coat to contact surfaces of pavements, curbs, gutters, manholes, and other structures according to Section 412.

401.07 Weather Limitations. Place asphalt mix on a dry, unfrozen surface when the air temperature in the shade is above 2 °C and rising. For HMA placement temperature, conform to Table 401-2.

Table 401-2
Minimum Asphalt Concrete Mix Placement Temperatures

Compacted Lift Thickness	< 50 mm	50 – 75 mm	> 75 mm
Road Surface Temperature °C	Minimum Lay Down Temperature °C ⁽¹⁾		
< 2	(2)	(2)	(2)
2 – 3.9	(2)	(2)	138
4 – 9.9	(2)	141	135
10 – 14.9	146	138	132
15 – 19.9	141	135	129
20 – 24.9	138	132	129
25 – 29.9	132	129	127
≥ 30	129	127	124

⁽¹⁾ Never heat the asphalt concrete mix above the temperature specified in the approved mix design.

⁽²⁾ Paving not allowed.

401.08 Asphalt Preparation. Uniformly heat the asphalt binder to provide a continuous supply of the heated asphalt binder from storage to the mixer. Do not heat asphalt binder above 185° C.

401.09 Aggregate Preparation. 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.

For batch plants, heat, dry, and deliver aggregate for pugmill mixing at a temperature sufficient to produce a mix temperature within the approved range. Adjust flames used for drying and heating to prevent damage to and contamination of the aggregate. Additional plant adjustments may be required to provide dry aggregate at the reduced mixing temperatures of WMA.

Control plant operations so the moisture content of the mix behind the paver is 0.5 percent or less according to AASHTO T 329.

Before starting mix production, obtain approval of synchronized metering and weighing devices used to introduce a constant rate of lime and water.

Add lime to the aggregate by one of the following methods:

(a) Method A. Add lime to the combined cold feed aggregate using an enclosed in-line cold feed mechanical pugmill mixer. Use a twin-shaft, continuous mixing pugmill with adjustable mixing paddles. Adjust the retention time of the mixture in the pugmill so no unmixed lime is visible after the lime and aggregate exit the pugmill.

(b) Method B. Add lime to the produced aggregates during stockpiling using a pugmill. Distribute the lime per the stockpile ratios stated in the mix design.

A minimum moisture content of two percent by dry weight for coarse aggregate and four 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.

(c) 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.

401.10 Mixing. Measure the aggregate and asphalt into the mixer according to the JMF. Mix until all the particles are completely and uniformly coated with asphalt according to AASHTO M 156. Maintain the discharge temperature according to the JMF.

401.11 Hauling. Use vehicles with tight, clean, and smooth metal beds for hauling asphalt concrete mixes.

Coat the beds with an approved material 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. Drain the bed before loading.

Equip each truck with a canvas cover or other suitable material of sufficient size to protect the mix from the weather. When necessary to maintain temperature, use insulated truck beds and securely fastened covers. Provide access ports or holes for checking temperature of asphalt concrete mix in the truck.

401.12 Production Start-Up Procedures.

(a) Pre-paving conference. At least three days before the start of paving operations, arrange for a pre-paving conference. Coordinate attendance with CO and all applicable subcontractors. Submit and prepare to discuss the following:

- (1) Proposed schedule of paving operations.

- (2) List of all equipment (excavation, compaction, laydown, haul, pugmill, etc.), and personnel used in the production and construction of the work.
- (3) Proposed traffic control plan for paving operations including provisions for pavement drop-offs and moving operations.
- (4) Contractor quality control plan for paving and sampling and testing according to Sections 153 and 154.
- (5) Procedures for constructing the control strip including placing, finishing, compacting, and smoothness procedures.
- (6) Acceptance procedures according to Subsections 106.05 and 401.17.
- (7) Asphalt binder and aggregate correction factors according to AASHTO T 308 and AASHTO T 30 on FHWA Form 1640 for each JMF. If RAP is used, provide the asphalt binder and aggregate correction factors according to FLH T 308 Addendum and AASHTO T 30 on FHWA Form 1648 for each JMF.
- (8) Calibration certification for the gyratory compactor.

(b) Control strip. Provide seven days notice before beginning production of an asphalt concrete mix.

On the first day of production, produce sufficient mix to construct a 300-meter long control strip, one-lane wide, and at the designated lift thickness. Construct the control strip on the project at an approved location.

Construct the control strip using mix production, construction equipment, and compaction procedures intended for the entire mix. Cease production after construction of the control strip until the asphalt concrete mix and the control strip are evaluated and accepted.

- (1) **Mixture.** Take and test at least three control strip asphalt concrete mix samples and evaluate according to Subsection 401.17.
- (2) **Compaction.** Take nuclear density readings behind each roller pass to determine the roller pattern necessary to achieve required density.

At a minimum of five locations within the control strip, take nuclear gauge readings, and cut and test core samples according to Subsection 401.17. Furnish the CO with the nuclear gauge readings, core densities, and nuclear gauge correlation using FHWA Form 1646 at completion of control strip.

The control strip mix is acceptable if the Contractor's test results for asphalt content, VMA, VFA, gradation and core density produce a calculated pay factor of 0.90 or greater and the Contractor's testing is verified by the Government.

Repeat the control strip process until an acceptable control strip is produced. See Subsection 106.01 for the disposition of material in unacceptable control strips. Accepted control strips may remain in place and will be accepted and measured as a part of the completed pavement. Tests used for the control strip will not be included in the evaluation for payment according to Subsection 106.05. When a control strip is verified and accepted, full production may begin.

Use these start-up procedures when producing material from a different plant or when resuming production after a termination of production due to unsatisfactory quality according to Subsection 106.05.

401.13 Placing and Finishing. Do not use mixes produced from different plants unless the mixes are produced according to the same JMF, use material from the same sources, and are approved. Construct control strips according to Subsection 401.12 for each plant from which production is intended.

Place mix at a temperature conforming to Table 401-2. Measure temperature of the mix in the hauling vehicle just before dumping into spreader or measure it in the windrow immediately before pickup.

Place the asphalt concrete mix with a paver conforming to Subsection 401.05. Control horizontal alignment using a reference line. Automatically control the grade and slope from reference lines, a ski and slope control device, or dual skis. Use skis having a minimum length of 6 meters.

In areas where mechanical spreading and finishing is impractical, place and finish the mix with alternate equipment to produce a uniform surface closely matching the surface obtained when using a mechanical paver.

Offset the longitudinal joint of one layer at least 150 millimeters from the joint in the layer immediately below. Make the longitudinal joint in the top layer along the striped centerline of two-lane roadways or at the lane lines of roadways with more than two lanes.

The CO will designate the JMF to be used for wedge and leveling courses at each location. Place wedge and leveling courses in maximum 75 millimeter lifts. Complete the wedge and leveling before starting normal paving operations.

For simple curve widening locations (widening only on one side) shift the centerline joint location such that the final layer is midway between the normal edge of shoulders. The shift from the staked centerline will be towards the widened lane one-half the total curve widening specified for the given station as shown in the plans.

401.14 Compacting. Furnish at least three rollers. Furnish one roller each for breakdown, intermediate, and finish rolling. At least one roller will be pneumatic-tired. Size the rollers to achieve the required results. Operate rollers according to the recommendation of the manufacturer. Diesel fuel will not be used as a release agent with any roller used to compact the asphalt mix. Do not cause cracking, shoving, or undue displacement. Continue rolling until all

roller marks are eliminated, all cracks are sealed, and the required density is obtained. For HMA, do not roll the mix after the surface cools below 80 °C.

Monitor the compaction process with nuclear density gauges calibrated to the control strip core density test results. Cut 150 millimeter diameter core samples from the compacted pavement. Fill and compact the core holes with asphalt concrete mixture. Label the cores and protect them from damage due to handling or temperature during storage.

Along forms, curbs, headers, walls, and other places not accessible to the rollers, compact the mix with alternate equipment to obtain the required compaction.

401.15 Joints, Trimming Edges, and Cleanup. Complete pavement construction of adjacent traffic lanes to the same elevation within 24 hours. If elevation differences exceeding 50 millimeters between adjacent lanes are left overnight, sign with "*Uneven Lanes*" warning signs and provide a 1V:3H fillet.

At connections to existing pavements and previously placed lifts, make the transverse joints vertical to the depth of the new pavement. Form transverse joints by cutting back the previous run to expose the full-depth course.

To both transverse and longitudinal joints, apply an asphalt tack coat to the joint edge according to Section 412.

Place the asphalt concrete mix as continuously as possible. Do not pass rollers over any unprotected edge of a freshly laid mix.

Dispose of material trimmed from the edges and any other discarded asphalt concrete mix according to Subsection 211.02(a)(2).

401.16 Pavement Roughness. 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 (e) below.

(a) Profile Measurement.

Equipment. Provide an ASTM E 950, class 1, inertial profiling system meeting all the requirements and specifications found in AASHTO M 328 and certified in accordance with AASHTO R 56. At least 21 days before profiling begins, provide copies of the system certification(s). Display a current decal on the equipment indicating the expiration date of the certification(s).

Personnel. Provide an operator certified in accordance with AASHTO R56. At least 21 days before profiling begins provide copies of the operator's certification(s).

Measuring. The CO will identify the beginning and ending points and any excluded areas. Measure the pavement profile in both wheel paths using a sensor path spacing of 1.65-1.80

meters and centered in the traveled way of the lane. Operate the inertial profiler in accordance with manufacturer's recommendations and AASHTO R 57. Use a long wave cutoff filter distance of 61.0 meters and report the profile data (elevation and distance) at a maximum interval of 50 millimeters. Provide a lead-in distance, after reaching the testing speed, of at least 45.72 meters. Furnish personnel to provide flagging operations as may be 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.

Cattle guards, bridges not being overlaid and turning lanes, passing lanes, side roads and ramps less than 300 meters in length will be excluded from profile measurement.

Measure excluded areas with a straightedge according to paragraph (e).

The CO will coordinate and observe profiling operations. Immediately after profiling export each profile (elevation, distance data, header and marker info) in pvp (project and embedded data file format) to a disk (CD or DVD) and provide the disk to the CO. Non-continuous data files will not be accepted. Use the following naming convention for all electronic files provided to the CO for Type I and Type II pavement roughness:

[Project Name (may be abbreviated)] _ [beginning station_to_ending station] _ [Initial or Final],
(e.g. - Beaver_Cr_Rd_25+500_to_38+350_Initial.pvp).

Use the following naming convention for Type III pavement roughness:

[Project Name (may be abbreviated)] _ [beginning station_to_ending station],
e.g. - [Beaver Cr Rd_25+500_to_38+350.pvp].

Evaluation. The CO will review and analyze all profile measurements. The CO may perform verification testing, equipment validation or both.

(1) Verification Testing. 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 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. Contractor's equipment failing to match the CO's IRI value for either wheel path shall not be used.

(2) Equipment Validation. Equipment validation will consist of determining a cross correlation value on at least one section having a minimum length of 161 meters. 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 segment(s). The minimum acceptable cross correlation value is 0.90. Contractor's equipment failing to obtain a cross correlation value of at least 0.90 shall not be used.

The CO will use the profile measurements to determine the Mean Roughness Index (MRI) value for the traveled way using the current version of Profile Viewer and Analysis (ProVAL) software. The MRI is determined by averaging the International Ride Index (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.

Areas of localized roughness will be identified using a report of continuous MRI with a base length of 7.62 meters. This will yield the MRI of every possible 7.62 meter 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. When corrections are not allowed an additional payment deduction in accordance with paragraph (f) will apply. No deduction will be made for areas of localized roughness identified within 3.81 meters of the beginning or end of a profile section or within 3.81 meters of any excluded areas. Measure these areas with a straightedge according paragraph (e).

Cattle guards, bridges not being overlaid and turning lanes, passing lanes, side roads and ramps less than 300 meters in length will be excluded from the calculation of MRI and determination of localized roughness.

A report of continuous IRI is defined as the roughness profile from “Profiles from Roughness”, TRR 1260, by M.W. Sayers. Its use for detection of localized roughness, as required here, is demonstrated in “Using a Ride Quality Index for Construction Smoothness Specifications”, TRR 1861, by M. Swan and S. Karamihas.

Correct areas of localized roughness in accordance with paragraph (g).

(b) Type I pavement roughness. 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 insitu 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:

$$\text{Localized Roughness (LR)} = \text{Initial MRI} + 1.881(S_{25})$$

Where the Initial MRI is the MRI obtained before construction activities begin and (S_{25}) is the sample standard deviation of the 7.62 meter MRI.

No work that will disturb the initial pavement surface shall proceed 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 original surface MRI will be used in conjunction with the final MRI to determine the percent improvement for the traveled way.

The percent improvement in MRI will be determined to one decimal place for the traveled way according to the following formula:

$$\% \text{ Improvement} = [(\text{Initial MRI} - \text{Final MRI}) / \text{Initial MRI}] \times 100$$

Table 401-3 will be used to determine the final pay factor (PF_{rough}) for the traveled way to two decimal places. When the % Improvement is less than 25.0 percent and the final MRI value is less than or equal to 1.104 meters per kilometer the final MRI, Table 401-5 and Table 401-6 Type III will be used to determine the final pay factor (PF_{rough}). Correct areas of localized roughness in accordance with paragraph (g). Any pavement with a negative percent improvement shall have a minimum 25 millimeter overlay placed over the entire paved surface.

Table 401-3
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
10.0 to 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

(c) Type II pavement roughness. 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 insitu 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:

$$\text{Localized Roughness (LR)} = \text{Initial MRI} + 1.282(S_{25})$$

Where the Initial MRI is the MRI obtained before construction activities begin and (S_{25}) is the sample standard deviation of the 7.62 meter MRI.

No work that will disturb the initial pavement surface shall proceed 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 original surface MRI will be used in conjunction with the final MRI to determine the percent improvement for the entire traveled way.

The percent improvement in MRI will be determined to one decimal place for the traveled way according to the following formula:

$$\% \text{ Improvement} = [(\text{Initial MRI} - \text{Final MRI}) / \text{Initial MRI}] \times 100$$

Table 401-4 will be used to determine the final pay factor (PF_{rough}) for the traveled way to two decimal places. When the % Improvement is less than 49.0 percent and the final MRI value is less than or equal to 1.105 meters per kilometer the final MRI, Table 401-5 and Table 401-6 Type III will be used to determine the final pay factor (PF_{rough}). Correct areas of localized roughness in accordance with paragraph (g). Any pavement with a percent improvement less than 10.0 percent shall have a minimum 25 millimeter overlay placed over the entire paved surface.

Table 401-4
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

(d) 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 2.525 meters per kilometer. Pay factors from Table 401-5 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 401-5 multiplied by ProVAL's corresponding histogram percentages, divided by 100. The final pay factor (PF_(rough)) will be determined to three decimal places. Correct areas of localized roughness in accordance with paragraph (g). Any pavement with an MRI greater than 1.973 meters per kilometer is in reject and shall be corrected in accordance with paragraph (g).

Table 401-5
Type III Pavement Roughness Pay Factors

MRI (mm/km)	PF_(rough)
Greater than 1.499	0.700
1.499 to 1.420	0.800
1.420 to 1.342	0.850
1.342 to 1.263	0.900
1.263 to 1.184	0.960
1.184 to 1.105	0.980
1.105 to 1.026	1.000
1.026 to 0.947	1.010
0.947 to 0.868	1.020
0.868 to 0.789	1.025
0.789 to 0.710	1.030
0.710 to 0.631	1.035
0.631 to 0.552	1.040
0.552 to 0.473	1.045
Less than 0.473	1.050

(e) Straightedge Measurement. Use a 3 meter metal straight edge to measure at right angles and parallel to the centerline. Defective areas are deviations between the surface and the bottom of the straightedge in excess of 6 millimeters measured between any two contacts of the straightedge, or deviations in excess of 6 millimeters measured at the end of the straightedge. Use a 3 meter metal straight edge to measure areas within 3.81 meters of the beginning or end of a profile section or within 3.81 meters of any excluded areas. Correct defective areas in accordance with paragraph (g).

(f) 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 in accordance with Table 401-6.

**Table 401-6
Localized Roughness Pay Reductions**

Type I	Type II	Localized Roughness Limit (MRI)	Type III	
Deduct per Occurrence	Deduct per Occurrence		Localized Roughness Limit MRI (mm/km)	Deduct per Occurrence
\$200	\$300	Computed MRI value per paragraph (b) for Type I and per paragraph (c) for Type II	2.210 to 2.682	\$300
			2.683 to 2.840	\$450
			2.841 to 2.998	\$600
			2.999 to 3.156	\$750
			3.157 to 3.313	\$900
			3.314 to 3.471	\$1,200
			3.472 to 3.629	\$1,500
			3.630 to 3.787	\$2,000
		Greater than or equal to 3.788	\$4,000	

(g) Defective area correction. Correct defective areas by milling a minimum of one half the pavement depth and filling with approved HMA or WMA mix or by cutting and removing the defective area and repaving with approved HMA or WMA mix. All other proposed methods of correction require approval from the CO before starting any corrective work.

When correction by any method other than milling and filling or cutting, removing and repaving is proposed submit a proposal to the CO for approval. 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. All seals shall be placed in accordance with Section 409 or 410. Grinding depth is limited to 12.5% of the design pavement thickness. Grinding in excess of these depths is not an acceptable unless it is accompanied by a minimum 25 millimeter overlay. The CO may take up to 7 days to approve, modify or reject the proposal.

Defective area corrections and surface treatments shall be provided at no cost to the Government.

After corrections are made, re-measure the pavement profile in accordance with Subsection 401.16 (a). Data from the re-measurement will be analyzed to determine the MRI or Percent Improvement, areas of localized roughness and to determine the final payment in accordance with Subsection 401.19. The maximum pay factor obtainable when correction and re-measurement of the surface are required is 1.00.

If for any reason corrections are not allowed, no adjustment will be made to the final pay factor (PF_{rough}) or localized roughness pay deductions

401.17 Acceptance. See Table 401-8 for sampling and testing requirements and the acceptance quality characteristic category.

Mineral filler, antistripping additives, and WMA additives will be evaluated under Subsections 106.02 and 106.03.

Aggregate quality properties will be evaluated under Subsections 106.02 and 106.04.

Asphalt binder will be evaluated under Subsection 106.03, 106.04, 702.09, and Table 401-7.

Construction of the HMA or WMA pavement course will be evaluated under Subsections 106.02 and 106.04.

Asphalt content, aggregate gradations, core density, VMA, and VFA will be evaluated under Subsection 106.05.

Air voids (V_a) will be evaluated under Subsection 106.04.

Pavement roughness will be evaluated under Subsection 106.04 and Subsection 401.16.

(a) Asphalt content. The upper and lower specification limits are the approved JMF target value plus or minus 0.4 percent.

(b) Aggregate gradations. The upper and lower specification limits are the approved JMF target values plus or minus the allowable deviations shown in Table 703-13.

(c) Core density. The lower specification limit is 91.0 percent of the maximum specific gravity (density) determined according to AASHTO T 166 and T 209. Use 0.9975 kg/m^3 to convert specific gravity to density.

(d) Asphalt binder. The pay factor is determined from Table 401-7.

(e) Pavement roughness. The evaluation for payment will be made after all defective areas are addressed. See Subsection 401.16 (g).

(f) VMA. The lower specification limit is the value shown in Table 401-1. After the JMF has been verified according to subsections 401.03 and 401.12, the Contractor's combined coarse and fine bulk specific gravity of aggregate G_{sb} values shall be used to calculate VMA on field produced asphalt mix samples.

(g) VFA. The upper and lower specification limits are the values shown in Table 401-1.

(h) Air voids (V_a). The upper and lower specification limits are three and five percent.

Measurement

401.18 Measure the Section 401 items listed in the bid schedule according to Subsection 109.02.

Payment

401.19 The accepted quantities will be paid at the contract price per unit of measurement for the Section 401 pay items listed in the bid schedule except for the asphalt concrete pavement contract unit bid price will be adjusted according to Subsections 106.05, 401.16, and Table 401-7. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Payment for asphalt concrete pavement will be made at a price determined by multiplying the contract unit bid price by the material pay factor. The material pay factor is calculated as follows:

$$PF_{\text{Material}} = 1 + [(PF_{\text{Mix}} - 1) + (PF_{\text{PG}} - 1)]$$

where:

PF_{Material} = Material pay factor.

PF_{Mix} = Pay factor for asphalt concrete pavement. PF_{Mix} is the lowest single pay factor determined for asphalt binder content, VMA, and core density.

PF_{PG} = Pay factor for asphalt binder. The PF_{PG} formula is as follows:

$$PF_{\text{PG}} = (PF_1 + PF_2 + PF_3 + \dots + PF_n) / n$$

where:

$PF_{\#}$ = For each sample, the lowest pay factor determined from any test in Table 401-7. If the lowest pay factor for a sample is in reject, the sample's pay factor is zero.

n = Number of samples tested.

If either the pay factor for the asphalt binder (PF_{PG}) or the pay factor for asphalt concrete pavement (PF_{Mix}) is below 0.75, the lot for asphalt concrete pavement is in reject.

When the bid schedule contains a pay item for asphalt concrete pavement, Type I, II or III pavement roughness, a separate pay adjustment will be made for pavement roughness calculated as follows:

$$\text{Type I, II and III Pay Adjustment} = 24,800 (PF_{\text{Rough}} - 1.00)(L) - (LRPR)$$

where:

PF_{Rough} = Pay factor from Table 401-3, Table 401-4, or Table 401-5.

L = Total project length in lane kilometers of traveled way as specified in the contract. Measure the project length to three decimals.

LRPR = Localized Roughness Pay Reduction from Table 401-6.

Table 401-7
Asphalt Binder Pay Factor Table

Tests on Original	Specifications (See 702.01)	Pay Factor =					
		1.01	1.00	0.95	0.90	0.75	Reject
Dynamic Shear Rheometer, kPa	≥ 1.00	≥ 1.17	1.16 to 1.00	0.99 to 0.89	0.88 to 0.77	0.76 to 0.50	< 0.50
Tests after Rolling Thin Film Oven (RTFO)							
Dynamic Shear Rheometer, kPa	≥ 2.20	≥ 2.69	2.68 to 2.20	2.19 to 1.96	1.95 to 1.43	1.42 to 1.10	< 1.10
Tests on Pressure Aging Vessel (PAV)							
Dynamic Shear Rheometer, kPa	$\leq 5,000$	$\leq 4,711$	4,712 to 5,000	5,001 to 5,289	5,290 to 5,578	5,579 to 5,867	$> 5,867$
Bending Beam Rheometer, s, MPa	≤ 300	≤ 247	248 to 300	301 to 338	339 to 388	389 to 449	≥ 450
Bending Beam Rheometer, m- value	≥ 0.300	≥ 0.320	0.319 to 0.300	0.299 to 0.294	0.293 to 0.278	0.277 to 0.261	< 0.261

Table 401-8
Sampling and Testing Requirements

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Method Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
Aggregate source quality (703.07)	Measured and tested for conformance (106.04 and 105)	LA abrasion	---	AASHTO T 96	1 per type & source of material	Source of materials	Yes	Before producing
		Sodium sulfate soundness loss (coarse & fine)	---	AASHTO T 104				
		Fractured faces	---	ASTM D 5821				
		Fine aggregate angularity	---	AASHTO T 304				
		Flat and elongated particles	---	ASTM D 4791				
		Sand equivalent	---	AASHTO T 176				
Asphalt concrete pavement (mix design)	Measured and tested for conformance (106.04)	Gradation	---	AASHTO T 11 AASHTO T 27	1 per each submitted mix design	Stockpiles	Yes	30 days before paving
		RAP asphalt binder content	---	AASHTO T 308				
		Bulk specific gravity of aggregate (coarse & fine)	---	AASHTO T 84 AASHTO T 85				
		VMA	---	AASHTO R 35				
		VFA	---	AASHTO R				

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Method Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
				35				
		Air voids (V _a)	---	AASHTO R 35		---		
		Hveem S-value	---	AASHTO T 246 AASHTO T 247		---		
		Retained strength (TSR)	---	AASHTO T 283		---		
Asphalt binder (mix design)		Quality	---	AASHTO M 320		Mixing plant or Asphalt Supplier		Tested by the Government

Table 401-8 (continued)
Sampling and Testing Requirements

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Method Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time	
Asphalt concrete pavement (control strip)	Statistical (106.05)	Gradation:		AASHTO T 30	3 minimum	Behind the paver before compaction	Yes	Prior to beginning of next day's production	
		9.5 mm	I						
		4.75 mm	I						
		2.36 mm	I						
		300 µm	I						
		75 µm	I						
		Other specified sieves (See Table 703-12)	II						
		Asphalt content ⁽¹⁾	I						AASHTO T 308
		VMA	I						AASHTO R 35
	VFA	I	AASHTO R 35						
	Core density ⁽²⁾ ₍₃₎	I	AASHTO T 166	5 minimum	In-place after compacting	Yes	24 hours after placement		
Measured and tested for conformance (106.04)	Air voids (V _a)	---	AASHTO R 35	3 minimum	Behind the paver before compaction	Yes	Prior to beginning of next day's production		
	Maximum specific gravity	---	AASHTO T 209 ⁽⁵⁾						

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Method Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
		Mix temperature	---	---	First load & as determined by the CO	Hauling vehicle before dumping or windrow before pickup	---	As directed by the CO

Table 401-8 (continued)
Sampling and Testing Requirements

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Method Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time	
Asphalt concrete pavement (production)	Statistical (106.05)	Asphalt content ⁽¹⁾	I	AASHTO T 308	1 per 700 tonnes	Behind the paver before compaction	Yes	Prior to beginning of next day's production	
		VMA	I	AASHTO R 35		In-place after compacting	Yes	24 hours after placement	
		Core density ⁽²⁾ ₍₄₎	I	AASHTO T 166		Behind the paver before compaction	Yes	Prior to beginning of next day's production	
	Measured and tested for conformance (106.04)	Gradation	---	AASHTO T 308 AASHTO T 30		1 per 2000 tonnes of mix, but not less than 5 samples	In line between tank & mixing plant (702.09(c))	Two 1-quart samples	Tested by the Government
		VFA	---	AASHTO R 35					
		Air voids (V _a)	---	AASHTO R 35					
		Maximum specific gravity	---	AASHTO T 209 ⁽⁵⁾					
Asphalt binder (production)	Measured and tested for conformance (106.04 & Table 401-7)	Quality	Table 401-7	AASHTO M 320					

Table 401-8 (continued)
Sampling and Testing Requirements

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Method Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
Asphalt concrete pavement (final surface)	Measured and tested for conformance (106.04)	Type I Pavement Roughness, before construction (Initial MRI)	---	AASHTO R 56 & R 57	See Subsection 401.16	Left and Right Wheel Paths	---	Original surface before overlaying, recycling, or milling and within 14 days of Notice to Proceed
		Type I Pavement Roughness, after construction (Final MRI)	---	AASHTO R 56 & R 57	See Subsection 401.16	Left and Right Wheel Paths	---	21 days after final paving
		Type II Pavement Roughness, before construction (Initial MRI)	---	AASHTO R56 & R 57	See Subsection 401.16	Left and Right Wheel Paths	---	Original surface before overlaying, recycling, or milling and within 14 days of Notice to Proceed.
		Type II Pavement Roughness, after construction	---	AASHTO R 56 & R 57	See Subsection 401.16	Left and Right Wheel Paths	---	21 days after final paving

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Method Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
Asphalt concrete pavement (final surface)	Measured and tested for conformance (106.04)	Type I Pavement Roughness, before construction (Initial MRI)	---	AASHTO R 56 & R 57	See Subsection 401.16	Left and Right Wheel Paths	---	Original surface before overlaying, recycling, or milling and within 14 days of Notice to Proceed
		(Final MRI)						
		Type III Pavement Roughness (Final MRI)	---	AASHTO R 56 & R 57	See Subsection 401.16	Left and Right Wheel Paths	---	21 days after final paving

- ⁽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. Modify AASHTO T 308, parts 8.2 and 10.2 to allow the use of AASHTO T 255, Total Evaporable Moisture Content of Aggregate by Drying.
- ⁽²⁾ Side-by-side cores for each lift will be obtained for core density testing. Submit each companion core to the CO. Fill and compact the sample holes with asphalt concrete mixture. Cores shall be 150 millimeters in diameter. Label cores and protect from damage due to handling or alteration due to temperature during storage or transfer. Use AASHTO T 166 regardless of the volume of water absorbed. Care should be taken to dry cores to constant mass at $52 \pm 2^\circ\text{C}$, before testing.
- ⁽³⁾ Use the average maximum specific gravity value (AASHTO T 209) of the control strip samples to determine the percent compaction of each control strip.
- ⁽⁴⁾ For production, use the average maximum specific gravity value (AASHTO T 209) of the first three samples to determine the percent compaction of each lot.
- ⁽⁵⁾ Do not use the dry back method (Section 11 of AASHTO T 209).

Section 409. – ASPHALT SURFACE TREATMENT**Construction Requirements****409.10 Fog Seal.** Add the following after the first sentence:

Unless otherwise noted on the plans, dilute the specified emulsion one part water to one part emulsified asphalt.

Measurement**409.14** Add the following:

Measure fog seal including water added for dilution.

Indicate a breakdown of total emulsion and water added on the load invoices supplied to the CO for payment.

Section 411. – ASPHALT PRIME COAT**Description**

Delete the Section and substitute the following:

Description

411.01 This work consists of applying a cut-back or emulsified asphalt prime coat.

Prime coat asphalt grade is designated as shown in AASHTO M 140 or AASHTO M 208 for emulsified asphalt; AASHTO M 81 or AASHTO M 82 for cut-back asphalt; or Subsection 702.03(f) for penetrating emulsified asphalts.

Material

411.02 Conform to the following Subsections:

Asphalt surface treatment aggregate	703.10
Blotter	703.13
Cut-back asphalt	702.02
Emulsified asphalt	702.03
Penetrating emulsified asphalt	702.03(f)
Water	725.01(c)

Construction Requirements

411.03 Equipment. Use equipment conforming to Subsection 409.04.

411.04 Surface Preparation. Prepare the surface to be primed according to Subsection 301.05 and 301.06. When required, use sweeping or other approved method to remove loose dust and fine material and lightly spray the surface with water prior to application of the prime coat.

411.05 Weather Limitations. Apply prime coat on a dry or slightly damp surface when the air temperature in the shade and the surface temperature are at least 10 °C and rising and when the weather is not foggy or rainy.

411.06 Asphalt Application. Apply cut-back or emulsified asphalt according to Subsection 409.08 using method (1), (2), or (3) as described below.

(a) Method 1 (topical). Apply cut-back asphalt or undiluted emulsified asphalt formulated as a penetrating prime coat at a rate of 0.45 to 1.35 liters per square meter. The CO will approve the exact application rate.

(b) Method 2 (inverted prime). Apply undiluted emulsified asphalt at a rate of 0.90 to 1.35 liters per square meter. Immediately apply crushed aggregate meeting the requirements of Table 703-7, Grading D, at a uniform rate of 11 to 13.5 kilograms per square meter using an aggregate spreader. The CO will approve the exact application rate. Operate the aggregate spreader so the asphalt is covered with aggregate before wheels pass over it. Immediately seat the aggregate using a roller. Operate rollers at a maximum speed of 8 kilometers per hour.

During part-width construction, leave a 150-millimeter wide uncovered strip of asphalt to permit an overlap of asphalt material.

(c) Method 3 (processed). Scarify the surface to a depth of 50 to 75 millimeters before applying the asphalt as a prime coat. Apply emulsified asphalt at an undiluted rate of 1.10 liters per square meter per 25 millimeters of scarification depth. Immediately, process, respread, and compact the material. When required, dilute a slow-setting emulsified asphalt by adding water. Use of other methods to incorporate asphalt into aggregate may be used with approval of the CO.

411.07 Curing. Cure surfaces primed with emulsified asphalt for at least 24 hours and surfaces primed with cut-back asphalt at least 3 days before covering with the next course.

411.08 Maintenance. Until the next course is placed, maintain the primed surface by keeping it free of corrugations, potholing, and loose material. Remove all dirt or other deleterious material and repair all damaged areas.

To protect traffic or to minimize rain damage spread blotter to cover unabsorbed asphalt. Remove excess blotter after the asphalt is absorbed.

411.09 Acceptance. Emulsified asphalt and cut-back asphalt will be evaluated under Subsections 106.02 and 106.03.

Aggregate and blotter will be evaluated under Subsection 106.03.

Construction of the prime coat will be evaluated under Subsections 106.02.

Measurement

411.10 Measure the Section 411 items listed in the bid schedule according to Subsection 109.02 and the following as applicable.

Measure prime coat width including treated widenings. Measure the square meter length along the centerline of the roadway.

Do not measure water added for dilution. Indicate a breakdown of total emulsion and water added on the load invoices supplied to the CO.

Payment

411.11 The accepted quantities will be paid at the contract price per unit of measurement for the Section 411 pay items listed in the bid schedule. Payments will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Section 412. – ASPHALT TACK COAT

Description

412.01 Delete the text and substitute the following:

This work consists of applying an emulsified asphalt or hot asphalt cement tack coat.

Tack coat emulsified asphalt grade will meet AASHTO T 140 or AASHTO T 208.

Tack coat asphalt cement grade will meet AASHTO M 20, M 226, or M 320

Measurement

412.08 Add the following after the second paragraph:

Indicate a breakdown of total emulsion and water added on the load invoices supplied to the CO for payment.

Section 552. – STRUCTURAL CONCRETE**Material****552.02** Add the following:

Concrete coloring agent	711.05
Polychloroprene elastomeric joint seals	717.16
Precast reinforced concrete box sections	706.07
Precast concrete units	725.11
Reinforcing fibers	725.29

Delete the following:

Elastomeric compression joint seals	717.16
-------------------------------------	--------

Construction Requirements**552.03 Composition (Concrete Mix Design).** Delete Tables 552-1, 2, and 3 and substitute the following:

**Table 552-1
Composition of Concrete**

Class of Concrete	Minimum Cement Content (kg/m³)	Maximum W/C Ratio	Slump ⁽¹⁾ (mm)	Maximum Nominal Coarse Aggregate Size ⁽⁵⁾ (mm)
A	360	0.49	50 to 100	37.5
A(AE)	360	0.44	25 to 100	37.5
B	310	0.58	50 to 100	63
B(AE)	310	0.58	50 to 100	63
C	390	0.49	50 to 100	19
C(AE)	390	0.44	25 to 75	19
D(AE) ⁽²⁾	360	0.40	25 to 75	37.5
E(AE) ⁽³⁾	360	0.40	100 to 150 ⁽⁴⁾	19
P (Prestressed)	390	0.44	0 to 100	25
P(AE)	390	0.44	0 to 100	25
Seal	390	0.54	100 to 200	37.5

- (1) Maximum slump is 200 millimeters if approved mix design includes a high-range water reducer.
(2) Concrete with a water reducing and retarding admixture conforming to AASHTO M 194, type D.
(3) A latex modified concrete with 0.31 liters of modifier per kilogram of cement.
(4) Measure the slump 4 to 5 minutes after the concrete is discharged from the mixer.
(5) Meeting the processing requirements of AASHTO M43, Table 1 – Standard Sizes of Processed Aggregate.

Table 552-2
Minimum Air Content for Air Entrained Concrete

Nominal Maximum Aggregate Size ⁽¹⁾	As Delivered Minimum Air Content ^{(2) (3)} (%)
63 mm	3.5
50mm	3.5
37.5 mm	4.0
25 mm	4.5
19 mm	4.5
12.5 mm	5.5

(1) Meeting the processing requirements of AASHTO M 43, Table 1 – Standard Sizes of Processed Aggregate.

(2) These air contents apply to the total mix. When testing these concretes, aggregates larger than 37.5 millimeters is removed by handpicking or sieving, and air content is determined on the minus 37.5-millimeter fraction of the mix. Air content of the total mix is computed from the value determined on the minus 37.5-millimeter fraction.

(3) For P(AE) concrete, the as delivered minimum air contents may be reduced 1.0 % and the maximum air content is 6.0 %

Table 552-3
Required Average Compressive Strength ⁽¹⁾

Specified Compressive Strength (f'_c) (MPa)	Required Average Compressive Strength (f'_{cr}) (MPa)
Less than 21	$f'_c + 7.0$
21 to 35	$f'_c + 8.5$
Over 35	$1.10f'_c + 5.0$

(1) Use this table when there is not enough data available to establish a standard deviation

552.09 Quality Control of Mix. Add the following after the first paragraph:

At least 2 weeks prior to the start of concrete placement operations, arrange a pre-concrete placing conference. Coordinate attendance with the CO and any applicable subcontractors. Be prepared to discuss and/or submit the following:

- (1) Proposed concrete placement schedule.

- (2) Review approved concrete mix design and determination of batch weights.
- (3) Discuss Section 153, Contractor Quality Control, minimum frequency schedule for process control sampling and testing (to be performed by the Contractor).
- (4) Discuss batching, mixing, placing, and curing requirements.
- (5) Discuss Subsections 106.03, Certification, and 106.05, Statistical Evaluation of Material for Acceptance.

552.12 Construction Joints. Delete the third paragraph and substitute the following:

When the joint is between two fresh concrete placements, rough float the first placement to thoroughly consolidate the surface and leave the surface in a roughened condition. Clean the joint surface of laitance, curing compound, and other foreign material. Use an abrasive blast or another approved method to expose the aggregate on the joint surface. Re-tighten forms where the joint overlaps the first placement. Immediately before placing new concrete, flush the joint surface with water and allow to dry to a surface dry condition.

552.19 Acceptance. Add the following:

Material for fly ash, lime, hydraulic cement, and water will be evaluated under Subsections 106.02 and 106.03.

Measurement

552.20 Add the following:

Do not measure for payment the volume of concrete required outside the neat lines of the footing to pour against undisturbed rock as shown on the plans. When the CO directs the removal of material below the established elevation of the bottom of the footing, the volume of concrete required to fill the void will be measured for payment.

Payment

552.21 Delete the text and substitute the following:

The accepted quantities will be paid at the contract price per unit of measurement for the Section 552 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Table 552-9 Sampling and Testing Requirements Delete Table 552-9 and substitute the following:**Table 552-9
Sampling and Testing Requirements**

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Method Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
Aggregate (source quality)	Measured and tested for conformance (106.04 & 105)	Quality	---	Subsection 703.01 & 703.02	1 per material type	Source of materials	Yes	Before producing
Concrete composition (mix design)	Measured and tested for conformance (106.04 & 105)	All	---	Subsection 552.03	1 per mix design	Source of materials	Yes	Before producing
Concrete (production)	Measured and tested for conformance (106.04)	Slump	---	AASHTO T 119	1 per load	Point of discharge ⁽¹⁾	---	Upon completing tests
		Air Content		AASHTO T 152 or AASHTO T 196				
		Unit Mass		AASHTO T 121				
		Temperature		AASHTO T 309				
	Statistical (106.05)	Compressive Strength ⁽²⁾	II	AASHTO T 23 and AASHTO T 22	1 set per 25 m ³ , but not less than 1 set per day and not less than 5 sets total	Discharge stream at point of placing ⁽¹⁾	Note 3	See Subsection 552.09(b)(4)

⁽¹⁾ Sample according to AASHTO T 141 except composite samples are not required.⁽²⁾ A single compressive strength test result is the average result from 2 cylinders cast from the same load and tested at 28 days.⁽³⁾ Deliver cylinders to designated laboratory for testing.

Section 553. – PRESTRESSED CONCRETE**Construction Requirements****553.03 Method Approval.**

Delete (i) and (j) and substitute the following:

- (i) Pressure grouting material and equipment for post-tensioning;
- (j) Samples of wire or strand taken according to Subsection 709.03; and
- (k) Additions or re-arrangement of reinforcing steel and changes in concrete dimensions.

553.05 Concrete.

Delete (e) and (f) and substitute the following:

- (e) Heat concrete to no more than 38 °C during the first 2 hours after placing concrete, and increase the temperature no more than 22 °C per hour to a maximum of 71 °C.
- (f) Cool concrete, after curing is complete, no more than 22 °C per hour until a temperature 11 °C above the temperature of the air to which the concrete will be exposed has been reached.

553.09 Post-Tensioned Members.**(a) Ducts.**

Delete (5) and substitute the following:

- (5) Metal duct with bar tendons preassembled with duct 0.25 millimeter

Delete the eighth paragraph of Subsection 553.09(a) and substitute the following:

Provide inlets and outlets with an inner diameter of at least 20 millimeters for strand tendons and of at least 12 millimeters for single bar tendons. Extend the length of outlets a sufficient distance out of the concrete member to allow for the proper closing of the outlets.

(e) Post-Tensioning.

Delete the third paragraph of Subsection 553.09(e) and substitute the following:

Determine the friction loss in the prestressing process (i.e., the difference between tension at the jack and minimum tension in the prestressing steel) according to the AASHTO *Load and Resistance Factor Design Bridge Design Specifications*.

Section 554. – REINFORCING STEEL**Construction Requirements**

554.07 Epoxy Coated Reinforcing Steel. Delete the fifth paragraph and substitute the following:

Field repairs will not be allowed on bars that have severely-damaged coatings. Replace bars with severely-damaged coatings. A severely-damaged coating is defined as a bar where the sum of all areas covered with patching material, including overlaps, exceeds five percent of the total surface area of the bar. This limit on repaired damage coating does not include sheared or cut ends that are coated with patching material. Coat mechanical splices after splice installation according to AASHTO M 284M for patching damaged epoxy coatings.

554.08 Placing and Fastening. Delete the first sentence of the first paragraph and substitute the following:

Place, fasten, and support the bars according to the *CRSI Manual of Standard Practice*. Use precast concrete blocks or metal supports.

554.09 Splices. Delete the fifth paragraph and substitute the following:

Mechanical couplers may be used in lieu of welding if approved. Use couplers with a strength that is at least 125 percent of the required yield strength of the reinforcing steel. The total slip of the reinforcing bar within the splice sleeve after loading in tension to 207 megapascals and relaxing to 20 megapascals shall not exceed 0.25 millimeters for bar sizes up to No. 43 as measured between gage points clear of the splice sleeve.

Section 562. – TEMPORARY WORKS**Material**

562.02 Delete the second sentence and substitute the following:

Furnish factory fabricated components of vertical shoring towers complying with the *Certification Program for Bridge Temporary Works* (FHWA-RD-93-033).

Design Requirements

562.03 Design.

(c) Delete the third paragraph and substitute the following:

Do not use overhang form brackets for girder bridges that require holes to be cast or drilled into the girder webs.

Delete the seventh paragraph and substitute the following:

Do not use overhang form brackets for girder bridges that require holes to be cast or drilled into the girder webs.

Construction Requirements

562.07 Maintenance and Inspection. Delete the text and substitute the following:

Inspect and maintain temporary works in an acceptable condition throughout the period of use.

In the presence of the CO, perform an in-depth inspection of temporary works not more than 24 hours before beginning each concrete placement or before allowing people to enter a cofferdam or excavation support structure. Inspect other temporary works at least once a month to insure they are functioning properly. Use a registered professional engineer to inspect cofferdams, shoring, support of excavation structures, and support systems for load tests before loading.

Furnish written results of the inspections to the CO before placing concrete, before allowing people to enter a cofferdam or excavation support structure, and before loading temporary works. Include a certification that the system meets the requirements of the contract and drawings.

Clearly mark the capacity of factory fabricated components of vertical shoring towers according to the *Certification Program for Bridge Temporary Works* (FHWA-RD-93-033). Make inspections and certifications for factory fabricated components of vertical shoring towers according to the *Certification Program for Bridge Temporary Works* (FHWA-RD-93-033).

Section 563. – PAINTING

Description

563.01 Add the following: This work also consists of applying rock stain to the newly exposed rock slope surfaces..

Add the following:

This work also consists of staining riprap, boulders, slopes, and wall facing to produce a natural weathered appearance.

Material

563.02 Conform to the following Subsection:

Penetrating Stain

708.05

Add the following:

Furnish a desert varnish weathering material that is an aqueous solution containing salts of iron and manganese, built in oxidizers and other trace elements including copper and zinc. Furnish a stable, one-step component solution applied directly to the natural and galvanized surfaces.

Provide a material that has a projected life expectancy range from 50 to 100 years. Furnish a material that develops full coloration within two weeks of application. Supply a material where the final color is controlled or modified by custom blending of the basic ingredients, application techniques, dilution rate of the color concentrate with water or a combination of these methods.

Furnish a material that contains chemical components that have no adverse reactions or effects on soils, plants, or animals. The material can not contain corrosive by-products once the product has been applied. Only nitrate fertilizer products are permitted to be present as soluble residues.

For information, the following stain systems have been previously used on CFLHD projects or by client agencies:

NATINA manufactured by Natina Products, LLC
1577 First Street
Coachella, CA 92236
Telephone: (877) 762-8462
www.natinaproducts.com

PERMEON manufactured by Soil-Tech, Co.
6420 S. Cameron Dr., Suite 207
Las Vegas, Nevada 89118
Telephone: (702) 873-2023
www.soil-tech.com

Alternate stain systems from various manufacturers may be proposed provided they meet the minimum material requirements.

Construction Requirements

563.03 Protection of Public, Property, and Workers. Add the following:

Comply with all applicable federal, state, and local regulations. Furnish material safety data sheets for all cleaning and staining products.

563.06 Paint Application, General. Add the following:

Use a penetrating stain with color shades for the newly exposed rock slope surfaces which complement the natural rock outcroppings in the vicinity of the rock slope with the CO's approval. Ensure the final color shades consist of 50% brown tones and 50% gray tones.

Ensure the color/stain application is applied by a Color Application Artist who has a minimum of five consecutive years of experience applying special color stain surface finish to newly exposed rock slopes surfaces. Submit the following for approval by the CO:

(a) A list of three applications of newly exposed rock slopes surface work completed by the Color Application Artist within the last 5 years. Include the stain manufacturer, project name, project location, project address, and phone number of the owner or owner's representative.

(b) A minimum of three 8 inch x 10 inch color photographs of each installation referenced above. The photographs must show details of the color/stain application and overall quality of the work. The photographs will be used to evaluate the experience and ability of the Color Application Artist to achieve realistic surfaces. Submit photographs taken at various distances from the stained surface to clearly show distinguishing characteristics and overall quality of the work.

Achieve the desired finish effect by applying one color over another or by intermixing several colors of stain. Apply concrete stain base coat using an air or airless sprayer. Highlight coloration will be by hand or other suitable antiquing method. Stain individual rocks on the pattern to produce natural irregularities.

Provide a color/stain Manufacturer's Technical Representative for on site technical supervision of the Color Application Artist during the color/stain application production work.

Measurement

563.12 Add the following:

Measure rock stain by the square meter of the rock slope.

Delete the Section and substitute the following:

Section 569. – MICROPILES

Description

569.01 This work consists of furnishing all necessary engineering and design services, supervision, labor, materials, and equipment to perform all work necessary to install and test micropiles, per the specifications described herein, and as shown in the Plans. Install a micropile system that will develop the load capacities indicated in the Plans. The micropile load capacities and measurements shall be verified by testing, as specified herein.

Material

569.02 Conform to the following:

(a) Water. 725.01. Test drilling fluids in accordance with API RP 13B-1, Recommended Practice – Standard Procedure for Field Testing Water Based Drilling Fluids.

(b) Admixtures. 711.03. Admixtures which control bleed, improve flowability, reduce water content, and retard set may be used in the grout subject to the review and acceptance of the CO. Add expansive admixtures only to the grout used for filling sealed encapsulations. Provide admixtures compatible with the grout and mixed in accordance with the manufacturer's recommendations. Their use will only be permitted after appropriate field tests on fluid and set grout properties. Admixtures with chlorides are not permitted.

(c) Cement. 701.01(a). Conduct additional grout mix tests if the brand or type of cement is changed during a project, to ensure consistency of quality and performance in situ.

(d) Fillers. Inert fillers such as sand may be used in the grout in special situations (e.g., presence of large voids in the ground, when grout take and travel are to be limited) as approved by the CO.

(e) Bar reinforcement.

(1) Deformed bars. 709.01. Provide deformed reinforcing steel bars conforming to AASHTO M31, in Grade 420 or Grade 520 as designated on the plans.

(2) High strength steel bars. 709.03.

(3) Epoxy-coated bars. Furnish bars conforming to AASHTO M284, except that coating flexibility bending requirements are waived. Store, handle and repair epoxy-coated bars in accordance with Subsection 554.07.

(4) Bar couplers. Use couplers with a strength that is at least 125 percent of the required yield strength of the reinforcing steel.

When a bearing plate and nut are required to be threaded onto the top end of reinforcing bars for the pile top to the anchorage, the threading may be continuous spiral deformed ribbing provided by the bar deformations (e.g., Dywidag or Williams continuous thread bars) or may be cut into a reinforcing bar. If threads are cut into a reinforcing bar, provide the next larger bar number designation from that shown on the plans.

(f) Permanent casing. Provide permanent steel casing which meets the following:

(1) Tensile requirements of ASTM A252, Grade 3

(2) Minimum yield strength as shown on the plans

(3) Minimum elongation = 15%

(4) Minimum diameter and wall thickness as shown on the plans

Permanent casing may be new “Structural Grade” (a.k.a. “Mill Secondary”) API Specification 5CT, Grade N80 steel pipe meeting (1) thru (4) above but without Mill Certification, free from defects (dents, cracks, tears) and with two coupon tests per truckload.

Perform welding in accordance with Section 551.09(a). Welding, except as shown on the plans, is not permitted without approval.

The permanent steel casing wall thickness includes an additional 1.6 millimeters of sacrificial steel required for long term corrosion protection.

(g) **Plates and shapes.** ASTM A36M.

(h) **Centralizers.** Fabricate centralizers from plastic, steel, or material that is non-detrimental to the reinforcing steel. Wood centralizers are not allowed.

(i) **Grout.** 725.22 (f). In addition, furnish a grout mixture consisting of fine aggregate.

Construction Requirements

569.03 Related Project Experience. Provide a micropile contractor fully experienced in all aspects of micropile design and construction, and capable of furnishing all necessary equipment, materials, skilled labor, and supervision to carry out the contract. The micropile contractor will have successfully completed at least five projects in the previous five years of similar scope and size, demonstrating experience with similar soil/rock project conditions and demonstrating experience with comprehensive micropile testing. The contractor must also provide résumés of key personnel who will be present on site and materially involved, and who will each have at least three years of relevant experience. Include resumes for superintendent, driller, and project engineer/manager. In addition, at least 30 calendar days prior to the start of construction, submit a project reference and personnel list to the CO. Include a brief project description with the owner’s name, current phone number and load test reports on the project reference list. Identify the system designer (if applicable), supervising engineer, drill rig operators, and on-site foremen on the personnel list.

Do not allow the micropile contractor to sublet the whole or any part of the contract without the express permission in writing of the CO.

569.04 Pre-Installation Submittals. Submit drawings according to Subsection 104.03. Furnish drawings that bear the seal and signature of a professional engineer who is proficient in micropile design and licensed in the state where the project will be constructed. Submit the following:

(a) Proposed construction schedule

(b) Drawings for micropile installation showing:

- (1) Plan and elevation views,
- (2) Micropile number, location and pattern,
- (3) Micropile design load,
- (4) Type and size of permanent casing,
- (5) Type and size of reinforcing steel,
- (6) Type and dimensions of structural steel plates
- (7) Minimum total bond length,
- (8) Corrosion protection system,
- (9) Total micropile length,
- (10) Grouting volumes and maximum pressures,
- (11) Micropile top attachment,
- (12) Micropile cut-off elevation,
- (13) Quantities summary, and
- (14) General construction sequence notes.

(c) Proposed method(s) for constructing and load testing the micropiles. Include all necessary drawings and details to clearly describe the load test method and equipment proposed. Include a schedule of major equipment resources. Include supporting structural design calculations for all structural components of the micropile load test apparatus.

(d) Certified mill test reports for the reinforcing steel, properly marked and as the materials are delivered. Include the ultimate strength, yield strength, elongation, and composition. For steel pipe used as permanent casing submit a minimum of two representative coupon tests on each load delivered to the project. Submit mill certifications if available.

(e) Grout mix designs, including details of all materials to be incorporated and the procedure for mixing and placing the grout. The grout design strength is 27.6 MPa at 28 days and 13.8 MPa at 7 days. Include certified test results verifying the acceptability of the proposed mix designs whereby 100 by 200 mm cylinders are made and standard cured in accordance with AASHTO T23 and tested at 7 and 28 days in accordance with AASHTO T22. The measured grout density shall typically range from 1.8 kg/m³ to 1.9 kg/m³, with grout mixes generally conforming to Section 725.22(f) with fine aggregate.

(f) Calibration reports for each test jack, pressure gauge, and master pressure gauge to be used. An independent testing laboratory must have conducted the tests within 6 months of the date

submitted. Do not commence testing until the CO has approved the jack, pressure gauge and master pressure gauge test components.

Do not start construction of any micropile work for which drawings are required until the CO has accepted the drawings.

A pre-work meeting will be held by the CO prior to the start of micropile installation to clarify construction requirements, coordinate the construction schedule and activities, and identify contractual relationships and delineation of responsibilities amongst the prime Contractor and the various Subcontractors.

569.05 Allowable Tolerances.

- (a) Construct centerline of piling no more than 75mm (3 in.) from indicated pile spacing and plan location.
- (b) Construct the pile-hole alignment within 2% of design alignment.
- (c) Construct the top elevation of pile within +25 mm (+1 in.) of the design vertical elevation.
- (d) Construct the centerline of reinforcing steel no more than 19 mm ($\frac{3}{4}$ in.) from centerline of piling.

Observe site conditions in the vicinity of the micropile construction on a daily basis for signs of ground heave or subsidence. Immediately suspend operations and notify the CO if signs of movement are observed, if the micropile structure is adversely affected, or if adjacent structures are damaged from drilling or grouting. Take corrective actions necessary to stop the movement or perform repairs as directed by the CO.

569.06 Installation Records. The following records will be prepared for the CO within 24 hours after each pile installation is completed. Include the following minimum record information:

- (a) Pile drilling duration and observations (e.g., flush return)
- (b) Soil/rock/water encountered, included in drilling log format
- (c) Approximate final tip elevation
- (d) Cut-off elevation
- (e) Overburden depth,
- (f) Depth to bedrock,
- (g) Description of unusual installation behavior or problems encountered

- (h) Grout pressures attained
- (i) Grout quantities pumped
- (j) Pile materials employed and dimensions,
- (k) Installation methods/equipment employed, and
- (l) Micropile test records, analyses, and details, as applicable

In addition, as-built drawings showing the location of the piles, their depth and inclination, depth to bedrock, and details of their composition shall be submitted within 14 calendar days of project completion.

Execution

569.07 Micropile Installation. Provide a micropile installation technique that it is consistent with the geotechnical, logistical, environmental, and load carrying conditions of the project. Select the drilling method and the grouting procedures used for the installation of the micropiles, subject to the approval of the CO. Provide drilling equipment and methods suitable for drilling through the conditions to be encountered, with minimal disturbance to these conditions or any overlying or adjacent structure or service. After drilling, flush the hole with water and/or air to remove drill cuttings and/or other loose debris. The borehole must be open to the defined nominal diameter, full length, prior to placing grout and reinforcement. Develop methods of stabilizing borehole that in no way have a deleterious effect on the geotechnical bond development of the grout.

Determine and schedule all installation techniques such that there will be no interconnection or damage to piles in which grout has not achieved final set.

Securely attach centralizers and spacers to the reinforcement; sized to position the reinforcement to the tolerances defined in 569.05; sized to allow grout tremie pipe insertion to the bottom of the drill hole; and designed to allow grout to freely flow up the drill hole and casing without misalignment of the reinforcement. Provide centralizers at 3.0 meters maximum vertical spacing and within 1.5 meters from the top and bottom of the reinforcement.

Lower the central reinforcement steel with centralizers into the stabilized drill holes to the desired depth without difficulty. Provide reinforcement that is free of deleterious substances such as soil, mud, grease, or oil that might contaminate the grout or coat the reinforcement and impair bond. Do not drive or force partially inserted reinforcing bars into the hole such that there will be no interconnection or damage to piles in which the grout has not achieved final set.

If, during installation of a pile, an obstruction is encountered that prevents the practical advancement of the pile, abandon the hole and fill with grout. Drill a new pile at a location to be determined by the CO; however, it must be acknowledged that in certain structures, relocation

options may be severely limited, and further attempts at the original location with different methods may be required.

Inject grout according to Section 569.09, below.

Check pile top elevations and adjust all installed micropiles to the planned elevations.

For a minimum of one micropiles at each of the bridge foundation units, advance micropile borings a minimum of 4 meters below the assumed bedrock contact to verify top of bedrock and that piles are not founded on a boulder.

569.08 Pipe Casing and Reinforcing Bar Placement and Splicing. Secure lengths of casing and reinforcing bars to be spliced in proper alignment and in a manner to avoid eccentricity or angle between the axes of the two lengths to be spliced. Locate threaded pipe casing joints at least two casing diameters (OD) from a splice in any reinforcing bar. When multiple bars are used, stagger bar splices at least 300 millimeters. Construct all pile splices to develop the required design strength of the pile section.

569.09 Grouting. Grout micropiles the same day the load transfer bond length is drilled. Provide a grout that does not contain lumps or any other evidence of poor or incomplete mixing. Mix admixtures, if used, in accordance with manufacturer's recommendations. Equip the pump with a pressure gauge to monitor grout pressures. Provide a pressure gauge capable of measuring pressures of at least 1,035 kPa (150 psi) or twice the actual grout pressures used by the Contractor, whichever is greater. Size the grouting equipment to enable the grout to be pumped in one continuous operation. Keep the grout in constant agitation prior to pumping.

Inject the grout from the lowest point of the drill hole by gravity fill (tremie method) until clean, pure grout flows from the top of the micropile. The tremie grout may be pumped through grout tubes, hollow stem augers, or drill rods. Subsequent to tremie grouting, all grouting operations associated with, for example, extraction of drill casing and pressure grouting, must ensure complete continuity of the grout column. The use of compressed air to directly pressurize the fluid grout is not permissible. Control the grout pressures and grout takes to prevent excessive heave in cohesive soils or fracturing of soil or rock formations. Grout the entire pile to the design cut-off level.

There will be no extra payment for grout overruns.

Upon completion of grouting, the grout tube may remain in the hole, but filled with grout. If the Contractor uses a post-grouting system, submit all relevant details including grouting pressure, volume, location and mix design, as part of Section 569.04. Grout within the micropiles shall be allowed to attain the minimum design strength prior to being loaded.

During production, micropile grout shall be regularly tested by the Contractor for compressive strength and consistency. Compressive strength of 100 by 200 mm cylinders shall be determined in accordance with AASHTO T22 at a frequency of no less than one set of three samples from

each grout plant each day of operation, or per every 20 micropiles, whichever occurs more frequently. Cylinders shall be made and standard cured in accordance with AASHTO T23. The compressive strength shall be the average of the three samples tested, and shall meet or exceed the approved mix design strength requirements, as submitted under 569.04. Grout consistency, as measured by grout density, shall be determined in accordance with AASHTO T133 or API RP-13B-1 at a frequency of at least one test per every five piles. Provide grout compressive strength and density test results to the CO within 24 hours of testing.

Pile Load Tests

569.10 Micropile Load Verification Tests. Perform pre-production verification pile load tests to verify the design of the pile system and the construction methods proposed prior to installing any production piles. Construct sacrificial verification test piles as directed in the plans, located as directed by the CO.

Submit for review and acceptance the proposed micropile load testing procedure. Provide the testing program at least two weeks prior to starting the load testing. Provide the micropile verification load testing proposal in general conformance with ASTM D-1143 and D-3689, and indicate the minimum following information:

- (1) Type and accuracy of apparatus for load measurement,
- (2) Type and accuracy of apparatus for applying load,
- (3) Type and apparatus for measuring pile deformation and displacement,
- (4) Type and capacity of reaction load system, including sealed design drawings,
- (5) Hydraulic jack calibration report.

Size the verification test micropile structural steel sections to safely resist the maximum test load. Do not exceed 80 percent of the structural capacity of the micropile structural elements, including steel yield in tension, steel yield or buckling in compression, or grout crushing in compression when the maximum verification (and proof) test loads are applied.

Provide micropile load verification test results that verify the suitability of the Contractor's design and installation methods. The test results will be reviewed and accepted by the CO prior to beginning production micropiles. Provide drilling and grouting methods, casing and other reinforcement details, and depth of embedment for the test pile identical to the production piles, except where approved otherwise by the CO.

Load tested micropiles to 250% of the compression and/or tension design load (DL) (i.e., 2.5 DL). The load tested piles must be of the same design as the production piles to ensure meaningful results. Position the jack at the beginning of the test such that the unloading and repositioning of the jack during the test will not be required. Test piles under compression loads prior to testing under tension loads, as applicable. An Alignment Load (AL), if required, may be applied to the pile prior to setting the movement recording devices. Provide an Alignment Load

no greater than 10% of the Design Load (i.e., 0.1 DL). Zero dial gauges after the first setting of AL.

Conduct axial pile load tests by loading the micropile and recording the pile head movement in the following cyclic load increments:

Table 569-1

Load	Hold Time (Minutes)
AL	1
0.25 DL	1
0.50 DL	1
AL	1
0.25 DL	1
0.50 DL	1
0.75 DL	1
AL	1
0.25 DL	1
0.50 DL	1
0.75 DL	1
1.00 DL	1
AL	1
0.25 DL	1
0.50 DL	1
0.75 DL	1
1.00 DL	1
1.33 DL	60*
1.75 DL	1
2.00 DL	1
2.25 DL	1
2.50 DL	10
AL	1

* Hold until pile meets acceptance criterion (2) below

AL = Alignment Load

DL = Design Load

Thereafter for special test piles not to be later used in service, further load cycles should be conducted to the maximum safe loading capability of the test apparatus or to failure, whichever comes first.

Obtain measurement of pile movement at each increment. Start the load hold period as soon as the test load is applied, and measure and record the pile movement, with respect to a fixed reference. Measure the pile movement during the creep test, and record, at 1, 2, 3, 4, 5, 6, 10, 20, 30, 50, and 60 minutes.

The acceptance criteria for micropile verification load tests are:

- (1) Provide a pile to sustain the compression and tension design loads (1.0 DL) with no more than 10 mm (3/8 in.) total vertical movement at the top of the pile as measured relative to the top of the pile prior to the start of testing. If an Alignment Load is used, then the allowable movement will be reduced by multiplying by a factor of $(DL-AL)/DL$. (This conservatively accounts for the movement in reaching AL).
- (2) Provide test piles that have a creep rate at the end of the 133% DL increment which is not greater than 1 mm/log cycle (0.040 in./log cycle) time from 1 to 10 minutes or 2 mm/log cycle (0.080 in./log cycle) time from 6 to 60 minutes and has a linear or decreasing creep rate.
- (3) Failure does not occur at the 2.5 DL maximum compression and tension loads. Failure is defined as a slope of the load versus deflection (at end of increment) curve exceeding 0.635 mm/kip (0.025 inches/kip).

Provide the CO a written report confirming micropile geometry, construction, and testing details within seven working days following completion of the pre-production verification tests. This report will either confirm the bond lengths as shown in the drawings for micropiles or propose modifications based upon the results of the verification tests.

When a micropile fails to meet the acceptance criteria, establish the cause(s) and provide modifications to the design, the construction procedures, or both. Retest the new system, as directed by the CO. These modifications include, but are not limited to, installing replacement micropiles, modifying the installation methods, increasing the bond length, regrouting via pre-placed re-grout tubes, or changing the micropile type. Any modification which requires changes to the structure must have prior review and acceptance of the CO. Determine the cause for any modifications of design or construction procedures in order to appropriately determine any additional cost implications.

At the completion of verification testing, test piles shall be removed down to the elevation specified by the CO.

Any change in construction method or encounter with a markedly different foundation material should be accompanied by additional verification tests.

569.11 Production Pile Proof Testing. Perform proof load tests on at least one production pile per foundation unit at the Beartooth Ravine Bridge. The piles to be tested will be selected by the CO. At the Contractor's suggestion, but with the CO's concurrence, tension tests may be performed based on maximum DL in compression or tension for friction piles with sufficient structural tension capacity.

Test piles designated for compression or tension proof load testing to a maximum test load of 1.67 times the micropile Design Load, as shown on the Plans or Working Drawings. Proof tests shall be made by incrementally loading the micropile in accordance with the following schedule, to be used for both compression and tension loading:

Table 569-2

Load	Minimum Hold Time (Minutes)
AL	1
0.25 DL	1
0.50 DL	1
0.75 DL	1
1.00 DL	1
1.33 DL	10*
1.67 DL	1
AL	1

* Hold until pile meets acceptance
criterion (2) of next paragraph
AL = Alignment Load
DL = Design Load

The acceptance criteria for micropile proof load tests are:

- (1) Compression and tension design loads (1.0 DL) with no more than 13 mm (1/2 in.) total vertical movement at the top of the pile as measured relative to the pile prior to the start of testing. If an Alignment Load is used, then the allowable movement will be reduced by multiplying by a factor of $(DL-AL)/DL$. (This conservatively accounts for the movement in reaching AL.)
- (2) A creep rate at the end of the 133% DL increment which is not greater than 1 mm/log cycle (0.040 in./log cycle) time from 1 to 10 minutes or 2 mm/log cycle (0.080 in./log cycle) time from 6 to 60 minutes and has a linear or decreasing creep rate.
- (3) Failure does not occur at the maximum compression and tension load increment. Failure is defined as a slope of the load versus deflection (at end of increment) curve exceeding 0.635 mm/kip (0.025 inches/kip).

If a proof-tested micropile fails to meet the acceptance criteria, proof test another micropile in the immediate vicinity. For failed piles and further construction of other piles, modify the design, the construction procedure, or both. These modifications include, but are not limited to, installing replacement micropiles, incorporating piles of reduced load capacities, modifying the installation methods, increasing the bond length, or changing the micropile type. Provide prior review for the approval of the CO of any modification which requires changes to the structure. Decide the cause for any modifications of design or construction procedures in order to appropriately determine any additional cost implications.

Measurement

569.13 Measure Section 569 items listed in the bid schedule according to Subsection 109.02 and the following as applicable.

Measure Micropile load verification tests by each. Do not measure failed verification test micropiles or additional verification test micropiles installed to verify alternative micropile installation methods proposed by the Contractor.

Measure production micropiles by linear meter. Measure from the plan top elevation to the approved tip elevation. No payment will be allowed for grout.

Measure micropile proof load tests by each. Do not measure failed proof test micropiles.

Payment

569.14 The accepted quantities will be paid at the contract price per unit of measurement for Section 569 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Section 602. – CULVERTS AND DRAINS

Material

602.02 Delete the text and substitute the following: Conform to the following Section and Subsections:

Asphalt-coated pipe	707.04
Joint fillers, sealants, and preformed joint seals	712.01
Metallic-coated corrugated steel pipe	707.02
Lean concrete backfill	614
Watertight gaskets	712.03
Precast concrete units	706.07

Construction Requirements

602.03 General. Add the following:

In wetlands, construct culvert inverts so that the existing water surface elevations are maintained.

Use asphalt coated culvert pipe end sections to diminish their visibility.

602.06 Laying Plastic Pipe. Add the following to the second paragraph:

Provide watertight joints for plastic pipe culverts.

Section 609. – CURB AND GUTTER**Description****609.01** Add the following:

This work also consists of constructing paved ditches contiguous to the traveled way.

Construction Requirements**609.03 General.** Add the following:

For asphalt paved ditches, form the bed parallel to the finished surface of the ditch.

609.08A Asphalt Paved Ditch. Perform the work according to Section 404. Before overlaying existing asphalt paved ditches, clean and seal the cracks according to Section 414. Compact according to Subsection 404.07(a). Compact according to Subsection 404.07(b), only if paved ditch cannot be rolled safely.

Measurement**609.10** Delete the subsection and substitute the following:

609.10 Measure the Section 609 items listed in the bid schedule according to Subsection 109.02 and the following as applicable.

Make no deduction in length for drainage structures installed in the curb section or for driveway and handicap access ramp openings where the gutter is continuous across the opening.

Measure curb by the linear meter.

Measure paved ditches by the square meter width horizontally to include total width.

No separate measurement will be made for the asphalt mixture included in asphalt curb or paved ditch.

Section 614. – LEAN CONCRETE BACKFILL**Construction Requirements****614.02** Add the following:

Fly Ash

725.04

614.03 Composition of Mix. Delete Table 614-1 and substitute the following:

**Table 614-1
Composition of Lean Concrete Backfill**

Property	Specification
Cement content	56 kg/m ³ min.
Aggregate particle size	25 mm max.
Aggregate passing 75- μ m sieve	10% max.
7-day compressive strength	1.5 MPa max.

614.04 General. Add the following:

Do not place lean concrete backfill in contact with aluminum, aluminum-coated or plastic culverts.

Section 617. – GUARDRAIL

Material

617.02 Delete the precast concrete anchor reference and substitute the following:

Precast concrete anchors 601

Construction Requirements

617.03 Posts. Add the following:

Use Type IV corrosion resistant steel for guardrail posts in accordance with Section 710.09.

Construct all post systems for the Wyoming Box Beam in accordance with the plans.

617.04 Rail Elements. Add the following:

Construct the Wyoming Box Beam rail sections in accordance with the plans. Paint all Wyoming Box Beam rail sections to match bridge railing.

617.05 Terminal Sections. Add the following:

Construct all terminal sections for the Wyoming Box Beam in accordance with the specials M617-A in the plans. See the Long Lake Outlet Bridge plans for paint color for all such components. Apply paint according to Section 563.

Delete the third paragraph and substitute the following:

Use Type FAT-G3 (Wyoming Box Beam end anchorage type I) as shown in the specials M617-A in the plans. Submit drawings from the manufacturer for the terminal according to Subsection 104.03.

617.06 Connection to Structure. Add the following:

Use the Wyoming Box Beam for the transition rail to connect the guardrail to all the structures on the project. The Wyoming Box Beam has a standard detail shown in the plans for connecting the Wyoming TL-3 bridge rail used on the structures.

Section 620. – STONE MASONRY

Construction Requirements

620.03 General. Delete the first paragraph and replace with the following:

Furnish stone that matches native stone on the project. Salvage original stone masonry on the bridges and culvert headwalls and use the salvaged stone masonry, except as described below, to provide facing for the bridge abutments as called for in the plans. Split exposed face of stone into nominal 10 inch thick pieces maintaining the original size of the exposed face as much as possible. Limit the losses during splitting to 50%. Adjust the method of splitting the stone if losses exceed 50%. Additional rock quarry locations will be available on the project site for use in constructing stone masonry as directed by the CO. Submit stone samples representing the range of colors and sizes to be used on the project to the CO 14 days before beginning work.

Add the following:

Prior to removal of stone masonry, submit a plan that addresses and records the existing stone assembly pattern, removal, temporary storage, resetting, safety, and construction requirements for approval by the CO. Photographs and dimensioning of the existing stone will be required to ensure that the reset stone pattern is similar to the existing historic structures. Submit working drawings and procedures according to Subsection 104.03.

Stockpile salvaged stone adjacent to roadway or parking area within the clearing limits, and away from construction activities. Take all necessary precautions to prevent damage to stone when disassembling.

Ensure the stone masonry work is performed by a journeyman stone contractor experienced in this type of work.

Submit for review by the CO substantiating evidence that the contractor or subcontractor(s) is (are) qualified by previous experience in construction of stone masonry. Include the following:

(a) A list of representative jobs the Contractor or subcontractor has completed using the various procedures required to accomplish this type of work, i.e., furnishing, selecting, and placing the stone.

(b) The name and work history of the person(s) employed by the Contractor or subcontractor(s) who will be in direct supervision of the stone masonry operations. Include a list of projects that such person(s) has been in a position of responsibility for and has successfully completed while in the employment of the Contractor or its subcontractor(s).

Rub dark colored or obsidian sand into mortar joint surfaces before it sets to obtain the color of the Lake Creek Retaining wall mortar joints. Obtain the obsidian sand from an approved source. A commercial source for the obsidian sand is Squire Brick, Inc. in Rexburg, Idaho phone number (208) 356-3324. Dark colored sand material may also be produced on site, utilizing material from the mafic dike area located near the road closure gate east of the Top of the World Store.

620.04 Placing Stone. Add the following:

When removing and resetting stone, place weathered faces outward and in the most visible locations as directed by the CO. The intent is to replicate the original stone appearance at the new locations.

Measurement

620.11 Add the following:

Do not measure excavation, mining, splitting, and handling of all stone but include in the work.

Measure, removal, and resetting stone masonry by the square meter in the structure after resetting.

Section 622. – RENTAL EQUIPMENT

Description

622.01 Add the following:

If normal blasting and excavation activities result in an insufficient quantity of soil pockets on the rock cuts, the CO may order the creation of additional soil pockets utilizing rental equipment.

This work also consists of salvaging willows and sod conservation and placement.

This work also consists of the construction of fill slope terraces, rock soil pockets, and removing and dislodging topsoil from stumps with Item 62201-0350, Backhoe or Item 62201-3000, Hydraulic Excavator.

This work also consists of stump removals along the project. Major clearing was completed in 2005. It is expected that stump removals will be accomplished with Item 62201-1300, Bulldozer, 62201-3000 Hydraulic Excavator, 62201-3150, Hydraulic Excavator with thumb attachment and Item 62201-0350, Dump truck. Estimated hours for the removal of the stumps along the project are shown in the plans.

Section 623. – GENERAL LABOR

Delete the text of this Section and substitute the following:

Description

623.01 This work consists of furnishing workers and hand tools for construction work, survey crews, and/or furnishing qualified personnel to perform technical work ordered by the CO and not otherwise provided for under the contract.

623.02 Workers and Equipment. Furnish competent workers and appropriate hand tools for the work.

Obtain approval of the length of a workday and workweek before beginning the work. Keep daily records of the number of hours worked. Submit the records along with certified copies of the payroll.

623.03 Surveying Services. Furnish personnel, equipment, and material that conform to the requirements of Subsection 152.01. Survey according to Section 152.

Survey and establish controls within the tolerances shown in Table 152-1, or within other tolerances as established by the CO.

Prepare field notes in an approved format. Furnish calculations. All field notes, supporting documentation, and calculations become the property of the Government upon completion of the work.

623.04 Office Technical Services. Furnish qualified engineering personnel experienced in highway construction and design, capable of performing in a timely and accurate manner. Provide personnel with a minimum of NICET Level II certification in highway design and construction, or State (SHA) or industry certification-related design and construction equivalent to their intended responsibilities. Personnel with 2 years or more of recent job experience in the type of highway design and construction provided for under the contract may be used in lieu of certifications. Provide the names and relevant experience of all personnel. Furnish supporting tools and equipment (e.g., calculator, computer, and software, and appropriate and commonly-used drafting tools for the assigned task).

All calculations, notes, and supporting documentation become the property of the government upon completion of the work.

623.05 Acceptance. Additional surveying services will be evaluated under Section 152.

Hired technical services will be evaluated under Subsections 106.02 and 106.04

Measurement

623.06 Measure the Section 623 items listed in the bid schedule according to Subsection 109.02 and the following as applicable.

Round portions of an hour up to the nearest half hour. Measure time in excess of 40 hours per week at the same rate as the first 40 hours.

For surveying services, the minimum field survey crew is two persons. Measure surveying service by the crew hour. Do not measure time spent in making preparations, performing calculations, plotting cross-sections and other data, and processing computer data, and other efforts necessary to successfully accomplish the ordered survey services.

Do not measure time for worker's transportation time to and from the project site.

Measure office technical services by the hour as ordered by the CO for performing calculations, plotting cross-sections and other data, and processing computer data.

Payment

623.07 The accepted quantities will be paid at the contract price per unit of measurement for the Section 623 pay item listed in the bid schedule. Payment will be full compensation for the work prescribed in this section. See Subsection 109.05.

Section 624. – TOPSOIL

Description

624.01 Add the following:

This work also consists of preparing a topsoil handling plan and submitting the plan to the CO for approval, prior to beginning work.

Construction Requirements

624.03 Preparing Areas. Delete the second sentence and substitute the following:

Prior to placing topsoil in areas not roughened under Section 204.13, disk or scarify slope to a depth of 300 millimeters in a direction perpendicular to the natural flow of water. Rake out

obvious furrows. Leave slopes with small depressions, up to 150 mm deep and 300 mm in diameter, on all cut and fill slopes for seed and plant establishment.

624.04 Placing Topsoil. Add the following:

Spread conserved topsoil at depths ranging from 100 mm to 200 mm thick as directed by the CO. In wetland and riparian areas, spread conserved topsoil at depths ranging from 300 mm to 450 mm.

Do not stockpile topsoil at depths greater than 1.2 m, except stockpiling of topsoil stripped at the Ghost Creek Material source may vary in height, as necessary for material processing requirements, as approved by the CO.

If the conserved quantities of topsoil in a specific area are not sufficient to obtain the designated depth pursuant to Section 204.05, the CO may approve use of additional topsoil from a nearby area on the project. If determined necessary by the CO, place reduced topsoil thicknesses on the lower one-third of the embankment slopes and the least visible portions of the cutslopes as directed by the CO. Remove all equipment marks from the soil.

On rock slopes, place and lightly compact topsoil in depressions, pockets, and ledges to establish areas for planting and vegetation. If necessary, use special equipment and manual methods to completely fill all pockets with compacted topsoil over the entire rock face.

Use all conserved topsoil on disturbed slopes. Coordinate grading operations so that topsoil is replaced on the slopes within 30 days of stockpiling, unless otherwise approved by the CO. Replacement of topsoil stripped at the Ghost Creek Material source may be longer than 30 days, as necessary for material processing requirements, as approved by the CO.

Do not import topsoil from outside of the project area or move it from its conserved location unless approved by the CO.

Prepare a topsoil handling plan for the project detailing the salvaging, windrowing, and replacement of topsoil. Describe the process, including equipment to be used, by which topsoil will be salvaged, windrowed, and replaced to maximize the amount of topsoil conserved. Describe how extra topsoil, if any, will be salvaged and placed in those areas deficient in topsoil.

Payment

624.07 Add the following: Payment for construction of rock cut soil pockets and boulder field section placement will be made under Section 622.

Section 625. – TURF ESTABLISHMENT**Construction Requirements****625.03 Turf Establishment Seasons.** Add the following:

The CO may approve turf establishment beyond 30 days from completion of grading activities if the CO determines that turf establishment would be more successful if delayed.

625.04 Preparing Seedbed. Delete the first paragraph and substitute the following:

Grade seeding area to line and grade as described in Section 624. Remove all weeds and other debris detrimental to application, growth, or maintenance of turf. Remove all stones greater than 1.2 meters in diameter unless approved by CO to remain as landscape features. Do not grade the area completely smooth. Leave small depressions in the topsoil between 75 mm and 150 mm in diameter for establishment of plants and seed.

625.06 Fertilizing. Add the following:

(a) Dry method. Apply an organic fertilizer at a rate of 1,690 kg/ha. Use standard agricultural seed/fertilizer spreaders or other application equipment approved by the CO. Calculate the application rate for the organic fertilizer on a dry weight basis. Do not consider water, soil material, rock or other impurities as part of the application rate. For a specified application rate, apply the amendment in an appropriate, uniform manner across the project site. Do not apply the organic fertilizer during windy conditions strong enough to displace material. The CO may halt application during such conditions.

Following amendment application, rake or harrow the soil to incorporate the fertilizer to a depth of 50 mm. Ensure a complete and uniform mix of the organic fertilizer and soil to a depth of 50 mm. Remove all equipment tracks.

Complete all harrowing and raking within 48 hours of amendment application. Harrow or rake so that soil and organic fertilizer are uniformly spread over the seeded area. Ensure equipment trucks are not visible when completed.

625.07 Seeding.**(a) Dry method.** Delete the paragraph and substitute the following:

(a) Dry method. Apply the seed with approved power driven seeders, drills, or other mechanical equipment. Hand-operated seeding methods are satisfactory on areas inaccessible to mechanical equipment.

625.08 Mulching. Delete the text and substitute the following:

Avoid application of surface mulch to bare rocks. Apply mulch within 48 hours after seeding by the following methods:

(b) Hydraulic method. Apply bonded fiber matrix at a rate of 3,400 kg/ha. Apply so no hole in the matrix is greater than 10 mm. Apply so that no gaps exist between the matrix and soil. Apply according to manufacturer's recommendations.

625.09 Protecting and Caring for Seeded Areas. Delete the subsection and substitute the following:

625.09 Protecting and Caring for Seeded Areas. Protect and care for seeded areas including watering when needed. Repair or apply supplemental applications of seed, mulch, fertilizer, and water as many times as needed until turf is established or final acceptance.

Section 626. – PLANTS, TREES, SHRUBS, VINES, AND GROWDCOVERS**Description****626.01** Add the following:

This work also includes planting vegetation in accordance with the plant lists identified in Section 713.06 and according to Specials M626-7B through 7D. The work also includes and willow transplants.

This work also includes construction of fill slope terraces, rock cut soil pockets, and boulder field sections as indicated on Specials M626-8 B-D and M626-9 A-C.

Construction Requirements**626.03 General.** Add the following:

All 164 ml (supercell type), 262 ml (deepot type) and 1,835 ml (minimum 0.5 gallon) plant materials must be planted between April 15 and June 30. A fall planting schedule may be allowed at the direction of the CO; however, the warranty requirement of Subsection 626.13 will still apply. Plant all containerized plant materials with an 884 ml gel pack as described in Section 713.06.

Salvaged Willows. Salvage selected mature willows with root balls ranging in size from 0.6 to 1.0 m from wetland and riparian areas to be impacted during clearing and grubbing operations. Equipment used must be capable of handling willows and root balls so that root balls remain intact, and branches remain intact to the extent practicable. Salvage willows as follows:

(a) Prune all dead or unhealthy branches, and 1/3 of live healthy branches.

(b) Excavate the root ball insuring that the root ball remains intact. Provide hydraulic excavator with thumb.

Supply all necessary water to plant materials to ensure health and survival.

Willow Sprigs. Cut live willow sprigs from existing willows found on the site as directed by the CO. Cut the existing willows 200 to 250 mm from the ground with loppers or hand saws. Make cuts at a 45-degree angle. Cut willow sprigs approximately from 900 mm to 1200 mm long and between 12 to 25 mm in diameter.

Collect and plant willow sprigs before the willows break dormancy. Dormancy has been broken when green leafy material of any size is present on the plant. In the project area, dormancy may be broken between April and June, depending on the elevation and annual climatic conditions.

626.05 Protection and Temporary Storage. Add the following:

Transplant salvaged willows and other plant materials immediately after salvaging unless storage is approved by the CO.

When storage of salvaged willows or other plant material is unavoidable, store plant materials to ensure survival and health. Supply all necessary water to plant materials to ensure health and survival. Create planting beds in stockpile areas in which to temporarily plant salvaged willows. Plant roots must at no time become dry or be exposed to air for more than 10 minutes.

If stockpiling of salvaged willows is necessary, dig pits or a trench for placement of willows that allows soil backfill to completely cover the root ball. Water willows to ensure survival during temporary storage. If salvaged willows do not survive, or are in an unhealthy condition when transplanting is to proceed, replace stored willows with newly salvaged willows at the direction of the CO.

626.06 Excavation for Plant Pits and Beds. Add the following:

For plant material with minimum container sizes of approximately 164 ml, 262 ml and 1,835 ml dig pits the size of the plant material and ensure the pit contains a gel pack as described in Section 713.06. Scarify the edges of the pits. Remove all plastic or other containers, labels, etc. prior to planting.

For salvaged willows, dig a pit that accommodates the salvaged willow root ball so that soil backfill will completely cover the root ball. Pit sizes depending on root ball size. Size pits so that no air pockets are left around the root ball following transplanting.

Plant willow sprigs with the cut end planted first. Create a minimum 600 mm deep hole to insert the willow sprigs. Insert a minimum 65% of the sprig into the hole. Plant willow sprigs so that

the bottom 100 mm of the willow sprig will be below the final water table at the site. Leave the upper 300 mm above the soil surface.

(b) Depth of excavation. Add the following:

(2) Deciduous and evergreen shrubs. Add the following:

(c) Salvaged willows. A minimum of 0.15 m deeper than the root ball to be planted.

(4) Vines and groundcovers. Delete the text and substitute the following:

Double the depth of the pot.

Add the following:

(5) Herbaceous plants.

(a) Under 60 cm height. 250 mm.

626.07 Setting Plants. Delete the second paragraph and substitute the following:

Set all plants approximately plumb and at the same level or slightly lower than the depth at which they were grown in the nursery or collected in the field. Plants should be placed in small depressions, adjacent to logs or rocks where possible. Refer to Landscaping Detail Special M626-8 for more detailed instructions. Set plants to match vegetation patterns in adjacent undisturbed areas. Set plants in pits to minimize air pockets around the root ball. Areas for plants in Plant Lists 1 and 2 are shown on the Revegetation Plans. Plant lists and planting locations for landscape plans are shown on the Site Specific Landscape Plans.

626.09 Watering. Add the following:

Place 164 ml, 262 ml and 1,835 ml plant materials in small basins, make the diameter of the basin equal to that of the plant pit (about 125 mm in diameter).

Place salvaged willows in basins about 0.33 m larger than the root ball.

626.13 Plant Establishment Period. Delete the title and text of this Subsection and substitute the following:

626.13 Warranty Requirement.

Provide a one year warranty period from the date of final acceptance. Ensure 80% survival rate after one year. If less than 80% survival rate, replace any plant materials that have died during the warranty period up to 80% of original number planted.

Measurement**626.15** Add the following:

Do not measure rock cut soil pockets and boulder field section placement.

Landscaping boulders for the boulder field section placement will be measured under item 25125-0000.

Rock slope soil pockets will be measured according to Section 622, Rental Equipment.

Payment

626.16 Add the following: Payment for equipment hours for salvaged willows will be made under Section 622.

Section 627. – SOD**Description****627.01** Add the following:

This work also consists of removal, stockpile, and transplanting of wetland sod pockets as shown on the plans.

Construction Requirements**627.03 General.** Delete the text and substitute the following:

Move and lay sod during dry weather and on un-frozen ground.

Transplant salvaged wetland and upland sod immediately after salvaging unless storage is approved by the CO. If storage of salvaged sod is necessary, the CO will approve the location and methods to ensure survival. If storage is approved, supply two times the amount of salvaged sod required in the plans. Do not store salvaged sod more than one layer deep, and do not pile salvaged sod chunks on top of other salvaged sod. Store salvaged sod with the vegetation up and the roots down. Supply all necessary water to ensure health and survival as directed by the CO. Place salvaged sod chunks adjacent to one another so that moisture is maintained between sod chunks. Place subsoil material around the edges of salvaged sod to keep the edges from drying. Sod roots must at no time become dry or be exposed to air. The CO must approve all sod before planting.

627.04 Inspecting and Delivering. Delete the text and substitute the following:

Wetland Sod. Conserve wetland sod from areas within the construction limits during construction. Conserve sod only from wetland areas to be filled or removed by roadway construction. Provide at least 14 days notice before cutting sod. The CO will approve the sod for use in its original position before cutting. Harvest wetland sod 1.2 meters in diameter and 400 mm thick. Conserve sod so that the entire root zone is gathered and in one cohesive piece. Provide hydraulic excavator with thumb or approved equipment as directed by the CO to excavate sod.

Upland Sod. Conserve upland sod 300 mm in diameter. Conserve sod so that the entire root zone is gathered and in one cohesive piece, typically 100 mm deep. Disturb only the minimum area of soil necessary to remove upland sod. If sod is removed from areas not to be disturbed by construction, following removal of upland sod, repair the depression from which the sod was removed by back filling with topsoil.

627.05 Preparing the Soil. Delete the second paragraph and substitute the following:

Topsoil according to Section 624. Prepare depressions in the topsoil the size of the sod piece to be transplanted.

627.06 Placing Sod. Add the following:

Place sod in depressions in the soil so that the elevation of the top of soil in the sod chunk matches the elevation of adjacent topsoil. Pack topsoil around the edges of the sod and lightly compact sod chunks to eliminate air pockets adjacent to and under the sod.

Following placement, water sod within 2 hours so that the entire sod transplant is saturated.

Payment

Add the following Subsection:

627.10 Add the following: Payment for equipment hours for sod conservation and placement made under Section 622.

Section 629. – ROLLED EROSION CONTROL PRODUCTS AND CELLULAR CONFINEMENT SYSTEMS

Construction Requirements

629.05 Erosion Control Blanket, Open Weave Textile, and Turf Reinforcement Mat (RECP, Types 1.B, 1.C, 1.D, 2.B, 2.C, 2.D, 3.B, 4, 5.A, 5.B, and 5.C). Add the following:

Install erosion control mats on soil surfaces that are at final grade, stable, firm, and free of rocks or other obstructions. Spread erosion control mats evenly and smoothly, without stretching, to ensure direct contact with the soil at all points. Unroll erosion control mats parallel to the

drainage flow direction. Lap edges as recommended by the manufacturer. Install mats from the bottom up, so that upper mats overlap lower mats.

Place the upslope end in a 150-mm vertical slot. Backfill the slot and compact.

Place staples, rebar, and rock at a minimum spacing of 900 mm to ensure that the mat does not break free from the soil, and that the mat is in contact with the soil surface at all times. Voids between the mat and the soil surface will not be accepted, even in small depressions. Place staples in depressions so that the mat is in full contact with the soil surface.

629.05 (a) Slope Installations. Delete the text and substitute the following:

(a) Slope Installations. At the top of the slope, anchor the RECP by using an anchor trench.

(1) Anchor trench. Construct a 150-mm by 150-mm trench. Extend the upslope terminal end of the RECP 900 mm past the trench. Use staples on 300-mm centers to fasten the RECP into the trench. Backfill the trench and compact the soil. Secure the terminal end with a single row of staples on 300-mm centers and cover the end with soil. Apply turf establishment to trench.

Securely fasten all RECP to the soil by installing staples according to the manufacturer's recommendations.

Section 633. – PERMANENT TRAFFIC CONTROL

Description

633.01 Add the following:

This work also consists of constructing permanent snow pole delineator holders at the Long Lake Outlet Bridge as indicated in the plans.

Material

633.02 Add the following:

Snow pole delineator holder

Schedule 40 PVC

Timber material for snow poles will be provided by the National Park Service.

Construction Requirements

633.05 Panels. Delete the first paragraph and substitute the following:

Use type III, IV, VII, VIII, IX, or X retroreflective sheeting. For permanent sign panels, use type L-1 or L-3 letters, numerals, arrows, symbols, and borders. Cut panels to size and shape and drill or punch all holes. Make panels flat and free of buckles, warp, dents, cockles, burrs, and other defects.

633.05 Panels. Add the following at the end of the Subsection:

For all permanent sign panels, uniformly apply a protective overlay film to the front and back of the perimeter of the sign panel. Apply film using methods recommended by the manufacturer and provide a minimum of a 50-millimeter border of protective film along the front and back face and edge of the sign panel. Provide clear and colorless protective film. Film must be manufactured expressly for use as a protective overlay film for outdoor signs.

Film must be applied during manufacture of signs; field installation is not permitted.

633.06 Delineators and object markers. Add the following:

Construct the snow pole delineator holders as detailed on special M633-C.

633.07 Removing and Resetting Permanent Traffic Control Devices. Add the following:

Replace all existing sign posts with steel posts as indicated on the plans.

Measurement

633.09 Add the following:

Do not measure snow pole delineator holders for payment.

Payment

633.10 Add the following:

Payment for snow pole delineator holders will not be made. They are considered subsidiary to Item 63309-1000, Delineators, type snowpole.

Section 634. – PERMANENT PAVEMENT MARKINGS

Construction Requirements

634.03 General. Delete the last sentence of the first paragraph and substitute the following:

For simple curve widening locations (widening only on one side) shift the centerline striping location such that the centerline stripe is midway between the normal edge of shoulders. The

shift from the staked centerline will be towards the widened lane one-half the total curve widening specified for the given station as shown in the plans.

Add the following:

The Contractor may use, upon approval, permanent pavement marking materials and layouts meeting current state approved standards that are practiced in the region of the project in lieu of contract requirements, if the state standards meet the requirements of the MUTCD. The material substituted must be equivalent to that required in the specifications. Obtain the CO's approval before incorporating into the work. When requesting approval, furnish to the CO the applicable state standards (specifications and drawings), manufacturer's name and address, supplier's certification indicating material is produced to state approved specifications, pricing data showing cost difference for labor and materials, and any other available information describing application and performance. When directed, submit samples for approval at the Contractor's expense. Within 14 days, the CO will inform the Contractor as to the acceptance of the request. The unit price for the contract item(s) will be reduced to reflect any cost savings.

634.05 Waterborne Traffic Paint (Type B and C). Delete the second paragraph and substitute the following:

On new asphalt pavements or new asphalt surface treatments, apply two coats. Apply the first coat at 5.2 square meters per liter and the second coat at a rate of 2.6 square meters per liter. Do not use glass beads on the first coat.

Section 635. – TEMPORARY TRAFFIC CONTROL

Construction Requirements

635.07 Construction Signs. Delete the Subsection and substitute the following:

Use type III, IV, VII, VII, IX, or X retroreflective sheeting. For roll-up signs, use type VI retroreflective sheeting. Remove or completely cover all unnecessary signs with an acceptable material. Acceptable materials include plywood, hardboard, sheet metal, aluminum, corrugated polypropylene board, or rigid plastic, durable enough to resist deterioration due to weathering and atmospheric conditions for the duration of the project. Do not use adhesives, glues, tapes, or mechanical fasteners that mar the face of the panel to be masked.

Provide the same type of sheeting on all post-mounted construction signs that pertain to the project.

Use crashworthy posts within the traversable area adjacent to traffic. Install posts according to Section 633.

635.09 Flaggers. Delete the Subsection and substitute the following:

Use flaggers certified by the American Traffic Safety Services Association, the National Safety Council, the International Municipal Signal Association, a state agency, or other acceptable organization. Perform the work described under MUTCD Part 6. Use type III, IV, VII, VIII, IX, or X retroreflective sheeting on the “STOP” side of the flagger paddle. Use fluorescent retroreflective sheeting on the “SLOW” side of the flagger paddle.

635.13 Temporary Pavement Markings and Delineation. Delete the text and substitute the following:

Before opening a pavement surface to traffic, remove all conflicting pavement markings by sandblasting or other methods that do not damage the surface or texture of the pavement. Make removal pattern uneven so it does not perpetuate the outline of the removed pavement markings. Lightly coat sandblasted or removal areas on asphalt surfaces with emulsified asphalt.

Provide pavement markings or delineation and signing according to Section 156, the MUTCD, and project plans. Install and maintain temporary pavement markings that are neat, crack free, true, straight, and unbroken.

For seasonal suspensions, apply permanent pavement marking pattern with temporary traffic paint.

Install permanent pavement markings within 14 days. If permanent pavement markings are not placed within 14 days, provide, at no cost to the contract, additional temporary delineation equivalent to the permanent pavement marking pattern required by the contract. Do not apply temporary traffic paint to the final surface.

For temporary pavement markings, use preformed retroreflective tape, traffic paint, or temporary raised pavement markers as follows:

(a) Temporary markings. For temporary pavement markings, use preformed retroreflective tape, traffic paint, or temporary raised pavement markers as indicated in the plans and as follows:

(1) Preformed retroreflective tape. Apply according to the manufacturer's instructions. Remove all loose temporary preformed retroreflective tape before placing additional pavement layers.

(2) Temporary traffic paint. Apply temporary traffic paint at a 0.38-millimeter minimum wet film thickness (0.38 liters per square meter). Immediately apply type 1 glass beads on the paint at a minimum rate of 0.7 kilograms per liter of paint.

(3) Raised pavement markers. When chip seals, slurry seals, or tack coats are used after marker placement, protect the markers with an approved protective cover, which is removed after the asphalt material is sprayed.

Remove all temporary pavement markers before placing additional pavement layers. Remove all temporary pavement markings from the surface course before placing permanent pavement markings.

(b) Delineation for unmarked pavements with vehicle positioning guides. For ADT's greater than 1000, vehicle positioning guides may be used in lieu of temporary markings for the delineation of unmarked pavements for a period of no longer than 3 days. For ADT's of 1000 or less, vehicle positioning guides may be used in lieu of temporary markings for the delineation of unmarked pavements for the full 14 day temporary marking period.

For unmarked pavements, install signing and vehicle positioning guides as indicated on plan sheet M635-3. Use vehicle positioning guides that meet the requirements of Subsection 718.21(b), raised pavement markers.

Remove all vehicle positioning guides before placing additional pavement layers. Remove all vehicle positioning guides from the surface course before placing permanent pavement markings.

Measurement

635.26 Delete the tenth paragraph and substitute the following:

Measure temporary pavement markings by the kilometer along the centerline of the roadway. Measure temporary pavement markings as a single measurement, inclusive of all markings, from end to end regardless of color, material type, or number of lines. Do not deduct for standard gaps between stripes. Measure only one application of temporary pavement markings per lift.

Measure vehicle positioning guides used at the option of the Contractor in lieu of temporary markings as equivalent temporary pavement markings. When vehicle positioning guides exceed the period of use stated in the plans, provide additional temporary or permanent pavement markings at no cost to the Government. Measure vehicle positioning guides by the kilometer along the centerline of the roadway. Measure as a single measurement, inclusive of all markings, from end to end regardless of material type, gaps or number of lines. Measure only one application of vehicle positioning guides per lift. "DO NOT PASS", "PASS WITH CARE", and "NO CENTER STRIPE" signs required to be used with vehicle positioning guides are subsidiary to the temporary pavement marking item. Do not measure these signs as construction signs.

Add the following Section:

Section 647. – ROADSIDE DEVELOPMENT

Description

647.01 This work consists of limbing, placing and staking salvaged logs on finished slopes. Generate logs for this operation during the clearing and grubbing operations as directed by the CO.

Material

647.02 Materials shall conform to the following subsections:

Logs

713.19

Construction Requirements

647.03 Limbing. Limb logs and trees on one side. Use all salvaged logs before removing other live trees. Prior to selective clearing operations meet with the CO to determine which trees to salvage for landscaping logs.

647.04 Placing. Place and anchor all logs before completing work under Section 624. Place logs on all erodible slopes as directed by the CO. Stagger and place logs in a random fashion to prevent the appearance of a pattern. Lay logs flush with ground line.

647.05 Anchoring. Anchor logs to the slopes using 75x75 millimeter hardwood stakes. Drive stakes perpendicular to the ground line to a minimum depth of 450 millimeters. Use a minimum of three stakes to anchor logs of 3.0-meter length and a minimum of five stakes to anchor logs in excess of 200 millimeters in diameter. Use an additional stake for every 1.0 meter in length beyond the 3.0 meter minimum. Tops of stakes should not extend above the log, and should not protrude from the ground less than one-half the diameter of the log. Reinforcing steel (no. 5), 750 millimeters in length may be used in areas where wood stakes cannot be driven.

647.06 Acceptance. Logs for landscaping will be evaluated under Subsection 106.02 and 713.19.

Measurement

647.07 Measure logs by the each, in place, completed and accepted.

Payment

647.08 The accepted quantities will be paid at the contract unit price per unit of measurement for the Section 647 pay item listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Section 701. – CEMENT

701.01 Hydraulic Cement Delete the text and substitute the following:

701.01 Hydraulic Cement Do not mix cement brands or types.

(a) Portland Cement. Conform to AASHTO TM 85.

When Prestressed Concrete is specified, Type III cement is allowed.

(b) Blended Hydraulic Cement. Conform to AASHTO M 240.

Section 702. – ASPHALT MATERIAL

702.01 Asphalt Binder. Delete the Subsection and add the following:

702.01 Asphalt Binder. Conform to M 320, Table 1. Conform to Subsection 702.04.

In AASHTO M 320, Table 1 replace footnote *g* with the following:

⁸ If the creep stiffness is below 300MPa, the direct tension test is not required. If the creep stiffness is between 301 and 600 MPa, the direct tension failure strain requirement shall be used in lieu of the creep stiffness requirement. The *m*-value requirement must be satisfied in both cases.

702.03 Emulsified Asphalt. Add the following:

(e) Other emulsified asphalts. Other emulsified asphalts not covered by item (a) through (d) will conform to the following:

(1) Saybolt furol viscosity at 50°C, AASHTO T 59	15 - 150 sec
(2) Settlement, AASHTO T 59	1% max.
(3) Residue by distillation, AASHTO T 59	65% min.
(4) Oil Distillate by volume, AASHTO T 59	25% max.
(5) Solubility in trichloroethylene, AASHTO T 44	97.5 % min.

Add the following:

(f) Penetrating emulsions for prime coat. When a penetrating emulsified asphalt is used for a prime coat, conform to Table 702-5. Follow AASHTO T 59 test method except where noted.

Table 702-5
Penetrating Emulsion for Prime Coat

Tests on emulsion:	Minimum	Maximum
Viscosity, Saybolt Furol at 50°C, sec	15	150
Settlement, 24-hours, %	---	1
Residue by evaporation, %	62	---
Tests on Residue		
Penetration, 25°C, 100 g, 5 sec AASHTO T 49	40	200
Solubility in trichloroethylene, % AASHTO T 44	97.5	---

Section 703. – AGGREGATE

703.01 and 703.02 Delete the Subsections and substitute the following:

703.01 Fine Aggregate for Concrete. Furnish sand conforming to AASHTO M 6, class B, except as amended or supplemented by the following:

- (a) Material passing 75 µm sieve, AASHTO T 11 3.0% max.
- (b) Sand equivalent value, AASHTO T 176,
alternate method no. 2, reference method 75 min.
- (c) Meet alkali-silica reactivity requirements of 703.02

For lightweight fine aggregate, conform to AASHTO M 195

703.02 Coarse Aggregate for Concrete. Conform to AASHTO M 80, class A, except as amended or supplemented by the following:

- (a) Los Angeles abrasion, AASHTO T 96 40% max.
- (b) Adherent coating, ASTM D 5711 1.0% max.
- (c) Grading, AASHTO M 43 All sizes except
numbers 8, 89, 9, or 10.

For bridge decks or surface courses, do not use aggregates known to polish or carbonate aggregates containing less than 25 percent by mass of insoluble residue as determined by ASTM D 3042.

For lightweight coarse aggregate, conform to AASHTO M 195.

Alkali-silica reactivity. Test the fine and coarse aggregate for alkali silica reaction and conform to one of the following (1) through (5). Lithium compounds are not allowed as mitigation measures.

- | | |
|---|---|
| (1) Alkali-silica reactivity, ASTM C 1260 | ≤0.10% at 16 days after casting. |
| (2) Alkali-silica reactivity, ASTM C 1260 | 0.11% to 0.20% at 16 days after casting. |
| <i>and provide one of the following examinations:</i> | |
| (a) Petrographic examination of aggregates, ASTM C 295 | Favorable report for use performed within one year from the time of submittal. |
| <i>or</i> | |
| (b) Petrographic examination of hardened concrete, ASTM C 856 | Favorable report for use performed on ASTM C 1260 specimens after test. |
| (3) Alkali-silica reactivity with cementitious materials, ASTM C 1567 | ≤0.10% at 16 days after casting performed on approved mix design mass percent combinations. |
| (4) Alkali silica reaction, ASTM C 1293 | <0.04% at 12 months. |
| (5) Alkali-silica reaction with cementitious materials ASTM C 1293 | <0.04% at 24 months performed on approved mix design mass percent combinations. |

703.06 Crushed Aggregate. Add the following to the end of the paragraph:

When aggregate is used as a surface course, furnish an aggregate with a Plasticity Index conforming to Table 703-3a.

Table 703-3a
Surface Course Gradation and Plasticity Index

Sieve Size	Percent by Mass Passing Designated Sieve (AASHTO T 27 and T 11)
19.0 mm	100
4.75 mm	41-71
425 µm	12-28
75 µm	5-20
Plasticity Index (PI)	4-12

703.07 Hot Asphalt Concrete Aggregate. Delete the Subsection and substitute the following:

703.07 Hot Asphalt Concrete Aggregate. Furnish hard, durable particles or fragments of crushed stone, crushed slag, or crushed gravel conforming to the following:

- (a) Los Angeles abrasion, AASHTO T 96 35% max.
- (b) Sodium sulfate soundness, AASHTO T 104 (5 cycles):
Coarse aggregate 12% max.
Fine aggregate 12% max.
- (c) Fractured faces, ASTM D 5821 (one or more) 90% min.
- (d) Fine aggregate angularity, AASHTO T 304 (method A) 40% min.
- (e) Flat and elongated particles, ASTM D 4791 (1:5 ratio, +9.5 mm sieve, calculated by mass, weighted average) 10% max.
- (f) Sand equivalent AASTHO T 176 (referee method, alt 2) 45 min.

(g) Gradation. Size, grade and combined the aggregate fractions in mix proportions that result in a composite blend meeting the specified gradation. Nominal maximum size is one sieve size greater than the first sieve to retain more than 10 percent of the combined aggregate. Test according to AASHTO T 27 and T 11.

(1) See Table 703-12 for Superpave aggregate gradation.

(2) See Table 703-4 for Hveem or Marshall aggregate gradation.

For surface course, 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 D 3042.

703.10 Asphalt Surface Treatment Aggregate.

Delete lines (a) through (h) and substitute the following:

(a) Gradation	Table 703-7
(b) Los Angeles abrasion, AASHTO T 96	40% max.
(c) Sodium sulfate soundness loss (5 cycles) AASHTO T 104	12% max.
(d) Fractured faces, one or more, ASTM D 5821	90% min.
(e) Flat and elongated particles, 1:3 ratio. + 9.5 mm sieve, calculated by mass, weighted average, ASTM D4791	10% max.
(f) Clay lumps and friable particles, AASHTO T 112	1.0% max.
(g) Adherent coating, ASTM D 5711	0.5% max.

Table 703-7. Delete Table 703-7 and substitute the following:

**Table 703-7
Target Value Ranges for
Single and Multiple Course Surface Treatment Aggregate Gradation**

Sieve Size	Percent by Mass Passing Designated Sieve (AASHTO T 27 & T 11)					
	Grading Designation					
	A	B	C	D	E	F
37.5 mm	100 ⁽¹⁾					
25.0 mm	90 – 100 (3)	100 ⁽¹⁾				
19.0 mm	0 – 35 (5)	90 – 100 (3)	100 ⁽¹⁾			
12.5 mm	0 – 8 (3)	0 – 35 (5)	90 – 100 (3)	100 ⁽¹⁾		
9.5 mm	---	0 – 12 (3)	0 – 35 (5)	85 – 100 (3)	100 ⁽¹⁾	100 ⁽¹⁾
4.75 mm	---	---	0 – 12 (3)	0 – 35 (5)	85 – 100 (3)	85 – 100 (1)
2.36 mm	---	---	---	0 – 8 (3)	0 – 23 (4)	---
75 µm	0 – 1 (0.5)	0 – 1 (0.5)	0 – 1 (0.5)	0 – 1 (0.5)	0 – 1 (0.5)	0 – 10 ⁽¹⁾

⁽¹⁾ Statistical procedures do not apply.

() The value in parentheses is the allowable deviation (±) from the target value.

703.13 Blotter.

Delete lines (a) through (c) and substitute the following:

- | | |
|--|---------|
| (a) Material passing 9.5 mm sieve, AASHTO T 27 | 100% |
| (b) Liquid limit, AASHTO T 87 and T 89 | 25 max. |
| (c) Free of organic matter and clay balls | |

Section 704. – SOIL

704.02 Bedding Material. Delete the text and substitute the following:

- | | |
|--|--|
| (a) Maximum particle size depth, | 12.5 mm or half the corrugation whichever is smaller |
| (b) Material passing 75- μ m sieve, AASHTO T 27 and T 11 | 10% max. |

704.03 Backfill Material. Add the following:

- | | |
|-------------------------------|---------|
| (c) Backfill in wetland areas | |
| (1) Maximum particle size | 75 mm |
| (2) Minimum particle size | 6.25 mm |

704.04 Structural Backfill. Delete line (c) substitute the following:

- | | |
|---------------------------------------|---------|
| (c) Liquid limit, AASHTO T 87 and T89 | 30 max. |
|---------------------------------------|---------|

704.07 Select Borrow. Delete line (b) substitute the following:

- | | |
|---------------------------------------|---------|
| (b) Liquid limit, AASHTO T 87 and T89 | 30 max. |
|---------------------------------------|---------|

704.09 Bed Course. Delete line (b) substitute the following:

- | | |
|---------------------------------------|---------|
| (b) Liquid limit, AASHTO T 87 and T89 | 30 max. |
|---------------------------------------|---------|

Section 705. – ROCK

705.02 Riprap Rock. Delete lines (a), (b), (c), (d), and substitute the following:

- | | |
|--|-----------|
| (a) Apparent specific gravity, AASHTO T 85 | 2.40 min. |
|--|-----------|

- (b) Absorption, AASHTO T 85 4.0% max.
- (c) Los Angeles abrasion, AASHTO T 96 50% max.
- (d) Gradation for the class specified Table 705-1

Table 705-1
Gradation Requirements for Riprap

Class	Percent of Rock by Mass	Mass (Kg)	Approximate Cubic Dimension ^{(1) (2)} (millimeters)
1	20	10 to 25	150 to 200
	30	5 to 10	125 to 150
	40	0.5 to 5	50 to 125
	10 ⁽¹⁾	0 to 0.5	0 to 50
2	20	25 to 50	200 to 250
	30	10 to 25	150 to 200
	40	1 to 10	75 to 150
	10 ⁽¹⁾	0 to 1	0 to 75
3	20	100 to 150	350 to 400
	30	50 to 100	250 to 350
	40	5 to 50	125 to 250
	10 ⁽¹⁾	0 to 5	0 to 125
4	20	250 to 350	450 to 500
	30	100 to 250	350 to 450
	40	10 to 100	150 to 350
	10 ⁽¹⁾	0 to 10	0 to 150
5	20	700 to 1000	650 to 700
	30	350 to 700	500 to 650
	40	25 to 350	200 to 500
	10 ⁽¹⁾	0 to 25	0 to 200
6	20	850 to 1600	700 to 850
	30	500 to 850	550 to 700
	40	50 to 500	250 to 550
	10 ⁽¹⁾	0 to 50	0 to 250
7	20	4000 to 6500	1150 to 1400
	30	1500 to 4000	800 to 1150
	40	150 to 1500	350 to 800
	10 ⁽¹⁾	0 to 150	0 to 350

⁽¹⁾ Furnish spalls and rock fragments graded to provide a stable dense mass.

⁽²⁾ The volume of the rock with these cubic dimensions will have a mass approximately equal to the specified rock mass.

⁽³⁾ Furnish rock with breadth and thickness at least one-third its length.

705.04 Rock for Special Rock Embankment. Delete the Subsection and substitute the following:

705.04 Rock for Special Rock Embankment. Furnish angular stone that is hard, durable, and resistant to abrasion and weathering and that is free of weak cleavages that may cause the rock to disintegrate during handling and placing. Do not furnish rock with rounded surfaces.

(a) Mechanically-placed embankments. Furnish rock graded in a well-balanced range and conform to Table 705-2.

Table 705-2
Gradation for Mechanically-Placed Rock

Percent of Rock Fragments by Mass	Mass (kg)	Equivalent Cubic Dimension (millimeters)
50	Greater than 900	Larger than 700
50	40 to 900	250 to 700

(b) Hand-placed embankments. Furnish rock graded in a well-balanced range and conform to Table 705-3.

Table 705-3
Gradation for Hand-Placed Rock

Percent of Rock Fragments by Mass	Mass (kg)	Equivalent Cubic Dimension (millimeters)
75	Greater than 75	Larger than 300
25	40 to 75	250 to 300

705.05 Rock for Buttresses. Delete the Subsection and substitute the following:

705.05 Rock for Buttresses.

(a) General. Furnish angular stone that is hard, durable, free of organic and spoil material, and resistant to weathering and water action. Do not furnish rock with rounded surfaces. Conform to the following:

- | | |
|--|------------------------------------|
| (1) Rock breadth and thickness | At least one-third of rock length. |
| (2) Apparent specific gravity, AASHTO T 85 | 2.50 min. |
| (3) Absorption, AASHTO T 85 | 4.2% max. |

(4) Coarse durability index, AASHTO T 210 52 min.

(b) **Mechanically-placed buttresses.** In addition to (a) above, furnish rock graded in a well-balanced range and conform to Table 705-2.

(c) **Hand-placed buttresses.** In addition to (a) above, furnish rock graded in a well-balanced range and conform to Table 705-3.

Section 706. – CONCRETE AND PLASTIC PIPE

706.08 Plastic Pipe. Delete the text and substitute the following:

Furnish perforated and nonperforated plastic pipe conforming to the following for the size and types specified. For watertight joints, conform to ASTM D 3212. For pipe culvert, furnish pipe conforming to types (a), (b), or (c) for the size specified.

(d) **Corrugated polyethylene drainage tubing.** Delete the title and text and substitute the following:

(d) **Drainage pipe.** Furnish polyethylene perforated or non-perforated corrugated plastic pipe conforming to AASHTO M 252. Furnish perforated or non-perforated polyvinyl chloride pipe with smooth interior, smooth or ribbed exterior conforming to AASHTO M 278, ASTM F 758, or ASTM F 949.

Section 709. – REINFORCED STEEL AND WIRE ROPE

709.01 Reinforcing Steel.

(b) **Reinforcing bars.** Delete the text and substitute the following:

Furnish deformed, grade 420 bars conforming to AASHTO M31M or M322M.

(d) **Tie bars.** Delete the text and substitute the following:

Furnish deformed, grade 420 bars conforming to AASHTO M31M.

(e) **Hook bolts.** Delete the text and substitute the following:

Furnish deformed, grade 420 bars conforming to AASHTO M31M with M14 rolled threads or M16 cut threads. Furnish a threaded sleeve nut capable of sustaining a minimum axial load of 67 kilonewtons.

709.03 Prestressing Steel. Delete the first and second bullets and substitute the following:

- Stress-relieved steel wire, AASHTO M 204, type BA or WA
- Uncoated seven-wire steel strand, AASHTO M 203, grade 1860; or

Section 712. – JOINT MATERIAL**712.01 Sealants, Fillers, Seals, and Sleeves****(a) Joint Sealants and crack fillers.** Delete the text and substitute the following:

(a) Joint sealants and crack fillers. Furnish a commercial certification identifying the batch and lot number, material, quantity of batch, date and time of manufacture, and the name and address of the manufacturer.

(1) Joint and crack sealants, hot-applied,
for concrete and asphalt pavement AASHTO M 324

(2) Crack filler, hot applied, for asphalt concrete
and portland cement concrete pavements ASTM D 5078

(3) For proprietary asphalt-rubber products, furnish the following:

- (a) Source and grade of asphalt binder;
- (b) Total granulated rubber content and mass, as percent of the asphalt-rubber mixture;
- (c) Granulated rubber type(s) and content of each type (if blend);
 - (1) Mass as a percent of combined rubber; and
 - (2) Gradation of granulated rubber.
- (d) Type of asphalt modifier, if any;
- (e) Quantity of asphalt modifier and mass as a percent of asphalt binder;
- (f) Other additives;
- (g) Heating and application temperatures; and
- (h) Manufacturer's recommended application procedures.

(4) Elastomeric joint sealant ASTM C 920, type M, grade
P, class 25, use T₁ or T₂

Provide sealant matching the color of the adjacent sidewalk. Conform to the sealant manufacturer's recommendations for use of primers.

(5) Flexible cellular joint filler

ASTM D 1056,
type 2, grade 3, 4 or 5

(g) Backer rod. Delete the text and substitute the following:

Conform to ASTM D 5249 type 1. For size of backer rod, conform to Table 712-2.

Add the following Subsection:

(h) Non-sag elastomeric sealant. Furnish colored elastomeric sealants which conform to the following:

- Non-sag consistency
- Two-component polyurethane base
- Conforming to ASTM C-920 and Federal Specification TT-S-00227-E

Provide color samples or samples of the actual colored product to the CO for approval.

712.05 Mortar for Masonry Beds and Joints. Delete the text of this Subsection and substitute the following:

Furnish and proportion masonry mortar conforming to ASTM C 270. Use only mortar masonry cement mortar Type M or S. Mortar should not have any color or stain. Incorporate in the mortar mix a water repellent admixture. Provide a dosage sufficient to ensure a reduction of 25% of water absorption in hardened mortar as indicated by ASTM C 642. Mortar may be preblended or mixed on site.

Section 713. – ROADSIDE IMPROVEMENT MATERIAL

713.03 Fertilizer. Delete text of this Subsection and substitute the following:

Furnish an organic fertilizer derived from byproducts through the manufacture of penicillin and other antibiotics, or other organic sources. The organic fertilizer must provide a source of macronutrients with a nitrogen, phosphorous, and potassium (N:P:K) ratio of 7:2:3. The product must be a slow-release organic fertilizer that takes a minimum of 2 to 3 years to break down. Provide documentation of the rate of release, N:P:K ratio, and organic source to the CO for approval. Provide Biosol Mix™, a slow release organic amendment, as supplied by Rocky Mountain Bio Products, 2310 South Syracuse Way, Denver, CO 80231 (303)696-8964; or equal. Mineral fertilizer is not allowed.

Submit a sample of the organic fertilizer for approval prior to application. Submit organic fertilizer bag tags to CO for organic matter content, pH, and organic matter-to-nitrogen ratio verification.

Submit documented proof of equivalent revegetation results for organic amendment substitutions. Submit documentation in the form of test results on similar landforms, soil types, aspect, and elevation as exists at this project location. Results must be from studies in which a minimum of 5 years of revegetation data has been collected.

713.04 Seed. Add the following:

The Contractor may use seed obtained from commercial sources. Supply the CO with all seed bag tags and a certification from the supplier stating that the seed complies with the Federal Seed Act at least 3 weeks prior to seeding. Supply separate bags and separate seed bag tags for each species. Mix seed only after the CO has approved the seed bag tags. Supply seed bag tags labeled with:

- (a) The common name, genus, species, and variety of each species in excess of 1 %;
- (b) The percentage of each type of seed;
- (c) The state or county of origin;
- (d) The approximate percentage of viable seed of each species, together with the date of test; from an independent seed testing laboratory;
- (e) The approximate percentage by weight of pure seed, meaning the freedom of seed from inert matter and from other seeds;
- (f) The approximate percentage by weight of sand, dirt, broken seeds, sticks, chaff, and other inert matter;
- (g) The approximate percentage by weight of other seeds;
- (h) The full name and address of the person or firm selling the seed.

All seed must be guaranteed for purity and germination, free of noxious weed seed, and supplied on a Pure Live Seed (PLS) basis. Seed origin must be in the Northern Rocky Mountains or Northern Great Plains, and the Contractor must use seed with the closest practicable origin to the project area. The CO may reject seed with greater than 1 % weed seed, or with origin greater than 160 km (100 miles) from the project site. No substitutions unless approved by CO. Submit documentation within 30 days after the award of the project providing all specified seed in the quantities required by the dates specified.

Seed Mix A (Riparian/Wetland).

Item	Botanical Name	Common Name	PLS kg/ha	PLS % of Mix
1	<i>Calamagrostis Canadensis</i>	Bluejoint reedgrass	1.12	25.00
2	<i>Calamagrostis stricta</i>	Northern reedgrass	1.12	25.00
3	<i>Deschampsia caespitosa</i>	Tufted hairgrass	1.12	25.00
4	<i>Phleum alpinum</i>	Alpine timothy	1.12	25.00
Totals			4.48	100.00

Seed Mix C.

Item	Botanical Name	Common Name	KG/Ha (PLS)	PLS % of Mix
1	<i>Deschampsia caespitosa</i>	Tufted hairgrass	0.56	4.26
2	<i>Elymus trachycaulus</i>	Slender wheatgrass v. Pryor	5.60	42.55
3	<i>Festuca idahoensis</i>	Idaho fescue	2.24	17.02
4	<i>Festuca ovina</i>	Sheep fescue	2.24	17.02
5	<i>Penstemon procerus</i>	Penstemon	0.28	2.13
6	<i>Poa secunda</i>	Sandberg bluegrass	1.12	8.51
7	<i>Poa alpine</i>	Alpine bluegrass	1.12	8.51
Totals			13.16	100.00

Seed Mix D (Forbs).

Item	Botanical Name	Common Name	PLS kg/ha	PLS % of Mix
1	<i>Agoseris glauca</i>	False dandelion	1.12	24.27
2	<i>Chamerion angustifolium</i> (<i>Epilobium angustifolium</i>)	Fireweed	0.13	2.91
3	<i>Eriogonum umbellatum</i>	Sulphur flower	3.36	72.82
Totals			4.62	100.00

Seed Mix E (Ghost Creek).

Item	Botanical Name	Common Name	PLS kg/ha	PLS % of Mix
1	<i>Artemisia tridentata</i>	Big sagebrush	1.12	2.55
2	<i>Bromus marginatus</i>	Mountain brome	17.93	40.76
3	<i>Elymus trachycaulus</i>	Slender wheatgrass	5.60	12.74
4	<i>Eriogonum umbellatum</i>	Sulphur flower	2.24	5.10
5	<i>Festuca idahoensis</i>	Idaho fescue	2.80	6.37
6	<i>Koeleria macranthera</i>	Prairie junegrass	0.84	1.91
7	<i>Poa fendleriana</i>	Muttongrass	2.24	5.10
8	<i>Poa secunda</i>	Sandberg bluegrass	2.24	5.10
9	<i>Pseudoroegneria spicata</i>	Bluebunch wheatgrass	8.97	20.38
Totals			43.98	100.00

713.06 Plant Material. Add the following:

Supply the materials from a northern Rocky Mountain source.

Supply tree and shrub plant materials in 262 ml, 1,835 ml and 3,670 ml containers (3,670 ml containers must measure 300 mm to 400 mm deep) as specified in plant lists. These container sizes are the minimum sizes allowed; standard industry sizes near but above these are allowed. Ensure that plant roots are sufficiently developed that the soil material and plant roots are bound together and remain intact when removed from containers.

Supply herbaceous plants in container size ranging from 164 ml to 262 ml. These container sizes are the minimum sizes allowed; standard industry sizes near but above these are allowed. Ensure that plant roots are sufficiently developed that the soil material and plant roots are bound together and remain intact when removed from containers.

Ensure that plant roots are sufficiently developed that the soil material and plant roots are bound together and remain intact when removed from containers.

Supply gel containing a matrix of about 98% water in a 2% food-based gel. Submit manufacturer's information for gel pacs to CO at least 2 weeks prior to planting for CO approval.

Submit documentation within 30 days after the award of the project construction contract for providing all specified plant materials in the quantities required by the dates specified. No substitutions unless approved by the CO.

Plant List 1.

Item	Botanical Name	Common Name	Plants/Ha	Type/Size	Vertical Distance Above Ground Water
	Shrubs				
1	<i>Salix eastwoodii</i>	Eastwood willow	247	262 ml	600-900 mm
2	<i>Salix glauca</i>	Glaucus willow	247	262 ml	600-900 mm
3	<i>Salix planifolia</i>	Planeleaf willow	371	262 ml	600-900 mm
4	<i>Salix spp.</i>	Willow spp.	210	262 ml	450-1220 mm; Transplant from on site only
	Herbaceous				
5	<i>Senecio triangularis</i>	Arrowleaf groundsel	247	164 ml	305-915

Plant List 3.

Item	Botanical Name	Common Name	Plants/Ha	Type/Size	Pattern Notes
	Trees				
1	<i>Abies lasiocarpa</i>	Subalpine fir	124	262 ml	Locate on north-facing slopes in depressions adjacent to rocks or logs
2	<i>Picea engelmannii</i>	Engelmann spruce	124	262 ml	Locate in depressions adjacent to rocks or logs
3	<i>Pinus albicaulis (A)</i>	Whitebark pine	371	262 ml	Locate on north-facing slopes in depressions adjacent to rocks or logs away from lodgepole pine
4	<i>Pinus albicaulis (B)</i>	Whitebark pine	50	1,835 ml	Locate on in depressions adjacent to rocks or logs away from lodgepole pine
5	<i>Pinus contorta</i>	Lodgepole pine	124	262 ml	Locate in depressions adjacent to rocks or logs
	Shrubs				
6	<i>Juniperus communis</i>	Common juniper	185	164 ml	Locate in depressions adjacent to rocks or logs
	Herbaceous				
7	<i>Lupinus argenteus</i>	Silvery lupine	62	164 ml	Locate in depressions adjacent to rocks or logs

Plant List 7.

Item	Botanical Name	Common Name	Plants/Ha	Type/Size	Pattern Notes
	Herbaceous				
1	<i>Lupinus argenteus</i>	Silvery lupine	124	164 ml	Locate in depressions adjacent to rocks or logs
2	<i>Misc.</i>	Sod transplants	56	Varies	Transplant immediately, do not store

Plant List 8.

Item	Botanical Name	Common Name	Plants/Ha	Type/Size*	Elev. Above GW**
	Shrubs			(cc)	(mm)
1	<i>Salix planifolia</i>	Planeleaf willow	371	C	610-915
2	<i>Salix eastwoodii</i>	Eastwood willow	247	C	610-915
3	<i>Salix glauca</i>	Glaucus willow	247	C	610-915
4	<i>Salix</i> spp.	Willow spp.	210	T	<1220
	Herbaceous				
5	<i>Caltha leptosepala</i>	Marsh marigold	124	164	0-300
6	<i>Carex nebrascensis</i>	Nebraska sedge	124	164	0-300
7	<i>Carex utriculata</i>	Beaked sedge	124	164	0-300
8	<i>Carex haydeniana</i>	Hayden sedge	124	164	0-300
9	<i>Misc.</i>	Sod transplants	124	1 m ²	0-300

*C=Cutting , T=Transplant

**Vertical distance above the average ground water elevation during the growing season.

Add the following:

713.14A Gravel bags. Use clean, silt-free material between 9 and 19 millimeters in diameter for gravel filler. Secure the opening of the gravel bag. Conform to the following:

(a) Bag material Canvas, burlap, woven polypropylene, polyethylene, or polyamide fabric

(b) Approximate mass 13 to 23 kilograms

713.16 Silt fence. Delete this subsection and substitute the following:

713.16 Silt fence. Conform to the following:

- | | |
|--|---|
| (a) Silt fence fabric and fence support mesh | AASHTO M 288 |
| (b) Wood post | Commercial quality lumber,
nominal 50 mm square min. |
| (c) Steel post | Weigh 1.9 kg per meter min. |

Add the following:

713.16B Prefabricated filter insert. Conform to the following:

- | | |
|---|--|
| (a) Water flow rate, ASTM D 4491 | 145 gallons per minute
per square foot min. |
| (b) Puncture strength, ASTM D 4833 | 40 kilograms min. |
| (c) Apparent opening size, ASTM D 4571 | 425 μ m sieve |
| (d) Ultraviolet resistance, ASTM D 4355 | 70% min. |

713.17 Temporary Rolled Erosion Control Products.

(g) Type 2.C, short-term single-net erosion control blanket or open weave textile. Delete text and substitute the following:

(1) Straw and coconut mats. Furnish a mat consisting of 70% straw and 30% coconut fibers enclosed in biodegradable mesh. Do not use any synthetic plastic or non-biodegradable mesh. Furnish mats in continuous rolls of 1.25 meters or greater width.

(2) Staples. Furnish U-shaped wire staples, 2.2 mm in diameter or greater with legs 150 mm to 200 mm in length and a 25 to 50 mm crown.

Add the following Subsection:

713.19 Logs. Conform to the following:

- | | |
|------------------------------------|------------------------------------|
| (a) Diameter Requirements
(DBH) | 100 to 300 millimeters in diameter |
| (b) Length Requirements | Table 713-8 |

**Table 713-8
Landscaping Logs**

Length (m)	Percent of Logs to be placed
3 to 5	70
Greater than 5	30

Section 714. – GEOTEXTILE AND GEOCOMPOSITE DRAIN MATERIAL

714.02 Geocomposite Drains.

(b) Geocomposite sheet drains. Add the following:

For MSE wall construction, furnish prefabricated sheet drain with a core or net encapsulated in a Type I-D (Subsection 714.01) non-woven geotextile. Provide a sheet drain capable of draining from both sides of the sheet and a minimum flow rate of 1 liter per second per meter of width when tested according to ASTM D 4716. Perform the test under the following test conditions:

- (1) 300 millimeter long specimen
- (2) Pressure of 100 kPa
- (3) Gradient of 1.0
- (4) 100-hour seating period
- (5) Closed-cell foam rubber between platens and geocomposite

Section 718. – TRAFFIC SIGNING AND MARKING MATERIAL

718.01 Retroreflective Sheeting. Add the following:

Furnish fluorescent type sheeting for all signs and all devices specifying an orange background.
Furnish fluorescent type sheeting for signs with yellow background.

718.08 Signposts.

(b) Galvanized Steel posts.

(2) Square tubular steel posts.

(c) Delete the text and substitute the following:

Galvanizing after punching
(inside and outside of post)

ASTM A 653M,
coating designation Z275

718.14 Waterborne Traffic Paint.

(g) Daylight reflectance. (without glass beads) Delete the text and substitute the following:

- | | |
|-------------------------|--|
| (1) White, ASTM E 1347 | 84% relative to magnesium oxide standard |
| (2) Yellow, ASTM E 1347 | 55% relative to magnesium oxide standard |

Section 720. – STRUCTURAL WALL AND STABILIZED EMBANKMENT MATERIAL

720.01 Mechanically-Stabilized Earth Wall Material. Add the following:

(k) Geogrid. Furnish geogrid reinforcement with a regular grid structure with apertures of sufficient size to allow interlocking with surrounding soil, rock, or earth. Manufacture geogrid using high-density polyethylene, polypropylene, or polyester. Calculate long-term tensile strength “ T_{al} ” and pullout capacity of geogrids according to FHWA publication No. FHWA-NHI-00-043, entitled “Mechanically Stabilized Earth Walls and Reinforced Soil Slopes Design and Construction Guidelines.” The long-term tensile strength “ T_{al} ” must take into account reduction factors “RF” for creep (RF_{CR}), durability (RF_D), and installation damage (RF_{ID}) as defined in FHWA-00-043.

Section 725. – MISCELLANEOUS MATERIAL

725.04 Pozzolans. Delete the Subsection and substitute the following:

- | | |
|--|-----------|
| (a) Fly ash. Conform to AASHTO M 295, class C or F.
Available equivalent alkalis (Na_2O) | 1.5% max. |
| (b) Ground granulated blast-furnace slag. Conform to AASHTO M 302, grade 100 or 102.
Total alkalis | 1.0% max. |
| (c) Silica fume (micro silica). Conform to AASHTO M 307.
Total equivalent alkalis (Na_2O) | 1.0% max. |

725.11 Precast Concrete Units and Accessories. Delete item (g) in the list.

725.14 Protective Coatings for Concrete.

- | | |
|--------------------------------|--------------|
| (a) Boiled linseed oil. | AASHTO M 233 |
|--------------------------------|--------------|

725.29 Reinforcing Fibers. Delete the text and substitute the following:

- | |
|--|
| (a) Use with shotcrete. Fibers will be deformed steel or fibrillated polypropylene conforming to ASTM C 1116, Type I or Type III. |
|--|

(b) Use with concrete. Fibers will be fully oriented, 100% virgin polypropylene, collated fibrillated, white in color, 19 mm long, dosed at 0.9 to 1.8 kilograms per cubic meter of concrete, conforming to ASTM C 1116, Type III.