Sections 101, 508, 614 and 710 of the Standard Specifications are hereby revised for this project as follows:

In subsection 101.01 delete AWPA and replace with the following:

AWPA American Wood Protection Association

Delete subsection 508.03 and replace with the following:

508.03 Treated Timber. The preservative to be used shall be as specified on the plans. The preservatives and entire treatment process shall be as described in AASHTO M 133.

In subsection 508.05, delete the last sentence and replace with the following:

All hardware, except timber connectors and common nails, shall be galvanized in accordance with AASHTO M 232.

In subsection 508.06 delete the second paragraph and replace with the following:

Treated timbers shall not be sized or trimmed in the field, except when ordered. The Contractor shall not make temporary use of treated timber. All pieces that have been field cut shall be treated in accordance with AWPA Standard M4.

Delete subsection 508.07 and replace with the following:

508.07 Holes and Bolts. All holes bored shall be treated in accordance with AWPA M4. Holes drilled for drift bolts shall be 1/32 inch smaller than the diameter of the bolt. All other holes shall be bored to such size as to ensure a snug fit. Unless otherwise designated, all bolts shall be provided with two ogee washers.

In subsection 614.02, delete the fourth paragraph and replace with the following:

Underground portions of timber sign posts, plus at least 6 inches above groundline, shall be treated according to AWPA Standard M4.

In subsection 710.06, delete (4) and (5) and replace with the following:

(4) Treatment. The selected species shall be pressure treated lumber conforming in all respects to the AWPA Standard U1, Commodity Specification A: Sawn Products and AWPA Commodity Standard B: Posts. (Ground contact for posts, above ground for balance of fence). A treatment report is required from the treatment plant.

(5) Preservative. AASHTO M-133.

Delete the first paragraph of 710.07 and replace with the following:

710.07 Fence Posts. Wood posts shall conform to the details and dimensions indicated on the plans. Wood posts shall be straight, sound, and seasoned with ends sawed off square or as indicated. All knots shall be trimmed flush with the surface. Wood posts shall be peeled and shall be treated with preservative in accordance with AASHTO M 133. When native cedar posts are called for on the plans, the requirements for peeling and for treating may be omitted.
Sections 101 and 630 of the Standard Specifications are hereby revised for this project as follows:

In subsection 101.01 add the following:

MASH Manual for Assessing Safety Hardware

In subsection 630.01, delete the first paragraph and replace with the following:

630.01 This work consists of furnishing, installing, moving, maintaining, and removing temporary traffic signs, advance warning arrow panels, flashing beacon (portable), barricades, channelizing devices, delineators, temporary traffic signals, mobile pavement marking zones, masking and unmasking existing signs in construction zones, and concrete barriers as required by the Manual on Uniform Traffic Control Devices for Streets and Highways and the Colorado Supplement thereto, in accordance with the Contract. Devices shall comply with the performance criteria contained in NCHRP Report 350 (only applicable for devices developed prior to 2011) or MASH (acceptable for all devices). Devices temporarily not in use shall, as a minimum, be removed from the shoulder area. Moving will include devices removed from the project and later returned to use.

In subsection 630.02, delete the second paragraph, and replace with the following:

Temporary sign support assembly shall be timber, perforated square metal tubing inserted into a larger base post or slip base or perforated metal U-channel with a slip base. The temporary sign support assembly shall conform to NCHRP (only applicable for sign support assemblies developed prior to 2011) or MASH (acceptable for all sign support assemblies), and AASHTO requirements regarding temporary sign supports during construction.

Subsection 630.02 shall include the following:

If a timber post is selected, it shall conform to the requirements of subsection 614.02.

In subsection 630.07(a), delete the first paragraph and replace with the following:

(a) *Stackable Vertical Panels*. Stackable vertical panels shall comply with the crash test requirements contained in NCHRP Report 350 (only applicable for vertical panels developed prior to 2011) or MASH (acceptable for all vertical panels) and shall meet MUTCD requirements for vertical panels. Vertical panels shall be retroreflectorized with Type IV sheeting, in accordance with subsection 630.02. The stackable vertical panels shall have the following properties:

In subsection 630.07(b), delete the first paragraph and replace with the following:

(b) *Stackable Tubular Markers*. Stackable tubular markers shall comply with the crash test requirements contained in NCHRP Report 350 (only applicable for stackable tubular markers developed prior to 2011) or MASH (acceptable for all stackable tubular markers) and shall conform to MUTCD requirements for Tubular Markers. The stackable tubular markers shall have the following properties:

In subsection 630.09, delete the second and third paragraphs, and replace with the following:

Work zone devices designated by FHWA as Category I, II, or III, shall comply with the performance criteria contained in NCHRP Report 350 (only applicable for devices developed prior to 2011) or MASH (acceptable for all devices). Devices designated as Category IV, including but not limited to portable or trailer-mounted devices such as flashing arrow panels, temporary traffic signals, area lighting supports, and changeable message signs are not required to meet NCHRP 350 or MASH requirements.

Except for Category IV devices, the Contractor shall obtain and present to the Engineer the manufacturer’s written NCHRP 350 (only applicable for devices developed prior to 2011) or MASH (acceptable for all devices) certification for each work zone device before it is first used on the project.
In subsection 630.10(a) (3) (iii), delete the third paragraph, and replace with the following:

Groups 1 and 2 shall each be equipped with a truck-mounted Advance Warning Flashing or Sequencing Arrow Panel (C Type), and a truck mounted impact attenuator. The impact attenuator shall be located on the rearmost vehicle of each group. A separate vehicle for this attenuator may be used. Each truck-mounted impact attenuator shall be certified by the manufacturer to be able to withstand a 62 MPH impact in accordance with NCHRP 350, Test Level 3 (only applicable for truck-mounted impact attenuators developed prior to 2011) or MASH, Test Level 3 (acceptable for all truck-mounted impact attenuators). The cone setting truck and the cone pickup truck shall not be the same vehicle.

In subsection 630.16, delete the 5th paragraph.
Section 103 of the Standard Specifications is hereby revised for this project as follows:

Add subsection 103.05 as follows:

103.05 Escrow of Proposal Documentation (EPD). The successful bidder, and subcontractors with subcontracts exceeding $200,000, shall submit all information and calculations used to determine their bid for this project prior to executing the Contract. This documentation hereinafter referred to as "Escrow of Proposal Documentation" or "EPD", will be held in escrow for the duration of the Contract. If necessary, it will be used for the purpose of determining the Contractor's proposal concept, for price adjustments as provided in the Contract, or to resolve any dispute or claim by the Contractor.

(a) Format. Bidders and subcontractors are encouraged to submit the EPD in their usual cost-estimating format; a standard format is not required. It is not the intention of this specification to cause extra work during the preparation of a proposal, but to ensure that the documentation will be adequate to enable complete understanding and proper interpretation for the intended use.

The EPD shall clearly itemize the costs for each pay item. Each pay item shall be broken down into components small enough to allow a detailed cost estimate. Costs allocated to each component shall be broken down into the bidder's usual estimate categories such as direct labor, repair labor, equipment parts and supplies, expendable materials, permanent materials, and subcontractor cost as appropriate. Plant and equipment and indirect cost shall be broken down in the bidder’s usual format. Plant and equipment and indirect cost allocations shall be made to each bid item as appropriate. All costs shall be identified.

The EPD shall include quantity takeoffs, construction schedule on which the bid is based, rates of production and progress, calculations, copies and quotes from subcontractors and suppliers, memoranda, narratives, and all other information used by the bidder to arrive at all of the prices contained in the proposal. Manuals standard to the industry that are used by the Contractor may be included by reference to the name, date, and publisher of the manual.

(b) Submittal. The EPD shall be submitted to the Engineer in a sealed container, prior to executing the Contract, and shall be clearly marked with the bidder's name, date of submittal, project number, and "Escrow of Proposal Documentation." The EPD shall be accompanied with an affidavit, in the form following this subsection, signed by an individual authorized by the bidder to execute the proposal, stating that the material in the EPD contains all of the information which was used to develop the bid, that the individual has personally examined the contents of the EPD container, and the documentation is correct and complete.

Failure to submit EPDs as herein required will be cause for rejection of the proposal.

The successful bidder agrees, as a condition of award of the Contract, that the EPD constitutes all the assumptions and information used in the preparation of its proposal, and that no other proposal preparation information shall be considered in evaluating disputes or claims.

(c) Storage. The EPDs are, and shall remain, the property of the Contractor or subcontractors who prepared them and they are subject to use as provided herein. The EPDs shall be placed in escrow during the life of the Contract, in a banking institution or other bonded document storage facility suggested by the Engineer and acceptable to the Contractor. The cost of storage shall be paid by the Contractor.

(d) Examination. The EPDs may be examined at any time deemed necessary by the Engineer or the Contractor, in conjunction with settling disputes, claims, or contract modification orders. When the Engineer or Contractor determine that it will be necessary to review an EPD, the EPD shall be reviewed by the Engineer and either the prime Contractor or the subcontractor that submitted the EPD. If the prime Contractor and the subcontractor agree, in writing, the prime Contractor may be present when the subcontractor's EPD is reviewed. Examination of the EPD is subject to the following conditions:
REVISION OF SECTION 103
ESCROW OF PROPOSAL DOCUMENTATION

(1) The EPDs are proprietary and confidential and shall be treated as such.

(2) The Engineer and the Contractor shall each designate three representatives who are authorized to examine the EPDs. In addition, the Contractor shall designate one additional representative for every EPD submitted by subcontractors.

(3) Each party shall designate a representative to receive notice of examination of the EPD.

(4) Prior to examining the EPD 24 hours written notice shall be given to the other party, so that the examination can be witnessed by the other party. The notice shall include a list of the bid items or areas of work that will be examined.

(5) An authorized representative of the Engineer and the Contractor shall be present (1) to gain access to the EPD, and (2) during all examinations of the EPD. At no time will the EPD be allowed sole possession by either party.

(6) Following each examination, the EPD will be resealed and returned to the escrow institution, in the presence of an authorized representative of the Engineer and the Contractor.

(e) Subcontracting. If the successful bidder’s proposal is based upon subcontracting any part of the work, the successful bidder shall then require each subcontractor whose total subcontract price exceeds $200,000 to provide a separate EPD to the Engineer, to be submitted at the same time as the bidder’s EPD. The EPDs shall comply with the requirements of this subsection. A separate EPD affidavit, signed by the individual subcontractor, shall accompany the subcontractor's EPD.

If the Contractor wishes to subcontract any portion of the work after executing the Contract, or change subcontractors, the Engineer retains the right to require the subcontractor to submit an EPD in accordance with this subsection before the subcontract is approved.

(f) Return. The EPDs will be returned to the Contractor and subcontractors after all claims, disputes, and litigation have been resolved, final payment on the Contract has been made and accepted, and the Contractor submits a signed statement that no further claims shall be submitted on any project to which the EPDs are applicable.

ESCROW OF PROPOSAL DOCUMENTATION AFFIDAVIT

THE UNDERSIGNED HEREBY CERTIFIES THAT THE ESCROW OF PROPOSAL DOCUMENTATION CONTAINED HEREIN CONTAINS ALL OF THE INFORMATION WHICH WAS USED TO DEVELOP THE PROPOSAL AND THAT I HAVE PERSONALLY EXAMINED THESE CONTENTS AND THAT THE DOCUMENTATION IS CORRECT AND COMPLETE IN ACCORDANCE WITH SUBSECTION 103.05. SUBMITAL BY THE CONTRACTOR OF A CLAIM WHICH IS NOT CONSISTENT WITH THE CONTENTS OF THESE PROPOSAL PREPARATION DOCUMENTS SHALL RESULT IN DENIAL OF THE CLAIM.

By:______________________________
Title:____________________________
Firm:____________________________
Date of Submission:__________________
Project Number:____________________
Section 105 of the Standard Specifications is hereby revised for this project as follows:

Delete subsection 105.02(f)
REVISION OF SECTION 105
CONSTRUCTION SURVEYING

Section 105 of the Standard Specifications is hereby revised for this project as follows:

In subsection 105.13, delete (a) and replace with the following:

(a) **Contractor Surveying.** When the bid schedule contains pay item 625, Construction Surveying, the Department will provide control points and bench marks as described in the Contract. The Contractor shall furnish and set construction stakes establishing lines and grades in accordance with the provisions of Section 625. The Engineer may order extra surveying which will be paid for at a negotiated rate not to exceed $150 per hour.

In subsection 105.13 (b), delete the sixth paragraph and replace with the following:

The Contractor shall be held responsible for the preservation of all stakes and marks, and if any are destroyed, disturbed or removed by the Contractor, subcontractors, or suppliers, the cost of replacing them will be charged against the Contractor and will be deducted from the payment for the work at a negotiated rate not to exceed $150 per hour.
Section 105 of the Standard Specifications is hereby revised for this project as follows:

Subsection 105.03 shall include the following:

If there is a violation of the working time limitations for traffic control as set forth in the special provisions, a written notice to stop work will be imposed on the Contractor at the start of the next working day. Work shall not resume until the Contractor assures the Engineer, in writing, that there will not be a reoccurrence of the working time violation. If more violations take place, the Engineer will notify the Contractor in writing that there will be a price reduction charge for each incident in accordance with this specification. This incident price reduction charge will be deducted from any money due the Contractor. This price reduction will not be considered a penalty but will be a price reduction for failure to perform traffic control in compliance with the Contract.

An incident is any violation up to 30 minutes in duration. Each 30 minutes or increment thereof will be considered as an incident. A price reduction will be assessed for each successive or cumulative 30 minute period in violation of the working time limitations, as determined by the Engineer. The price reduction for each incident will increase at a progressive rate starting with $150 for the second incident and increasing to $1200 for the fifth and subsequent incidents in accordance with the following schedule. A 15 minute grace period will be allowed at the beginning of the second incident on the project before the price reduction is applied. This 15 minute grace period applies only to the second incident.

The number of incident charges will be accumulative throughout the duration of the Contract.

### PRICE REDUCTION SCHEDULE

<table>
<thead>
<tr>
<th>Incident</th>
<th>Incident Rate</th>
<th>Total Price Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>Notice to Stop Work</td>
<td>----</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>$150</td>
<td>$150</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>300</td>
<td>450</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>600</td>
<td>1,050</td>
</tr>
<tr>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>1,200</td>
<td>2,250</td>
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<tr>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>1,200</td>
<td>3,450</td>
</tr>
<tr>
<td>Etc.</td>
<td>1,200</td>
<td>4,650</td>
</tr>
<tr>
<td>Etc.</td>
<td></td>
<td>Etc.</td>
</tr>
</tbody>
</table>
Sections 105 and 106 of the Standard Specifications are hereby revised for this project as follows:

Delete subsection 105.05 and replace with the following:

105.05 Conformity to the Contract of Hot Mix Asphalt. Conformity to the Contract of all Hot Mix Asphalt, Item 403, except Hot Mix Asphalt (Patching) and temporary pavement will be determined by tests and evaluations of elements that include asphalt content, gradation, in-place density and joint density in accordance with the following:

All work performed and all materials furnished shall conform to the lines, grades, cross sections, dimensions, and material requirements, including tolerances, shown in the Contract.

For those items of work where working tolerances are not specified, the Contractor shall perform the work in a manner consistent with reasonable and customary manufacturing and construction practices.

When the Engineer finds the materials or work furnished, work performed, or the finished product are not in conformity with the Contract and has resulted in an inferior or unsatisfactory product, the work or material shall be removed and replaced or otherwise corrected at the expense of the Contractor.

Materials will be sampled randomly and tested by the Department in accordance with Section 106 and with the applicable procedures contained in the Department's Field Materials Manual. The approximate maximum quantity represented by each sample will be as set forth in Section 106. Additional samples may be selected and tested as set forth in Section 106 at the Engineer's discretion.

A process will consist of either a single test value or a series of test values resulting from related tests of an element of the Contractor’s work and materials. An element is a material or workmanship property that can be tested and evaluated for quality level by the Department approved sampling, testing, and analytical procedures. All materials produced will be assigned to a process. A change in process is defined as a change that affects the element involved. For any element, with the exception of the process for joint density element, a process normally will include all produced materials associated with that element prior to a change in the job mix formula (Form 43). For joint density, a new process will be established for each new layer of pavement or for changes in joint construction. Density measurements taken within each compaction test section will be a separate process. The Engineer may separate a process in order to accommodate small quantities or unusual variations.

Evaluation of materials for pay factors (PF) will be done using only the Department’s acceptance test results. Each process will have a PF computed in accordance with the requirements of this Section. Test results determined to have sampling or testing errors will not be used.

Except for in-place density measurements taken within a compaction test section, any test result for an element greater than the distance 2 x V (see Table 105-2) outside the tolerance limits will be designated as a separate process and the pay factor will be calculated in accordance with subsection 105.05(a). An element pay factor less than zero shall be zero. The calculated PF will be used to determine the Incentive/Disincentive Payment (I/DP) for the process.

In the case of in-place density or joint density the Contractor will be allowed to core the exact location (or immediately adjacent location for joint density) of a test result more than 2 x V outside the tolerance limit. The core must be taken and furnished to the Engineer within eight hours after notification by the Engineer of the test result. The result of this core will be used in lieu of the previous test result. Cores not taken within eight hours after notification by the Engineer will not be used in lieu of the test result. All costs associated with coring will be at the Contractor's expense.

(a) Representing Small Quantities. When it is necessary to represent a process by only one or two test results, PF will be the average of PFs resulting from the following:

If the test result is within the tolerance limits then PF = 1.00
If the test result is above the maximum specified limit, then

\[ PF = 1.00 - \frac{[0.25(T_O - T_U)/V]}{2} \]

If the test result is below the minimum specified limit, then

\[ PF = 1.00 - \frac{[0.25(T_L - T_O)/V]}{2} \]

Where: PF = pay factor.

V = V factor from Table 105-2.

T_O = the individual test result.

T_U = upper specification limit.

T_L = lower specification limit.

The calculated PF will be used to determine the I/DP for the process.

(b) **Determining Quality Level.** Each process with three or more test results will be evaluated for a quality level (QL) in accordance with Colorado Procedure 71.

(c) **Gradation Element.** Each specified sieve, with the exception of 100 percent passing sieves, will be evaluated for QL separately. The lowest calculated QL for a sieve will be designated as the QL for gradation element for the process.

(d) **Joint Density Element.** Joint Density will be tested according to subsection 401.17.

(e) **Process Pay Factor.** Using the calculated QL for the process, compute PF as follows: The final number of random samples (Pn) in each process will determine the final pay factor. As test values are accumulated for each process, Pn will change accordingly. When the process has been completed, the number of random samples it contains will determine the computation of PF, based on Table 105-3 and formula (1) below. When Pn is from 3 to 9, or greater than 200, PF will be computed using the formulas designated in Table 105-3. Where Pn is equal to or greater than 10 and less than 201, PF will be computed by formula (1):

\[
PF = \left( \frac{(PF_1 + PF_2)}{2} + \frac{(PF_2 + PF_3)}{2} - \frac{(PF_1 + PF_3)}{2} \right) \times \frac{(Pn_2 - Pn_X)}{(Pn_2 - Pn_3)}
\]

Where, when referring to Table 105-3:

PF_1 = PF determined at the next lowest Pn formula using process QL

PF_2 = PF determined using the Pn formula shown for the process QL

PF_3 = PF determined at the next highest Pn formula using process QL

Pn_2 = the lowest Pn in the spread of values listed for the process Pn formula

Pn_3 = the lowest Pn in the spread of values listed for the next highest Pn formula

Pn_X = the actual number of test values in the process

When evaluating the item of Furnish Hot mix asphalt, the PF for the element of In-Place Density shall be 1.0.

Regardless of QL, the maximum PF in relation to Pn is limited in accordance with Table 105-3.
As test results become available, they will be used to calculate accumulated QL and PF numbers for each process. The process I/DP’s will then be calculated and accumulated for each element and for the item. The test results and the accumulated calculations will be made available to the Contractor upon request.

Numbers from the calculations will be carried to significant figures and rounded according to AASHTO Standard Recommended Practice R-11, Rounding Method.

(f) Evaluation of Work. When the PF of a process is 0.75 or greater, the finished quantity of work represented by the process will be accepted at the appropriate pay factor. If the PF is less than 0.75, the Engineer may:

1. Require complete removal and replacement with specification material at the Contractor’s expense;
   or

2. Where the finished product is found to be capable of performing the intended purpose and the value of the finished product is not affected, permit the Contractor to leave the material in place.

If the material is permitted to remain in place the PF for the process will not be greater than 0.75. When condition red, as described in Section 106, exists for any element, resolution and correction will be in accordance with Section 106. Material, which the Engineer determines is defective, may be isolated and rejected without regard to sampling sequence or location within a process.

If removal and replacement is required because the joint density PF for a process is below 0.75, the Contractor shall remove and replace the full lane width adjacent to and including at least 6 inches beyond the visible joint line for the entire length of joint representing the process. If the lane removed is adjacent to another joint, that joint shall also be removed to a point 6 inches beyond the visible joint line. When a single joint density core is more than 2V outside the tolerance limits, the removal and replacement limits shall be identified by coring the failing joint at 25 foot intervals until two successive cores are found to be 1V or less below the minimum tolerance limit. If removal and replacement is required, the Contractor shall submit documentation identifying the process to be used to correct the area in question in writing. The process will be approved by the Engineer before commencing the corrective work.

<table>
<thead>
<tr>
<th>Table 105-2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>&quot;W&quot; AND &quot;V&quot; FACTORS FOR VARIOUS ELEMENTS</strong></td>
</tr>
<tr>
<td><strong>Hot Mix Asphalt</strong></td>
</tr>
<tr>
<td><strong>Element</strong></td>
</tr>
<tr>
<td>2.36 mm (No. 8) mesh and larger sieves</td>
</tr>
<tr>
<td>600 μm (No. 30) mesh sieve</td>
</tr>
<tr>
<td>75 μm (No. 200) mesh sieve</td>
</tr>
<tr>
<td>Gradation</td>
</tr>
<tr>
<td>Asphalt Content</td>
</tr>
<tr>
<td>In-place Density</td>
</tr>
<tr>
<td>Joint Density</td>
</tr>
</tbody>
</table>
Table 105-3
FORMULAS FOR CALCULATING PF BASED ON PN

<table>
<thead>
<tr>
<th>Pn</th>
<th>When Pn as shown at left is 3 to 9, or greater than 200, use designated formula below to calculate Pay Factor, PF = ..., when Pn is 10 to 200, use formula (1) above:</th>
<th>Maximum PF</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0.31177 + 1.57878 (QL/100) - 0.84862 (QL/100)^2</td>
<td>1.025</td>
</tr>
<tr>
<td>4</td>
<td>0.27890 + 1.51471 (QL/100) - 0.73553 (QL/100)^2</td>
<td>1.030</td>
</tr>
<tr>
<td>5</td>
<td>0.25529 + 1.48268 (QL/100) - 0.67759 (QL/100)^2</td>
<td>1.030</td>
</tr>
<tr>
<td>6</td>
<td>0.19468 + 1.56729 (QL/100) - 0.70239 (QL/100)^2</td>
<td>1.035</td>
</tr>
<tr>
<td>7</td>
<td>0.16709 + 1.58245 (QL/100) - 0.68705 (QL/100)^2</td>
<td>1.035</td>
</tr>
<tr>
<td>8</td>
<td>0.16394 + 1.55070 (QL/100) - 0.65270 (QL/100)^2</td>
<td>1.040</td>
</tr>
<tr>
<td>9</td>
<td>0.11412 + 1.63532 (QL/100) - 0.68786 (QL/100)^2</td>
<td>1.040</td>
</tr>
<tr>
<td>10 to 11</td>
<td>0.15344 + 1.50104 (QL/100) - 0.58896 (QL/100)^2</td>
<td>1.045</td>
</tr>
<tr>
<td>12 to 14</td>
<td>0.07278 + 1.64285 (QL/100) - 0.65033 (QL/100)^2</td>
<td>1.045</td>
</tr>
<tr>
<td>15 to 18</td>
<td>0.07826 + 1.55649 (QL/100) - 0.56616 (QL/100)^2</td>
<td>1.050</td>
</tr>
<tr>
<td>19 to 25</td>
<td>0.09907 + 1.43088 (QL/100) - 0.45550 (QL/100)^2</td>
<td>1.050</td>
</tr>
<tr>
<td>26 to 37</td>
<td>0.07373 + 1.41851 (QL/100) - 0.41777 (QL/100)^2</td>
<td>1.055</td>
</tr>
<tr>
<td>38 to 69</td>
<td>0.10586 + 1.26473 (QL/100) - 0.29660 (QL/100)^2</td>
<td>1.055</td>
</tr>
<tr>
<td>70 to 200</td>
<td>0.21611 + 0.86111 (QL/100)</td>
<td>1.060</td>
</tr>
<tr>
<td>≥ 201</td>
<td>0.15221 + 0.92171 (QL/100)</td>
<td>1.060</td>
</tr>
</tbody>
</table>

(g) Process I/DP Computation.

\[
I/DP = (PF - 1)(QR)(UP)(W/100)
\]

Where:

- I/DP = Incentive/Disincentive Payment
- PF = Pay Factor
- QR = Quantity in Tons of HMA Represented by the Process
- UP = Unit Bid Price of Asphalt Mix
- W = Element Factor from Table 105-2

When AC is paid for separately UP shall be:

\[
UP = \frac{([T_{\text{HMA}}]UP_{\text{HMA}}) + ([T_{\text{AC}}]UP_{\text{AC}}))}{T_{\text{HMA}}}
\]

Where:

- \(T_{\text{HMA}}\) = Tons of Asphalt Mix
- \(UP_{\text{HMA}}\) = Unit Bid Price of Asphalt Mix
- \(T_{\text{AC}}\) = Tons of Asphalt Cement
- \(UP_{\text{AC}}\) = Unit Bid Price of Asphalt Cement

For the joint density element:

\[
UP = UP_{\text{HMA}}
\]
Where: $UP_{HMA}$ is as defined above.

When AC is paid for separately $UP$ shall be:

$$UP = \frac{[(BTon_{HMA})(BUP_{HMA}) + (BTon_{AC})(BUP_{AC})]}{BTon_{HMA}}$$

Where:  $BTon_{HMA}$ = Bid Tons of Asphalt Mix  
$BUP_{HMA}$ = Unit Bid Price of Asphalt Mix  
$BTon_{AC}$ = Bid Tons of Asphalt Cement  
$BUP_{AC}$ = Unit Bid Price of Asphalt Cement

(h) **Element I/DP.** The I/DP for an element shall be computed by accumulating the process I/DP’s for that element.

(i) **I/DP for a Mix Design.** The I/DP for a mix design shall be computed by accumulating the individual I/DP’s for the asphalt content, in-place density, and gradation elements for that mix design. The accumulated quantities of materials for each element must be the same at the end of I/DP calculations for a mix design.

(j) **Project I/DP.** The I/DP for the project shall be computed by accumulating the mix design I/DP’s and the joint density I/DP’s. The accumulated quantities of materials for each element must be the same at the end of I/DP calculations for the project.

Delete subsection 106.05 and replace with the following:

**106.05 Sampling and Testing of Hot Mix Asphalt.** All hot mix asphalt, Item 403, except Hot Mix Asphalt (Patching) and temporary pavement shall be tested in accordance with the following program of process control testing and acceptance testing:

The Contract will specify whether process control testing by the Contractor is mandatory or voluntary.

(a) **Process Control Testing.**

1. **Mandatory Process Control.** When process control testing is mandatory the Contractor shall be responsible for process control testing on all elements and at the frequency listed in Table 106-1. Process control testing shall be performed at the expense of the Contractor.

   After completion of compaction, in-place density tests for process control shall be taken at the frequency shown in Table 106-1. The results shall be reported in writing to the Engineer on a daily basis. Daily plots of the test results with tonnage represented shall be made on a chart convenient for viewing by the Engineer. All of the testing equipment used for in-place density testing shall conform to the requirements of acceptance testing standards, except nuclear testing devices need not be calibrated on the Department’s calibration blocks.

   For elements other than in-place density, results from quality control tests need not be plotted, or routinely reported to the Engineer. This does not relieve the Contractor from the responsibility of performing such testing along with appropriate plant monitoring as necessary to assure that produced material conforms to the applicable specifications. Quality control test data shall be made available to the Engineer upon request.

2. **Voluntary Process Control.** The Contractor may conduct process control testing. Process control testing is not required, but is recommended on the elements and at the frequency listed in Table 106-1.

   All of the testing equipment used for in-place density testing shall conform to the requirements of acceptance testing standards, except nuclear testing devices need not be calibrated on the Department’s calibration blocks.
(b) **Acceptance Testing.** Acceptance testing is the responsibility of the Department. For acceptance testing the Department will determine the locations where samples or measurements are to be taken and as designated in Section 403. The maximum quantity of material represented by each test result, the elements, the frequency of testing and the minimum number of test results will be in accordance with Table 106-1. The location or time of sampling will be based on the stratified random procedure as described in CP 75. Acceptance sampling and testing procedures will be in accordance with the Schedule for Minimum Materials Sampling, Testing and Inspection in the Department’s Field Materials Manual. Samples for project acceptance testing shall be taken by the Contractor in accordance with the designated method. The samples shall be taken in the presence of the Engineer. Where appropriate, the Contractor shall reduce each sample to the size designated by the Engineer. The Contractor may retain a split of the each sample which cannot be included as part of the Contractor's process control testing. Dispute of the acceptance test results in accordance with CP-17 will not be allowed unless a provision for check testing has been included in the Contract and it has been successfully completed. All materials being used are subject to inspection and testing at any time prior to or during incorporation into the work.

### Table 106-1

**SCHEDULE FOR MINIMUM SAMPLING AND TESTING**

<table>
<thead>
<tr>
<th>Element</th>
<th>Process Control</th>
<th>Acceptance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphalt Content</td>
<td>1/500 tons</td>
<td>1/1000 tons</td>
</tr>
<tr>
<td>Theoretical Maximum Specific Gravity</td>
<td>1.1000 tons, minimum 1/day</td>
<td>1/1000 tons, minimum 1/day</td>
</tr>
<tr>
<td>Gradation</td>
<td>1/Day (1)</td>
<td>1/2000 tons</td>
</tr>
<tr>
<td>In-Place Density</td>
<td>1/500 tons</td>
<td>1/500 tons (2)</td>
</tr>
<tr>
<td>Joint Density</td>
<td>1 core/2500 linear feet of joint</td>
<td>1 core /5000 linear feet of joint</td>
</tr>
<tr>
<td>Aggregate Percent Moisture (3)</td>
<td>1/2000 tons or 1/Day if less than 2000 tons</td>
<td>1/2000 tons</td>
</tr>
<tr>
<td>Percent Lime (3)(4)</td>
<td>1/Day</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

**Notes:**

1. Process control tests for gradation are not required if less than 250 tons are placed in a day. The minimum number of process control tests for gradation shall be one test for each 1000 tons or fraction thereof.
2. The minimum number of in-place density tests for acceptance will be 5.
3. Not to be used for incentive/disincentive pay. Test according to CP 60B and report results from Form 106 or Form 565 on Form 6.
4. Verified per Contractor’s QC Plan.
(c) **Reference Conditions.** Three reference conditions can exist determined by the Moving Quality Level (MQL). The MQL will be calculated in accordance with the procedure in CP 71 for Determining Quality Level (QL). The MQL will be calculated using only acceptance tests. The MQL will be calculated on tests 1 through 3, then tests 1 through 4, then tests 1 through 5, then thereafter on the last five consecutive test results. The MQL will not be used to determine pay factors. The three reference conditions and actions that will be taken are described as follows:

1. **Condition green** will exist for an element when an MQL of 90 or greater is reached, or maintained, and the past five consecutive test results are within the specification limits.

2. **Condition yellow** will exist for all elements at the beginning of production or when a new process is established because of changes in materials or the job-mix formula, following an extended suspension of work, or when the MQL is less than 90 and equal to or greater than 65. Once an element is at condition green, if the MQL falls below 90 or a test result falls outside the specification limits, the condition will revert to yellow or red as appropriate.

3. **Condition red** will exist for any element when the MQL is less than 65. The Contractor shall be notified immediately in writing and the process control sampling and testing frequency increased to a minimum rate of 1/250 tons for that element. The process control sampling and testing frequency shall remain at 1/250 tons until the process control QL reaches or exceeds 78. If the QL for the next five process control tests is below 65, production will be suspended. If gradation is the element with MQL less than 65, the Department will test one randomly selected sample in the first 1250 tons produced in condition red. If this test result is outside the tolerance limits, production will be suspended. (This test result will not be included as an acceptance test.)

   After condition red exists, a new MQL will be started. Acceptance testing will stay at the frequency shown in Table 106-1. After three acceptance tests, if the MQL is less than 65, production will be suspended. Production will remain suspended until the source of the problem is identified and corrected. Each time production is suspended, corrective actions shall be proposed in writing by the Contractor and approved in writing by the Engineer before production may resume.

   Upon resuming production, the process control sampling and testing frequency for the elements causing the condition red shall remain at 1/250 tons. If the QL for the next five process control tests is below 65, production will be suspended again. If gradation is the element with MQL less than 65, the Department will test one randomly selected sample in the first 1250 tons produced in condition red. If this test result is outside the tolerance limits, production will be suspended.

(d) **Mix Verification Testing.** After the mix design has been approved and production commences, the Department will perform a minimum of three volumetric verification tests for each of the following elements to verify that the field produced hot mix asphalt conforms to the approved mix design:

1. Air Voids
2. Voids in Mineral Aggregate (VMA).
3. Asphalt Content (AC).

The test frequency shall be one per day unless altered by the Engineer.

The test results will be evaluated and the Contractor shall make adjustments if required in accordance with the following:

1. **Target Values.** The target value for VMA will be the average of the first three volumetric field test results on project produced hot mix asphalt or the target value specified in Table 403-1 and Table 403-2 of the specifications, whichever is higher. The target value for VMA will be set no lower than 0.5 percent below...
the VMA target on Form 43 prior to production. The target values for the test element of air voids and AC shall be the mix design air voids and mix design AC as shown on Form 43.

2. Tolerance Limits. The tolerance limits for each test element shall be:

<table>
<thead>
<tr>
<th></th>
<th>± 0.3 percent</th>
<th>± 1.2 percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>Air Voids</td>
<td>VMA</td>
</tr>
</tbody>
</table>

3. Quality Levels. Calculate an individual QL for each of the elements using the volumetric field verification test results. If the QL for VMA or AC is less than 65 or if the QL for air voids is less than 70, the production shall be halted and the Contractor shall submit a written proposal for a mix design revision to the Engineer. Production shall only commence upon receipt of written approval from the Engineer of the proposed mix design revision.

After a new or revised mix design is approved, three additional volumetric field verification tests will be performed on asphalt produced with the new or revised mix design. The test frequency shall be one per day unless altered by the Engineer.

If the QL for VMA or AC is less than 65 or the QL for the test element of air voids is less than 70, then production shall be halted until a new mix design has been completed in accordance with CP 52 or CP 54, a new Form 43 issued, and the Contractor demonstrates that he is capable of producing a mixture meeting the verification requirements in accordance with A or B below:

A. The Contractor shall produce test material at a site other than a CDOT project. The Contractor shall notify the Engineer a minimum of 48 hours prior to the requested test. The location and time of the test are subject to the approval of the Engineer, prior to placement. Three samples will be tested for volumetric properties. If the QL for VMA or AC is equal or greater than 65 and the QL for the element of air voids is equal or greater than 70, full production may resume or;

B. The Contractor may construct a 500 ton test strip on the project. Three samples in the last 200 tons will be tested for volumetric properties. After construction of the test section, production shall be halted until the testing is complete and element QLs are calculated. If the QL for VMA or AC is equal or greater than 65 or the QL for the element of air voids is equal or greater than 70, full production may resume. If the QL for VMA or AC is less than 65 or the QL for the element of air voids is less than 70, the material shall be removed and replaced at no cost to the Department. The time count will continue, and any delay to the project will be considered to have been caused by the Contractor and will not be compensable.

The costs associated with mix designs shall be solely at the Contractor’s expense.

If the Contractor fails to verify the new mix design in accordance with A or B, then production shall be halted until a new mix design has been completed in accordance with CP 52 or CP 54, a new Form 43 issued, and the Contractor demonstrates they are capable of producing a mixture meeting the verification requirements in accordance with A or B.

4. New or Revised Mix Design. Whenever a new or revised mix design is used and production resumes, three additional volumetric field verification tests shall be performed and the test results evaluated in accordance with the above requirements. The test frequency shall be one per day unless altered by the Engineer.

5. Field Verification Process Complete. When the field verification process described above is complete and production continues, the sample frequency will revert back to a minimum of 1/10,000 tons. The Engineer has the discretion to conduct additional verification tests at any time.
(e) **Stability Verification Testing.** After the mix design has been approved and production commences, the Department will perform a minimum of three stability verification tests to verify that the field produced HMA conforms to the approved mix design:

The test frequency shall be one per day unless otherwise directed by the Engineer.

The test results will be evaluated and the Contractor shall make adjustments if required in accordance with the following:

1. The minimum value for stability will be the minimum specified in Table 403-1 of the specifications. There will be no tolerance limit.

2. Quality Level. Calculate a QL for stability. If the QL for stability is less than 65, then production shall be halted and the Contractor shall submit a written proposal for a mix design revision to the Engineer. The Engineer shall give written approval to the proposed mix design revision before production continues.

After a new or revised mix design is approved, three additional stability tests will be performed on asphalt produced with the new or revised mix design. The test frequency shall be one per day unless altered by the Engineer.

If the stability QL is less than 65, then production shall be halted until a new mix design has been completed and approved using plant produced material or the Contractor shall submit a written proposal for a mix design revision to the Engineer. The Engineer shall give written approval to the proposed mix design revision before production continues.

3. New or Revised Mix Design. Whenever a new or revised mix design is used and production resumes, three additional stability field verification tests shall be performed and the test results evaluated in accordance with the above requirements. The test frequency shall be one per day unless altered by the Engineer.

4. Field Verification Process Complete. When the field verification process described above is complete and production continues, the sample frequency will revert back to 1 per 10,000 tons.
Section 106 of the Standard Specifications is hereby revised for this project as follows:

Subsection 106.11 shall include the following:

The Contractor shall maintain a document summarizing the date and quantity of all steel and iron material delivered to the project. The document shall show the pay item, quantity of material delivered to the project, along with the quantity of material installed by the cutoff date for the monthly progress payment. The summary shall also reconcile the pay item quantities to the submitted Buy America certifications. The Contractor shall also maintain documentation of the project delivered cost of all foreign steel or iron permanently incorporated into the project. Both documents shall be submitted to the Engineer within five days of the cutoff date for the monthly progress payment. A monthly summary shall be required even if no steel or iron products are incorporated into the project during the month. The summary document does not relieve the Contractor of providing the necessary Buy America certifications of steel and or iron prior to permanent incorporation into the project.
February 3, 2011

REVISION OF SECTION 106
CERTIFICATES OF COMPLIANCE AND
CERTIFIED TEST REPORTS

Section 106 of the Standard Specifications is hereby revised for this project as follows:

In subsection 106.12, delete the second paragraph and replace it with the following:

The original Certificate of Compliance shall include the Contractor’s original signature as directed above. The original signature (including corporate title) on the Certificate of Compliance, under penalty of perjury, shall be of a person having legal authority to act for the manufacturer. It shall state that the product or assembly to be incorporated into the project has been sampled and passed all specified tests in conformity to the plans and specifications for this project. One legible copy of the fully signed Certificate of Compliance shall be furnished to the Engineer prior to installation of material. The original shall be provided to the Engineer before payment for the represented item will be made.

In subsection 106.13, delete the second paragraph and replace it with the following:

The Certified Test Report shall be a legible copy or an original document and shall include the Contractor’s original signature as directed above. The signature (including corporate title) on the Certified Test Report, under penalty of perjury, shall be of a person having legal authority to act for the manufacturer or the independent testing laboratory. It shall state that the test results show that the product or assembly to be incorporated into the project has been sampled and passed all specified tests in conformity to the plans and specifications for this project. One legible copy or original document of the fully signed Certified Test Report shall be furnished to the Engineer prior to installation of material. Failure to comply may result in delays to the project or rejection of the materials.
Section 106 of the Standard Specifications is hereby revised for this project as follows:

In subsection 106.02 (a), delete the third paragraph and replace with the following:

The Contract will indicate whether the Department has or has not obtained the necessary County or City Zoning Clearance and the required permit from Colorado Department of Natural Resources needed to explore and remove materials from the available source. If the Department did not obtain the necessary clearances or permits, the Contractor shall obtain them. Any delays to the project or additional expenses that are incurred while these clearances or permits are being obtained shall be the responsibility of the Contractor. The Contractor shall ensure that the requirements of the permits do not conflict with the pit construction and reclamation requirements shown in the Contract for the available source.

In subsection 106.02 (b), delete the first paragraph and replace with the following:

(b) Contractor Source. Sources of sand, gravel, or borrow other than available sources will be known as contractor sources. The contractor source will be tested by the Department and approved by the Engineer prior to incorporation of the material into the project. If the submitted materials do not meet the contract specifications it will become the Contractor’s responsibility to re-sample and test the material. The Contractor will supply the Department with passing test results from an AASHTO accredited laboratory and signed and sealed by a Professional Engineer. If requested by the Engineer, the Department will then re-sample and re-test the material for compliance to the contract specifications. The Contractor shall produce material which meets contract specifications throughout construction of the project.

The cost of sampling, testing, and corrective action by the Contractor will not be paid for separately but shall be included in the work.
Section 106 of the Standard Specifications is hereby revised for this project as follows:

Subsection 106.01 shall include the following:

Prior to beginning any work the Contractor shall submit to the Engineer a completed Form 1425, Supplier List. During the performance of the Contract, the Contractor shall submit an updated Form 1425 when requested by the Engineer.

Failure to comply with the requirements of this subsection shall be grounds for withholding of progress payments.
Sections 106, 627, and 713 are hereby revised for this project as follows:

Subsection 106.11 shall include the following:

All post-consumer and industrial glass beads for pavement marking shall have been manufactured from North American glass waste streams in the United States of America. The bead manufacturer shall submit a COC in accordance with subsection 106.12 confirming that North American glass waste streams were used in the manufacture of the glass beads.

Subsection 627.06 (c) shall include the following:

Glass beads shall be applied into the thermoplastic pavement marking by means of a low pressure, gravity drop bead applicator.

In subsection 713.08, delete the first and third paragraphs and replace with the following:

713.08 **Glass Beads for Pavement Marking.** Glass beads for pavement marking shall conform to AASHTO M 247, except for the following:

1. **Gradation:**

<table>
<thead>
<tr>
<th>U.S. Mesh</th>
<th>Microns</th>
<th>% Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Epoxy and MMA</td>
</tr>
<tr>
<td>16</td>
<td>1180</td>
<td>90-100</td>
</tr>
<tr>
<td>18</td>
<td>1000</td>
<td>65-80</td>
</tr>
<tr>
<td>20</td>
<td>850</td>
<td>85-100</td>
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<td>30</td>
<td>600</td>
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<td>40</td>
<td>425</td>
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<tr>
<td>50</td>
<td>300</td>
<td>0-5</td>
</tr>
<tr>
<td>80</td>
<td>180</td>
<td>0-5</td>
</tr>
</tbody>
</table>

2. **Roundness:** All beads shall meet a minimum of 80 percent true spheres in accordance with the Office of Federal Lands Highways FLH T520 or a computerized optical testing method.

3. **Color / Clarity:** Beads shall be colorless, clear, and free of carbon residues.

4. **Refractive Index:** Minimum 1.51 by oil immersion method.

5. **Air Inclusions:** Less than 5 percent by visual count.

6. **Coatings:** Per manufacturer’s recommendation for optimum adhesion and embedment.

7. **Chemical Resistance:** Beads shall be resistant to hydrochloric acid, water, calcium chloride, and sodium sulfide as tested per methods outlined in sections 4.3.6 to 4.3.9 of the TT-B Federal Spec.1325D.

8. For Epoxy Pavement Marking, a minimum of 40 percent of the total weight shall be manufactured using a molten kiln direct melt method. For Waterborne and Low VOC Paint, a minimum of 15 percent of the total weight shall be manufactured using a molten kiln direct melt method. All molten kiln direct melt glass beads shall be above the 600 µm (#30) sieve.
(9) Glass beads used for any type of pavement marking shall not contain more than 75 parts per million (ppm) arsenic, 75 ppm antimony and 100 ppm lead, as tested in accordance with EPA methods 3052 and 6010C, or other approved testing method.
Section 107 of the Standard Specifications is hereby revised for this project as follows:

Subsection 107.01 shall include the following:

As related to the Form FHWA 1273, Required Contract Provisions Federal-Aid Construction Contracts, the Contractor shall check all Contractor and subcontractor project payrolls regarding accuracy of pay classification, pay hours, and pay rates. The Contractor shall sign and date all payrolls signifying this check has been performed.
Section 107 of the Standard Specifications is hereby revised for this project as follows:

Delete subsection 107.15(c) and replace it with the following:

(c) Each insurance policy shall include provisions preventing cancellation or non-renewal without at least 30 days prior notice to Contractor. The Contractor shall forward to the Engineer any such notice received within seven days of the Contractor's receipt of such notice.
REVISION OF SECTION 107
WARNING LIGHTS FOR WORK VEHICLES AND EQUIPMENT

Section 107 of the Standard Specifications is hereby revised for this project as follows:

Subsection 107.06 (b) shall include the following:

All work vehicles and mobile equipment shall be equipped with one or more functioning warning lights mounted as high as practicable, which shall be capable of displaying in all directions one or more flashing, oscillating, or rotating lights for warning roadway traffic. The lights shall be amber in color. The warning lights shall be activated when the work vehicle or mobile equipment is operating within the roadway, right of way or both. All supplemental lights shall be SAE Class 1 certified.
Section 107 of the Standard Specifications is hereby revised for this project as follows:

Delete subsection 107.25 and replace with the following:

107.25 Water Quality Control. The project work shall be performed using practices that minimize water pollution during construction. All the practices listed in (b) below shall be followed to minimize the pollution of any State waters, including wetlands.

(a) Definitions.

1. Areas of Disturbance (AD). Locations where any activity has altered the existing soil cover or topography, including vegetative and non-vegetative activities during construction.

2. Construction Site Boundary/Limits of Construction (LOC). The project area defined by the Stormwater Construction Permit.

3. Discharge of Pollutants. One or more pollutants leaving the LOC or entering State waters or other conveyances.

4. Limits of Disturbed Area (LDA). Proposed limits of ground disturbance as shown on the Plans.

5. Pollutant. Dredged spoil, dirt, slurry, solid waste, incinerator residue, sewage, sewage sludge, garbage, trash, chemical waste, biological nutrient, biological material, radioactive material, heat, wrecked or discarded equipment, rock, sand, or any industrial, municipal, or agricultural waste, as defined in the Colorado Code of Regulations (CCR) [5 CCR 1002-61, 2(76)]

6. Pollution. Man-made, man-induced, or natural alteration of the physical, chemical, biological, and radiological integrity of water. [25-8-103 (16), CRS]


(b) Construction Requirements.

1. The Contractor shall comply with the “Colorado Water Quality Control Act” (Title 25, article 8, CRS), the “Protection of Fishing Streams” (Title 33, Article 5, CRS), the “Clean Water Act” (33 USC 1344), regulations promulgated, certifications or permits issued, and to the requirements listed below. In the event of conflicts between these requirements and water quality control laws, rules, or regulations of other Federal, or State agencies, the more restrictive laws, rules, or regulations shall apply.

2. If the Contractor determines construction of the project will result in a change to the permitted activities or LDA, the Contractor shall detail the changes in a written report to the Engineer. Within five days after receipt of the report, the Engineer, after coordination with Region Planning and Environmental Manager (RPEM), will approve or reject in writing the request for change, or detail a course of action including revision of existing permits or obtaining new permits.

3. If construction activities result in noncompliance of any permit requirement, the project will be suspended and the permitting agency notified, if required. The project will remain suspended until the Engineer receives written approval by the permitting agency.

4. The Contractor is legally required to obtain all permits associated with specific activities within, or off the Right of Way, such as borrow pits, concrete or asphalt plant sites, waste disposal sites, or other facilities. It is the Contractor’s responsibility to obtain these permits. The Contractor shall consult with the Engineer, and contact the Colorado Department of Public Health and Environment (CDPHE) or other appropriate federal, state, or local agency to determine the need for any permit.
5. The Contractor shall conduct the work in a manner that prevents pollution of any adjacent State waters. Erosion control work shall be performed in accordance with Section 208, this subsection, and all other applicable parts of the Contract.

6. Prior to the Environmental Pre-construction Conference the SWMP Administrator, identified in subsection 208.03(c), shall identify and describe all potential pollutant sources, including materials and activities, and evaluate them for the potential to contribute pollutants to stormwater discharges associated with construction activities. The list of potential pollutants shall be continuously updated during construction. At a minimum, each of the following shall be evaluated for the potential for contributing pollutants to stormwater discharges and identified in the SWMP, if found to have such potential:

   (1) All exposed and stored soils
   (2) Vehicle tracking of sediments
   (3) Management of contaminated soils
   (4) Vehicle and equipment maintenance and fueling
   (5) Outdoor storage activities (building materials, fertilizers, chemicals, etc.)
   (6) Significant dust or particle generating processes
   (7) Routine maintenance involving fertilizers, pesticides, detergents, fuels, solvents, oils, etc.
   (8) On site waste management practices (waste piles, dumpsters, etc.)
   (9) Dedicated asphalt and concrete batch plants
   (10) Concrete truck and equipment washing, including the concrete truck chute and associated fixtures and equipment
   (11) Concrete placement and finishing tool cleaning
   (12) Non-industrial waste sources that may be significant, such as worker trash and portable toilets
   (13) Loading and unloading operations
   (14) Other areas or procedures where spills could occur

The SWMP Administrator shall record the location of potential pollutants on the site map. Descriptions of the potential pollutants shall be added to the SWMP notebook.

At or prior to the Environmental Pre-construction Conference the Contractor shall submit a Spill Response Plan for any petroleum products, chemicals, solvents, or other hazardous materials in use, or in storage, at the work site. See subsection 208.06(c) for Spill Response Plan requirements. Work shall not be started until the plan has been submitted to and approved by the Engineer.

On site above ground bulk storage containers with a cumulative storage shell capacity greater than 1,320 U.S. gallons, or storage containers having a "reasonable expectation of an oil discharge" to State waters, are subject to the Spill Prevention, Control and Countermeasure Plan (SPCC) Rule. Oil of any type and in any form is covered, including, but not limited to: petroleum; fuel oil; sludge; oil refuse; oil mixed with wastes other than dredged spoil. EPA Region 8 is responsible for administering and enforcing the SPCC plan requirements in Colorado. Prior to start of work, the Contractor shall submit a SPCC Form which has been approved by the EPA for the project.
7. The Contractor shall obtain a Construction Dewatering (CDW) permit from CDPHE anytime uncontaminated groundwater, including groundwater that is commingled with stormwater or surface water, is encountered during construction activities and the groundwater or commingled water needs to be discharged to State waters. If contaminated groundwater is encountered, a Remediation permit may be needed from CDPHE in accordance with Section 250.

8. Water from dewatering operations shall not be directly discharged into any State waters, unless allowed by a permit. Water from dewatering shall not be discharged into a ditch unless:

   (1) Written permission is obtained from the owner of the ditch.
   (2) It is covered in the approved CDW or Remediation permit that allows the discharge.
   (3) A copy of this approval is submitted to the Engineer. A copy of the Permit shall be submitted to the Engineer prior to dewatering operations commencing.

If the site is covered by a Colorado Discharge Permit System Stormwater Construction Permit (CDPS-SCP) and the following conditions are met, a separate CDW permit will not be required for discharge to the ground:

   (1) The source is identified in the Stormwater Management Plan (SWMP) as updated by the SWMP Administrator.
   (2) The SWMP describes and locates the practices implemented at the site to control stormwater pollution from the dewatering of groundwater or stormwater.
   (3) The SWMP describes and locates the practices to be used that will ensure that no groundwater from construction dewatering is discharged from the LOC as surface runoff or to surface waters or storm sewers.
   (4) Groundwater and groundwater combined with stormwater do not contain pollutants in concentrations exceeding the State groundwater standards in Regulations 5 CCR 1002-41 and 42.

If surface water are diverted around a construction area and no pollutants are introduced during the diversion, a CDW Permit is not required. If the diverted water enters the construction area and contacts pollutant sources (e.g. disturbed soil, concrete washout, etc.), the Contractor shall obtain a CDW permit for the discharge of this water to State waters or to the ground.

Construction Dewatering may be discharged to the ground on projects that are not covered by a CDPS-SCP if the conditions of the CDPHE’s low risk guidance document for Discharges of Uncontaminated Groundwater to Land are met. The conditions of this guidance are:

   (1) The source of the discharge is solely uncontaminated groundwater or uncontaminated groundwater combined with stormwater and does not contain pollutants in concentrations that exceed water quality standards for groundwater referenced above.
   (2) Discharges from vaults or similar structures shall not be contaminated. Potential sources of contamination include process materials used, stored, or conveyed in the structures, or introduced surface water runoff from outside environments that may contain oil, grease, and corrosives.
   (3) The groundwater discharge does not leave the project boundary limits where construction is occurring.
   (4) Land application is conducted at a rate and location that does not allow for any runoff into State waters or other drainage conveyance systems, including but not limited to streets, curb and gutter, inlets, borrow ditches, open channels, etc.
(5) Land application is conducted at a rate that does not allow for any ponding of the groundwater on the surface, unless the ponding is a result of implementing BMPs that are designed to reduce velocity flow. If the BMPs used result in ponding, the land application shall be done in an area with a constructed containment, such as an excavation or berm area with no outfall. The constructed containment shall prevent the discharge of the ponding water offsite as runoff.

(6) A visible sheen is not evident in the discharge.

(7) BMPs are implemented to prevent any sediment deposited during land application from being transported by stormwater runoff to surface waters or other conveyances.

(8) All BMPs used shall be selected, installed, implemented, and maintained according to good Engineering, hydrologic and pollution control practices. The selected BMPs shall provide control for all potential pollutant sources associated with the discharge of uncontaminated groundwater to land. The discharge shall be routed in such a way that it will not cause erosion to land surface. Energy dissipation devices designed to protect downstream areas from erosion by reducing the velocity of flow (such as hose attachments, sediment and erosion controls) shall be used when necessary to prevent erosion.

Discharged water shall be drained slowly so that it soaks into the ground without running outside the project boundary or causing flooding issues. The discharge shall be routed in such a way that it will not contact petroleum products or waste.

9. At least 15 days prior to commencing dredging or fill operations in a watercourse, the Contractor shall provide written notification to owners or operators of domestic or public water supply intakes or diversion facilities, if these facilities are within 20 miles downstream from the dredging or fill operations. Notification shall also be given to Owners or operators of other intakes or diversions that are located within five miles downstream from the site of the project. Identities of downstream owners and operators can be obtained from Colorado Division of Water Resources, Office of the State Engineer.

10. Temporary fill into wetlands or streams will not be allowed, except as specified in the Contract and permits. If such work is allowed, upon completion of the work all temporary fills shall be removed in their entirety and disposed of in an upland location outside of flood plains unless otherwise specified in the Contract.

11. Construction operations in waters of the United States as defined in 33 CFR Part 328.3, including wetlands, shall be restricted to areas and activities authorized by the U.S. Army Corps of Engineers as shown in the Contract. Fording waters will be allowed only as authorized by the U.S. Army Corps of Engineers 404 Permit.

12. Wetland areas outside of the permitted limits of disturbance shall not be used for storage, parking, waste disposal, access, borrow material, or any other construction support activity.

13. Pollutant byproducts of highway construction, such as concrete, asphalt, solids, sludges, pollutants removed in the course of treatment of wastewater, excavation or excess fill material, and material from sediment traps shall be handled, stockpiled, and disposed of in a manner that prevents entry into State waters, including wetlands. Removal of concrete waste and washout water from mixer trucks, concrete finishing tools, concrete saw and all concrete material removed in the course of construction operations or cleaning shall be performed in a manner that prevents waste material from entering State waters. A minimum of ten days prior to the start of the construction activity, the Contractor shall submit in writing a Method Statement for Containing Pollutant Byproducts to the Engineer for approval.

14. The use of chemicals such as soil stabilizers, dust palliatives, herbicides, growth inhibitors, fertilizers, deicing salts, etc., shall be in accordance with the manufacturer’s recommended application rates, frequency, and instructions.
15. All materials stored on-site shall be stored in a neat, orderly manner, in their original containers, with the original manufacturer’s label. Materials shall not be stored in a location where they may be carried into State waters at any time.

16. Spill prevention and containment measures conforming to subsection 208.06 shall be used at storage, and equipment fueling and servicing areas to prevent the pollution of any State waters, including wetlands. All spills shall be cleaned up immediately after discovery, or contained until appropriate cleanup methods can be employed. Manufacturer’s recommended methods for spill cleanup shall be followed, along with proper disposal methods. When required by the Colorado Water Quality Control Act, Regulation 5 CCR 1002-61, spills shall be reported to the Engineer and CDPHE in writing.

17. The Contractor shall prevent construction activities from causing grass or brush fires.

18. The construction activities shall not impair Indian tribal rights, including, but not limited to, water rights, and treaty fishing and hunting rights.

19. Prior to start of work, the Contractor shall certify in writing to the Engineer that construction equipment has been cleaned prior to initial site arrival. Vehicles and equipment shall be free of soil and debris capable of transporting noxious weed seeds or invasive species onto the site. Additional equipment required for construction shall also be certified prior to being brought onto the project site.

20. Vehicles which have been certified by the Contractor as having been cleaned prior to arrival on site may be cleaned on site at an approved area where wash water can be properly contained. Vehicles leaving and reentering the project site shall be recertified.

21. At the end of each day the Contractor shall collect all trash and dispose of it in appropriate containers.

22. Construction waste that is considered a pollutant or contaminant shall be collected and disposed of in appropriate containers. This material may be stockpiled on the project when it is contained or protected by an appropriate BMP.

(c) Measurement and Payment.

1. All the work listed in (b) above, including but not limited to dewatering, erosion control for dewatering, and disposal of water resulting from dewatering operations, including all costs for CDPHE concurrences and permits, will not be measured and paid for separately, but shall be included in the work.

2. The Contractor shall be liable for any penalty (including monetary fines) applied to the Department caused by the Contractor’s noncompliance with any water quality permit or certification. Monetary fines shall be deducted from any money due to the Contractor. If the monetary fine is in excess of all the money due to the Contractor, then the Contractor shall pay to the Department the amount of such excess.

3. The Contractor will not receive additional compensation, or time extensions, for any disruption of work or loss of time caused by any actions brought against the Contractor for failure to comply with good Engineering, hydrologic and pollution control practices.

4. If a spill occurs as a direct result of the Contractor’s actions or negligence, the clean-up of such spill shall be performed by the Contractor at the Contractor’s expense.

5. Areas exposed to erosion by fire resulting from the Contractor’s operations shall be stabilized in accordance with Section 208 by the Contractor and at the Contractor’s expense.

(d) Contractor Obtained Stormwater Construction Permit. The Contractor shall obtain a Colorado Discharge Permit System Stormwater Construction Permit (CDPS-SCP) for any project work that disturbs at least 1 acre of land. The Contractor shall apply for and obtain the permit upon award of the Contract. The Contractor shall provide a copy of permit certification or the submitted CDPS-SCP application to the Engineer prior to or
at Pre-construction Conference. No work shall begin until the CDPS-SCP permit has been approved from CDPHE, unless otherwise directed. A copy of the Permit and application to obtain a permit shall be placed in the project SWMP notebook.

If a Utility Company has pulled a permit for the area prior to the Contractor being on site, then the Contractor shall coordinate with the Utility Company to transfer those areas over to the Contractor prior to work commencing. The Contractor shall not commence construction until Application for Transfer of Ownership for All Permits, Certifications and Authorizations has been approved by CDPHE and submitted to the Engineer.

To initiate Partial Acceptance of the stormwater construction work (including seeding and planting required for erosion control), the Contractor shall request in writing a Stormwater Completion Walkthrough. The Engineer will set up the walkthrough and will include: the Engineer or designated representative, Superintendent or designated representative, Stormwater Management Plan (SWMP) Administrator, Region Water Pollution Control Manager (RWPCM) and Landscape Architect representing the region. Unsatisfactory and incomplete erosion control work will be identified in this walkthrough, and will be summarized by the Engineer in a punch list. The Water Quality Permit Transfer to Maintenance Punch List may be used as a template in creating the Engineer’s punch list.

The Engineer will coordinate with CDOT Maintenance on regular inspections of the corrective work. The completed action items associated with the corrective work shall be shown as completed on the Punch List. Upon completion of all items shown, the Contractor shall submit the completed Punch List to the Engineer for review. Upon written approval of the Punch List, the Contractor shall submit the “Application for Transfer of Ownership for All Permits, Certifications and Authorizations” to the CDPHE requesting transfer of ownership of the CDPS-SCP to CDOT Maintenance. When requested by CDOT Maintenance and approved by the Engineer, the Permit may be transferred by the Contractor to the Resident Engineer instead of CDOT Maintenance.

Until the transfer of the permit has been approved by the CDPHE the Contractor shall continue to adhere to all permit requirements. Requirements shall include erosion control inspections, BMP installation, BMP maintenance, BMP repair, including seeded areas, and temporary BMP removal. All documentation shall be submitted to the Engineer and placed in the SWMP notebook.

All costs associated with the Contractor applying for, holding, and transferring the CDPS-SCP permit between parties will not be measured and paid for separately, but shall be included in the work in accordance with subsection 107.02.
Section 108 of the Standard Specifications is hereby revised for this project as follows:

In subsection 108.08, delete (c) and (d) and replace with the following:

(c) Delay. Any event, action or factor that extends the performance period of the Contract.

1. Excusable Delay: A delay that was beyond the Contractor’s control and was not due to the Contractor’s fault or negligence. The Department may grant a contract time extension for an excusable delay.

A. Compensable Delay: A delay that the Department, not the Contractor, is responsible for entitling the Contractor to a time extension and monetary compensation. Monetary compensation for compensable delays will be made in accordance with Subsection 109.10.

B. Noncompensable Delay: An excusable delay that neither the Contractor nor the Department is responsible for that may entitle the Contractor to a contract time extension but no additional monetary compensation. Contract time allowed for the performance of the work may be extended for delays due to force majeure (i.e. acts of God, acts of the public enemy, terrorist acts, fires, floods, area wide strikes, embargoes, or unusually severe weather).

2. Nonexcusable Delay: A delay that was reasonably foreseeable or within the control of the Contractor for which the Department will not grant monetary compensation or a contract time extension.

3. Concurrent Delay. Independent delays to critical activities occurring at the same time.

A. The Department will not grant a time extension or additional compensation for the period of time that a non-excusable delay is concurrent with an excusable delay.

B. The Department may grant time but no compensation for the period of time that a non-compensable delay is concurrent with a compensable delay.

Delays in delivery of materials or fabrication scheduling resulting from late ordering, financial considerations, or other causes that could have been foreseen or prevented will be considered nonexcusable delays. However, delays caused by fuel shortage or delay in delivery of materials to the Contractor due to some unusual market condition caused by industry-wide strike, national disaster, area-wide shortage, or other reasons beyond the control of the Contractor which prevent procurement of materials or fuel within the allowable contract time limits will be considered excusable delays.

(d) Extension of Contract Time. The Contractor’s assertion that insufficient contract time was specified is not a valid reason for an extension of contract time. For time extension requests, the Contractor shall provide a two-part submittal: part one shall consist of a written notice of the delay and part two shall consist of the Contractor’s delay documentation and supporting analysis.

Part 1: The Contractor shall provide the written notice of delay within seven days of the delay occurrence. The notice shall describe the delay and include documentation substantiating the nature and cause of the delay. Failure to submit the written notice constitutes a waiver of entitlement to additional time or compensation.

Part 2: This shall be submitted within 30 days of the written notice. The Contractor shall include all documentation needed to support the time extension request. In order to request additional contract time for an unexpected delay, the Contractor shall provide a contemporaneous schedule analysis in accordance with subsection 108.03. The schedule analysis shall show that the delayed activity or activities were on the critical path or became critical due to the delay.
The Engineer will base a determination of an allowable contract time extension on:

1. The current Schedule in effect at the time of the alleged delay;
2. The supporting documentation submitted by the Contractor;
3. The contemporaneous schedule analysis; and
4. Any other relevant information available to the Engineer.

For a time extension request resulting from a change order, the Contractor shall demonstrate the delay to the project completion date by:

1. Inserting a fragnet containing the change order activities into an unprogressed copy of the schedule that is current at the time of the change order;
2. Tying the fragnet into the schedule logic; and
3. Recalculating the schedule.

The Department will not consider delays to activities which do not affect the performance period of the Contract as a basis for a Contract time extension. If the Engineer grants a contract time extension, the revised Contract Completion date will be in effect as though it were the original contract date.

A Contractor’s failure to have an approved, or approved with comments, current project schedule in place will preclude the Department from considering a Contractor’s a time extension request.
Section 108 of the Standard Specifications is hereby revised for this project as follows:

In subsection 108.08, delete the second paragraph and replace with the following:

The Contractor shall not carry on construction operations on Saturdays, Sundays or holidays unless previously arranged and approved. The Contractor shall not perform work on any day of a three or four day holiday weekend when the holiday is New Year’s Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, or Christmas Day. Construction operations shall stop at 12:00 Noon the day before the start of the holiday weekend and shall commence the day after the three or four days have passed. The Contractor shall only make emergency repairs, and provide proper protection of the work and traveling public on these days.
Section 108 of the Standard Specifications is hereby revised for this project as follows:

In subsection 108.09, delete the Schedule of Liquidated Damages and replace with the following:

<table>
<thead>
<tr>
<th>Original Contract Amount ($)</th>
<th>Liquidated Damages per Calendar Day ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>From More Than</td>
<td>To And Including</td>
</tr>
<tr>
<td>0</td>
<td>150,000</td>
</tr>
<tr>
<td>150,000</td>
<td>500,000</td>
</tr>
<tr>
<td>500,000</td>
<td>1,000,000</td>
</tr>
<tr>
<td>1,000,000</td>
<td>2,000,000</td>
</tr>
<tr>
<td>2,000,000</td>
<td>4,000,000</td>
</tr>
<tr>
<td>4,000,000</td>
<td>10,000,000</td>
</tr>
<tr>
<td>10,000,000</td>
<td>----</td>
</tr>
</tbody>
</table>
REVISION OF SECTION 108
NOTICE TO PROCEED

Section 108 of the Standard Specifications is hereby revised for this project as follows:

Delete subsection 108.02 and replace with the following:

108.02 Notice to Proceed. The Contractor shall not commence work prior to the issuance of a Notice to Proceed. The "Notice to Proceed" will stipulate the date on which contract time commences. When the Contractor proceeds with work prior to that date, contract time will commence on the date work actually begins. The Contractor shall commence work under the Contract on or prior to the 15th day following Contract execution or the 30th day following the date of award, whichever comes later, or in accordance with the selected start date allowed in the special provisions.
Section 108 of the Standard Specifications is hereby revised for this project as follows:

Delete subsection 108.03 and replace with the following:

**108.03 Project Schedule.**

(a) *Definitions.*

   Activity. An activity is a project element on a schedule that affects completion of the project. An activity has a description, start date, finish date, duration, and one or more logic ties.

   Activity ID. A unique, alphanumeric, identification code assigned to an activity and remains constant throughout the project.

   Bar Chart. A simple depiction of a Project Schedule without relationships or supporting logic of the schedule.

   Calendar. Defined work periods and no work periods that determine when project activities can occur. Multiple calendars may be used for different activities; e.g., a 5-day work-week and a 7-day work-week calendar.

   Constraint. A restriction imposed in a schedule, which fixes a value that would otherwise be calculated within the schedule. Examples of values that can be fixed by a constraint include start date, end date, and completion date.

   Critical Path. The sequence of activities that determines the duration of the project.

   Critical Path Method Scheduling. (CPM Scheduling) is a logic-based planning technique using activity durations and relationships between activities to calculate a schedule determining the minimum total project duration.

   Data Date. The starting point from which to schedule all remaining work.

   Duration. The estimated amount of time needed to complete an activity.

   Float. The amount of time between the earliest date an activity can start and the latest date when an activity must start, or the earliest date an activity can finish and latest date when an activity can finish before the activity becomes critical. The time between the Project Schedule completion date and the Contract completion date is not considered float.

   Gantt Chart. A time-scaled graphical display of the project's schedule.

   Lag. A time-value assigned to a relationship.

   Logic. Relationships between activities defining the sequence of work (See also predecessor activity and successor activity).

   Milestone. An activity, with no duration used to represent an event.

   Open-Ended Activity. An activity that does not have both a predecessor activity and a successor activity.

   Predecessor Activity. An activity that is defined by schedule logic to precede another activity.

   Relationship. The interdependence between activities.

   Salient Feature. An item of work that is of special interest for CDOT in coordinating the project schedule but may not affect the overall completion of the project.
SUCCESSOR ACTIVITY. An activity that is defined by schedule logic to follow another activity.

TIME-SCALED LOGIC DIAGRAM. Gantt chart that illustrates logic links depicting both schedule logic and the time at which activities are performed.

(b) Project Schedule - General

The Contractor shall use either Microsoft Project or Primavera Scheduling software to develop and manage a CPM Project Schedule to plan, schedule, and report the progress of the work. Prior to, or at the Pre-construction Conference, the Contractor shall notify the Engineer in writing, which scheduling software the Contractor shall use to manage the project. The Contractor’s selection and use of particular scheduling software cannot be changed after the first schedule submittal. If the Contractor selects Primavera, the Contractor shall calculate the schedule using the Retained Logic scheduling option. The Department will not allow use of bar charts for the Project Schedule.

The Contractor shall submit schedules for approval by the Engineer. The purpose of these schedules is to allow the Contractor and the Department to jointly manage the work and evaluate progress. The schedules also serve to evaluate the affect of changes and delays to the scheduled project completion. Either party may require a formal schedule review meeting.

The Contractor’s schedule shall consist of a time-scaled logic diagram and shall show the logical progression of all activities required to complete the work.

The Contractor shall use activity descriptions that ensure the work is easily identifiable. The Contractor shall show the no-work days in the schedule calendars.

The Contractor shall use durations for individual construction activities that do not exceed 15 calendar days unless approved by the Engineer. The Contractor may group a series of activities with an aggregate duration of five days or less into a single activity. Non-construction activities may have durations exceeding 15 working days, as approved by the Engineer.

The Contractor may include summary bars in the schedule as long as the detailed activities to complete the work are displayed.

The Contractor shall not use the following:

1. Negative lags
2. Lags in excess of 10 working days without approval by the Engineer. The Contractor’s written request shall justify the need for the lag. Lags shall be identified.
3. Start-to-finish relationships.
4. Open-ended activities - every activity shall have at least one predecessor activity and at least one successor activity, except for the first and last activities in the network. If the contractor uses a start-to-start relationship to link two activities, then both of those two activities should also have successor activities linked by either a finish-to-start or a finish-to-finish relationship.
5. Constraints without approval by the Engineer. The Contractor’s written request shall explain why the use of constraints in the schedule is necessary.

The Project Schedule shall show all activities required by all parties to complete the work. The Project Schedule shall include subcontracted work, delivery dates for critical material, submittal and review periods, permits and governmental approvals, milestone requirements, utility work by others and no work periods. The Contractor, its subcontractors, suppliers, and engineers, at any tier, shall perform the work according to the approved Project Schedule.
Float within the Baseline Schedule or any other Project Schedule is not for the exclusive use or benefit of either party, but is a project resource available to both parties as needed until it is depleted.

For any schedule submittal that shows completion in less than 85 percent of the Contract Time, the Contractor shall submit planned production rates in the schedule for all activities with float of 10 days or less. The Engineer may require additional methods statements for activities with float of 10 days or less.

The Engineer’s review of the schedule will not exceed 10 calendar days. The Engineer will provide the Contractor with one of the following responses within 10 days after receipt of the Project Schedule:

1. Approved, no exceptions taken;
2. Approved-as-Noted; or
3. Revise and Resubmit within 10 days.

The Contractor shall not assume that approval of the Project Schedule relieves the Contractor of its obligation to complete all work within the Contract Time.

(c) Schedule Submittals. The Contractor shall include a time-scaled logic diagram with all schedule submittals that:

1. Is plotted on a horizontal time-scale in accordance with the project calendar.
2. Uses color to clearly identify the critical path.
3. Is based on early start and early finish dates of activities.
4. For Schedule Updates and Schedule Revisions, shows actual completion dates up to but not including the data date.
5. Clearly shows the sequence and relationships of all activities necessary to complete the contract work.
6. Includes an activity block for each activity with the following information:

<table>
<thead>
<tr>
<th>Activity ID</th>
<th>Activity Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original Duration</td>
<td>Total Float</td>
</tr>
<tr>
<td>Early start date</td>
<td>Early finish date</td>
</tr>
<tr>
<td>Late start date*</td>
<td>Late finish date*</td>
</tr>
<tr>
<td>Actual Start date^</td>
<td>Actual Finish date^</td>
</tr>
<tr>
<td>Calendar used on the activity</td>
<td>Activity Responsibility</td>
</tr>
<tr>
<td>Remaining Duration^</td>
<td>Duration Percent Complete^</td>
</tr>
<tr>
<td>Gantt chart (time-scaled logic diagram)</td>
<td></td>
</tr>
</tbody>
</table>

*Required with the Preliminary and Baseline Schedule.
^Required with the Project Schedule Update and Schedule Revision.

The Contractor shall include the following with all schedule submittals:

1. A Job Progress Narrative Report that includes the following:
   i. A description of the work performed since the previous month’s schedule update.
   ii. A description of problems encountered or anticipated since the previous month’s schedule submission.
   iii. A description of unusual labor, shift, equipment, or material conditions or restrictions encountered or anticipated.
REVISION OF SECTION 108
PROJECT SCHEDULE

(iv) The status of all pending items that could affect the schedule.
(v) Explanations for milestones forecasted to occur late.
(vi) Scheduled completion date status and any change from the previous month’s submission.
(vii) An explanation for a scheduled completion date forecasted to occur before or after the contract completion date or contract time.
(viii) Schedule Delays:
1. A description of current and anticipated delays including: Identification of the delayed activity or activities by Activity ID(s) and description(s).
2. Delay type with reference to the relevant specification subsection.
3. Delay cause or causes.
4. Effect of the delay on other activities, milestones, and completion dates.
5. Identification of the actions needed to avoid a potential or mitigate an actual delay.
6. A description of the critical path impact and effect on the scheduled completion date in the previous month’s schedule update.
(ix) A list of all added and deleted activities along with an explanation for the change.
(x) All logic and duration changes along with an explanation for the change.

(2) A Predecessor Activity and Successor Activity report that defines all schedule logic and clearly indicates all logical relationships and constraints.
(3) An Early Start report listing all activities, sorted by actual start/early start date.
(4) A Float report listing all activities sorted in ascending order of available float.
(5) A Critical Path report listing all activities not yet complete with the percent complete, sorted by float and then by early start.
(6) A listing of all non-work days.

For all required schedule submittals, the Contractor shall submit two electronic copies on two compact disk, USB flash drive, or other media as directed by the Engineer. Electronic copies of CPM schedules shall be submitted both in the native schedule format and in “PDF” format. The Contractor shall also provide two printed copies of the CPM Schedule and all reports.

Each schedule submittal shall be appropriately labeled as a Preliminary Schedule, Baseline Schedule, Project Schedule Update, or Schedule Revision. The title bar shall include the CDOT project number, subaccount, project name, contractor name, schedule data date. If an originally submitted schedule is revised during review, the title bar shall also include a revision number (REV1, REV2, etc.) and revision date.

(d) Preliminary Schedule. Within 14 days of award of the Contract, the Contractor may submit a Preliminary Schedule showing all planned activities from the Notice to Proceed through the first 60 days of the project. If the Contractor elects not to submit a Preliminary Schedule, then the Contractor shall submit a complete Baseline Schedule within 14 days of award of the Contract, which will be subject to all requirements of a Baseline submittal. The Preliminary Schedule shall not show any progress and it will be approved by the Engineer before work can commence. The Preliminary Schedule shall be used as the basis for the Baseline Schedule.

(e) Baseline Schedule. If the Contractor elects to submit a Preliminary Schedule, within 45 days of the award of Contract, the Contractor shall submit a Baseline Schedule that includes all work activities completed within Contract Time. The Contractor shall not show progress in the Baseline Schedule. Further partial payments will not be made beyond 60 days after the start of Contract Time unless the Baseline Schedule is approved. When approved, the Baseline Schedule shall become the Project Schedule.

The Contractor shall use all information known by the Contractor at the time of bid submittal to develop the Baseline Schedule.
If the Contractor elects to submit a Baseline Schedule in lieu of a Preliminary Schedule, the Baseline Schedule shall be approved before work can commence.

(f) **Methods Statements.** The Contractor shall submit a Methods Statement for each salient feature or as directed by the Engineer that describes all work necessary to complete the feature. The Contractor shall include the following information in the Methods Statement:

1. Salient feature name;
2. Responsibility for the salient feature work;
3. Planned work procedures;
4. The planned quantity of work per day for each salient feature using the same units of measure as the applicable pay item;
5. The anticipated labor force by labor type;
6. The number, types, and capacities of equipment planned for the work;
7. The planned time for the work including the number of work days per week, number of shifts per day, and the number of hours per shift.

(g) **Project Schedule Update.** The Contractor shall submit a monthly update of the Project Schedule updated through the cut-off date for the monthly progress pay estimate, and a projection for completing all remaining activities. A schedule update may show a completion date that is different than the Contract completion date, after the baseline schedule is approved. Approval of this schedule shall not relieve the Contractor of its obligation to complete the work within the Contract Time. In this case, the Contractor shall provide an explanation for a late scheduled completion date in the Job Progress Narrative Report included with the schedule submittal.

When approved, the Project Schedule Update will become the Project Schedule. The Engineer will not issue a monthly progress payment if the Engineer has not received the Project Schedule Update. The Engineer will not make monthly progress payments for the months following the Project Schedule Update submission until the Engineer approves the Project Schedule Update.

When the project has a maintenance or landscape establishment period, the Engineer may waive the monthly update requirement. The Contractor shall submit a final Project Schedule Update that shows all work through the final acceptance date.

(h) **Weekly Planning Schedule.** The Contractor shall submit, in writing, a Weekly Planning Schedule that shows the Contractor’s and all Subcontractor’s planned activities for a minimum of two weeks immediately following the date of submittal and actual days worked versus planned for the week prior to the date of submittal. This schedule shall include the description, duration and sequence of work activities and anticipated lane closures for the upcoming two weeks. The Weekly Planning Schedule may be a time-scaled logic diagram or other standard format as approved by the Engineer. subsection 108.03(c) Schedule Submittal requirements for reports do not apply to the Weekly Planning Schedule.

(i) **Schedule Revision.** A Schedule Revision is required in the event of any major change to the work. Examples of major changes are:

1. Significant changes in logic or methods of construction or changes to the critical path;
2. Addition, deletion, or revision of activities required by contract modification order;
3. Approval of a Contractor submitted Value Engineering Change Proposal;
4. Delays in milestones or project completion;
5. Phasing revisions, or;
6. If the Engineer determines that the schedule does not reflect the actual work.
This revision shall include a description of the measures necessary to achieve completion of the work within the Contract Time. The Contractor may also need to submit revised Methods Statements. The Contractor shall provide a Schedule Revision within 10 days of written notification and shall include the diagrams and reports as described in subsection 108.03 (b) Schedule - General and (c) Schedule Submittals. In this case, the Contractor shall provide an explanation for a late scheduled completion date in the Job Progress Narrative Report included with the schedule.

Once approved, the Schedule Revision becomes the Project Schedule.

(j) Payment. All costs relating to the requirements of this subsection will not be paid for separately, but shall be included in the work.
REVISION OF SECTION 108
SUBLETTING OF CONTRACT

Section 108 of the Standard Specifications is hereby revised for this project as follows:

Delete subsection 108.01 and replace with the following:

108.01 Subletting of Contract. The Contractor shall not sublet, sell, transfer, assign, or dispose of the Contract or Contracts, or any portion thereof without written permission of the Engineer. Prior to beginning any work by subcontractor, the Contractor shall request permission from the Engineer by submitting a completed Sublet Permit Application, CDOT Form No. 205. The subcontract work shall not begin until the Contractor has received the Engineer’s written permission. The Contractor shall make all project related written subcontracts, agreements, and purchase orders available to the Engineer for viewing, upon request and at a location convenient to the Engineer.

The Contractor will be permitted to sublet a portion of the Contract, however, the Contractor’s organization shall perform work amounting to 30 percent or more of the total original contract amount. Any items designated in the contract as “specialty items” may be performed by subcontract. The cost of “specialty items” so performed by subcontract may be deducted from the total original contract amount before computing the amount of work required to be performed by the Contractor’s own organization. The original contract amount includes the cost of material and manufactured products which are to be purchased or produced by the Contractor and the actual agreement amounts between the Contractor and a subcontractor. Proportional value of a subcontracted partial contract item will be verified by the Engineer. When a firm both sells material to a prime contractor and performs the work of incorporating the materials into the project, these two phases shall be considered in combination and as constituting a single subcontract.

The calculation of the percentage of subcontracted work shall be based on subcontract unit prices.

Subcontracts or transfer of Contract shall not release the Contractor of liability under the Contract and Bond.
REVISION OF SECTION 109
ASPHALT CEMENT COST ADJUSTMENT
(ASPHALT CEMENT INCLUDED IN THE WORK)

Section 109 of the Standard Specifications is hereby revised for this project as follows:

Subsection 109.06 shall include the following:

(i) Asphalt Cement Cost Adjustments. Contract cost adjustments will be made to reflect increases or decreases in the monthly average price of asphalt cement from the average price for the month preceding the month in which bids were received for the Contract. These cost adjustments are not a change to the contract unit prices bid.

1. Cost adjustments will be based on the asphalt cement price index established by the Department and calculated as shown below. The index will be the average for the month of the daily Hardisty WCS spot price. This will be calculated by applying the monthly Hardisty WCS differential (as published on http://www.fhr.com/refining/crude_oil.aspx) from the West Texas Intermediate (WTI) daily spot price (as published on http://www.up.com/customers/surcharge/wti/prices/index.htm). The daily prices and the average index number for the month will be posted as soon as they are available on the CDOT website at:


2. Cost adjustments will be made on a monthly basis subject to the following conditions:

   A. Adjustment will be based on the pay quantities on the monthly partial pay estimate for the following two pay items when measured by the ton and asphalt cement is included in the pay items:

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>403*</td>
<td>Hot Mix Asphalt (Grading __) (Asphalt)</td>
<td>Ton</td>
</tr>
<tr>
<td>403</td>
<td>Stone Matrix Asphalt (Grading __) (Asphalt)</td>
<td>Ton</td>
</tr>
</tbody>
</table>

   *Hot Mix Asphalt (Patching) is not subject to asphalt cement cost adjustment.

   B. A cost adjustment will be made only when the asphalt cement price index varies by more than 5 percent from the asphalt cement price index at the time of bid, and only for that portion of the variance in excess of 5 percent. Cost adjustments may be either positive or negative dollar amounts.

   C. Asphalt cement cost adjustments will not be made for any partial estimate falling wholly after the expiration of contract time.

   D. Adjustment formula:

   EP greater than BP:
   \[
   ACCA = (EP - 1.05 \times BP) \times (PA) \times (Q)
   \]

   EP less than BP:
   \[
   ACCA = (EP - 0.95 \times BP) \times (PA) \times (Q)
   \]
REVISION OF SECTION 109
ASPHALT CEMENT COST ADJUSTMENT
(ASPHALT CEMENT INCLUDED IN THE WORK)

Where:

BP = Average Asphalt Cement price index for the calendar month prior to the calendar month in which bids are opened

EP = Average Asphalt Cement price index for the calendar month prior to the calendar month in which the partial estimate pay period ends

ACCA = Asphalt Cement Cost Adjustment

PA = Percent of the paving mixture that is asphalt cement. Asphalt Cement content will be determined by the weighted average of all asphalt cement content percentages obtained from the field acceptance tests for that item (Use decimal in formula, e.g.: 0.05.). If Reclaimed Asphalt Pavement (RAP), Reclaimed Asphalt Shingles (RAS), or both is used, the percent of Virgin Asphalt Cement added to the mix will be determined by subtracting the percent of asphalt cement in the RAP, RAS, or both from the percent of asphalt cement in the mix as calculated from Revision of Section 401, Reclaimed Asphalt Pavement and Revision of Section 401 Reclaimed Asphalt Shingles.

Q = Increased pay quantity for all 403 items shown above on the monthly partial pay estimate in Tons.

Example: Bids are opened on July 16. The BP will be the average of the daily postings for June 1 through June 30. For an estimate cut-off date selected by the Contractor at the Pre-Construction Conference of the 20th of the month a February estimate will include HMA quantities measured from the 21st of January through the 20th of February, and the EP index used to calculate ACCA will be the average of the daily prices for January 1 through January 31 as established by CDOT.

E. Cost adjustment will not be made for the quantity of any item that is left in place at no pay or for material removed and replaced at the Contractor’s expense.

F. Cost adjustments will not be made to items of work added to the Contract by Change Order after the award of the Contract.

G. The asphalt cement cost adjustment will be the sum of the individual adjustments for each of the pay items shown above. No adjustment will be made for asphalt cement costs on items other than those shown above.

H. Asphalt cement cost adjustments resulting in an increased payment to the Contractor will be paid for under the planned force account item: Asphalt Cement Cost Adjustment. Asphalt cement cost adjustments resulting in a decreased payment to the Contractor will be deducted from monies owed the Contractor.
In subsection 109.10, delete the first two paragraphs and replace with the following:

109.10 Compensation for Compensable Delays. If the Engineer determines that a delay is compensable in accordance with either subsection 105.22, 105.23, 105.24, or 108.08, monetary compensation will be determined in accordance with this subsection.

(a) These categories represent the only costs that are recoverable by the Contractor. All other costs or categories of costs are not recoverable:

(1) Actual wages and benefits, including FICA, paid for additional labor not otherwise included in (5) below;
(2) Costs for additional bond, insurance and tax;
(3) Increased costs for materials;
(4) Equipment costs calculated in accordance with subsection 109.04(c) for Contractor owned equipment and based on invoice costs for rented equipment;
(5) Costs of extended job site overhead;
(6) Costs of salaried employees not otherwise included in (1) or (5) above incurred as a direct result of the delay;
(7) Claims from subcontractors and suppliers at any level (the same level of detail as specified herein is required for all such claims);
(8) An additional 16 percent will be added to the total of items (1) through (7) as compensation for items for which no specific allowance is provided, including profit and home office overhead.
February 3, 2011

REVISION OF SECTION 109
FUEL COST ADJUSTMENT

Section 109 of the Standard Specifications is hereby revised for this project as follows:

Subsection 109.06 shall include the following:

(h) **Fuel Cost Adjustments.** Contract cost adjustments will be made to reflect increases or decreases in the monthly average prices of gasoline, diesel and other fuels from the average price for the month preceding the month in which bids were received for the Contract. These cost adjustments are not changes to the Contract unit prices bid. When bidding, the Contractor shall specify on the Form 85 whether the cost adjustment will apply to the Contract. After bids are submitted, the Contractor will not be given any other opportunity to accept or reject this adjustment. If the Contractor fails to indicate a choice on the Form 85, the cost adjustment will not apply to the Contract. If the fuel cost adjustment is accepted by the Contractor, the adjustment will be made in accordance with the following criteria:

1. Cost adjustments will be based on the fuel price index established by the Department and calculated as shown in subsection 109.06(h)2.D below. The index will be the monthly average of the rates posted by the Oil Price Information Service (OPIS) for Denver No. 2 Diesel. The rate used will be the OPIS Average taken from the OPIS Standard Rack table for Ultra-Low Sulfur w/Lubricity Gross Prices (ULS column), expressed in dollars per gallon and rounded to two decimal places.

2. Cost adjustments will be made on a monthly basis subject to the following conditions:

   A. Adjustment will be based on the pay quantities on the monthly partial pay estimate for each of the pay items listed in the table below for which fuel factors have been established. Adjustment will be made only when the pay item is measured by the pay unit specified in the table:

<table>
<thead>
<tr>
<th>Item</th>
<th>Pay Unit</th>
<th>Fuel Factor (FF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>202 - Removal of Asphalt Mat (Planing)</td>
<td>Square Yard</td>
<td>0.006 Gal/SY/Inch depth</td>
</tr>
<tr>
<td>203 - Excavation (muck, unclassified) Embankment, Borrow</td>
<td>Cubic Yard</td>
<td>0.29 Gal/CY</td>
</tr>
<tr>
<td>203 - Rock Excavation</td>
<td>Cubic Yard</td>
<td>0.39 Gal/CY</td>
</tr>
<tr>
<td>206 - Structure Excavation and Backfill [applies only to quantities paid for by separate bid item; no adjustment will be made for pay items that include structure excavation &amp; backfill, such as RCP(CIP)]</td>
<td>Cubic Yard</td>
<td>0.29 Gal/CY</td>
</tr>
<tr>
<td>304 - Aggregate Base Course (Class ___)</td>
<td>Cubic Yard</td>
<td>0.85 Gal/CY</td>
</tr>
<tr>
<td>304 - Aggregate Base Course (Class ___)</td>
<td>Ton</td>
<td>0.47 Gal/Ton</td>
</tr>
<tr>
<td>307 - Processing Lime Treated Subgrade</td>
<td>Square Yard</td>
<td>0.12 Gal/SY</td>
</tr>
<tr>
<td>310 - Full Depth Reclamation</td>
<td>Square Yard</td>
<td>0.06 Gal/SY</td>
</tr>
<tr>
<td>403 - Hot Mix Asphalt (HMA) (Grading ___)</td>
<td>Ton</td>
<td>2.47 Gal/Ton</td>
</tr>
<tr>
<td>403 - Stone Matrix Asphalt (Grading ___)</td>
<td>Ton</td>
<td>2.47 Gal/Ton</td>
</tr>
<tr>
<td>405 - Heating and Scarifying Treatment</td>
<td>Square Yard</td>
<td>0.44 Gal/SY</td>
</tr>
<tr>
<td>405 - Heating and Repaving Treatment</td>
<td>Square Yard</td>
<td>0.44 Gal/SY</td>
</tr>
<tr>
<td>405 - Heating and Remixing Treatment</td>
<td>Square Yard</td>
<td>0.44 Gal/SY</td>
</tr>
<tr>
<td>406 - Cold Bituminous Pavement (Recycle)</td>
<td>Square Yard</td>
<td>0.01 Gal/SY/Inch depth</td>
</tr>
<tr>
<td>412 - Concrete Pavement (___ Inch)</td>
<td>Square Yard</td>
<td>0.03 Gal/SY/Inch thickness</td>
</tr>
<tr>
<td>412 - Place Concrete Pavement**</td>
<td>Square Yard</td>
<td>0.03 Gal/SY/Inch thickness</td>
</tr>
</tbody>
</table>

   *Hot Mix Asphalt (Patching) is not subject to fuel cost adjustment.**Use the thickness shown on the plans.
B. A fuel cost adjustment will be made only when the current fuel price index varies by more than 5 percent from the price index at the time of bid, and only for that portion of the variance in excess of 5 percent. Fuel cost adjustments may be either positive or negative dollar amounts.

C. Fuel cost adjustments will not be made for any partial estimate falling wholly after the expiration of contract time.

D. Adjustment formula:

\[
\begin{align*}
\text{EP greater than BP:} & & \text{FA} = (\text{EP} - 1.05 \text{ BP})(Q)(\text{FF}) \\
\text{EP less than BP:} & & \text{FA} = (\text{EP} - 0.95 \text{ BP})(Q)(\text{FF})
\end{align*}
\]

Where:

- \(\text{BP}\) = Average fuel price index for the calendar month prior to the calendar month in which bids are opened
- \(\text{EP}\) = Average fuel price index for the calendar month prior to the calendar month in which the partial estimate pay period ends
- \(\text{FA}\) = Adjustment for fuel costs in dollars
- \(\text{FF}\) = Fuel usage factor for the pay item
- \(Q\) = Pay quantity for the pay item on the monthly partial pay estimate

Note: When the pay item is based on area, and the rate of fuel use varies with thickness, \(Q\) should be determined by multiplying the area by the thickness. For example: for 1000 square yards of 8-inch concrete pavement \(Q\) should be 8000.

Example: Bids are opened on July 16. The BP will be the average of the daily postings for June 1 through June 30. For an estimate cut-off date selected by the Contractor at the Pre-Construction Conference of the 20th of the month a February estimate will include HMA quantities (Q) measured from the 21st of January through the 20th of February, the FF will be 2.47 Gal/Ton, and the EP index used to calculate FA will be the average of the daily postings for January 1 through January 31 as established by CDOT.

E. Fuel cost adjustment will not be made for the quantity of any item that is left in place at no pay.

F. Fuel cost adjustments will not be made to items of work added to the Contract by Change Order after the award of the Contract.

The fuel cost adjustment will be the sum of the individual adjustments for each of the pay items shown. No adjustment will be made for fuel costs on items other than those shown. The factors shown are aggregate adjustments for all types of fuels used, including but not limited to gasoline, diesel, propane, and burner fuel. No additional adjustments will be made for any other type of fuel.

Fuel cost adjustments resulting in an increased payment to the Contractor will be paid for under the planned force account item: Fuel Cost Adjustment. Fuel cost adjustments resulting in a decreased payment to the Contractor will be deducted from monies owed the Contractor.
Section 109 of the Standard Specifications is hereby revised for this project as follows:

In subsection 109.01, delete the 17th paragraph and replace it with the following:

Vehicles used to haul material being paid for by weight shall bear a plainly legible identification mark. Each of these vehicles shall be weighed empty daily at times directed by the Engineer. The Contractor shall furnish to the Engineer, in writing, a vehicle identification sheet that lists the following for each delivery vehicle to be used on the project:

1. identification mark
2. vehicle length
3. tare weight
4. number of axles
5. the distance between extreme axles
6. information related to legal weight, including the Permit No. and permitted weight of each vehicle for which the State has issued an overweight permit.

This information shall be furnished prior to time of delivery of the material and at any subsequent time the Contractor changes vehicles, combination vehicles, axle length relationships, or overweight permitting of vehicles.
Section 109 of the Standard Specifications is hereby revised for this project as follows:

In subsection 109.01, delete the twenty-sixth paragraph and replace with the following:

Water may be measured either by volume or weight. Water meters shall be accurate within a range of ± 3 percent. When water is metered, the Contractor shall use an approved metering device and shall furnish the Engineer a certificate showing the meter has been accurately calibrated within the time allowed in the following schedule:

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Calibration Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 inch</td>
<td>4 years</td>
</tr>
<tr>
<td>4 inch to 6 inch</td>
<td>2 years</td>
</tr>
<tr>
<td>8 inch to 10 inch</td>
<td>1 year</td>
</tr>
</tbody>
</table>
Section 109 of the Standard Specifications is hereby revised to include the following:

Subsection 109.06 (e) shall include the following:

The Contractor shall submit the Form 1418, Monthly Payment Report, along with the project schedule updates, in accordance with subsections 108.03 (b) or 108.03 (c) (3). Failure to submit a complete and accurate Form 1418 shall be grounds for CDOT to withhold subsequent payments or retainage to the Contractor.
Section 109 of the Standard Specifications is hereby revised for this project as follows:

In subsection 109.01, delete the 11th paragraph and replace with the following:

Materials measured or proportioned by weight shall be weighed on accurate scales. Scales shall be accurate within the allowable tolerances as prescribed by State law. The scales shall be tested for accuracy by the Colorado Department of Agriculture or an approved Colorado Department of Agriculture vendor (https://www.colorado.gov/pacific/aginspection/scale-companies) as least once each year, each time the scales are relocated, and as often as the Engineer may deem necessary. Scales shall be furnished by the Contractor or the Contractor may utilize commercial scales.
Section 201 of the Standard Specifications is hereby revised for this project as follows:

In subsection 201.02, delete the third paragraph and replace with the following:

All surface objects, trees, stumps, roots, and other protruding obstructions not designated to remain shall be cleared and grubbed. In areas to be rounded at the tops of backslopes, stumps shall be removed to at least 2 feet below the surface of the final slope line.

In subsection 201.02, delete the ninth paragraph and replace with the following:

The Contractor shall clear and grub the areas within the excavation or embankment grading limits and shall include the removal from the ground of brush, roots, sod, grass, residue of agricultural crops, sawdust, and other vegetable matter. See subsection 208.04(e) for disturbed area limits.
Sections 202, 627 and 708 of the Standard Specifications are hereby revised for this project as follows:

In subsection 202.05, delete the third paragraph and replace with the following:

\(a\) Removal of temporary pavement marking on final alignment. Temporary pavement marking paint on the approved final alignment shall be removed completely from the roadway surface at locations of permanent pavement markings as shown on the plans. The ground location shall be clean, dry and free of laitance, oil, dirt, grease, paint or other foreign contaminants prior to application of final pavement marking. The Contractor shall not remove more pavement marking paint than what can be replaced with permanent pavement marking during the same working day or working period. If an event occurs that precludes the contractor from completing the work during the placement of permanent marking, the Contractor shall halt the removal operation and raised flexible pavement markers shall be placed at locations that have been removed but not marked while the pavement is drying prior to the marking application. Marking application shall resume when pavement is dry and has had no moisture for a minimum of 24 hours. Raised flexible pavement markers shall be installed with one marker at 40-foot centers.

\(b\) Removal of temporary pavement marking on transitions. Removal of pavement marking paint on temporary transitional alignments shall be performed by grinding or water-blasting. The removal shall result in 100 percent removal of the paint and a wide swath of ground pavement surrounding the former location of the temporary paint. The width of the swath shall be as follows; the center of the swath shall be the location of the paint line:

<table>
<thead>
<tr>
<th>Width of Pavement Marking to be removed</th>
<th>Width of Swath</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 8 inches</td>
<td>12 inches</td>
</tr>
<tr>
<td>&gt; 8 inches</td>
<td>15 inches</td>
</tr>
</tbody>
</table>

Subsection 202.11 shall include the following:

Removal of temporary pavement marking on transitions will be measured as the actual square feet of the swath constructed for the required width. Removal of pavement marking for the permanent alignment will be measured as the actual number of square feet removed.

Subsection 202.12 shall include the following:

Payment will be made under:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removal of Pavement Marking</td>
<td>Square Foot</td>
</tr>
<tr>
<td>Removal of Pavement Marking (12 Inch)</td>
<td>Square Foot</td>
</tr>
<tr>
<td>Removal of Pavement Marking (15 Inch)</td>
<td>Square Foot</td>
</tr>
</tbody>
</table>

Raised pavement markings shall be at the Contractor’s expense.

In subsection 627.04, delete the first paragraph and replace with the following:

627.04 Pavement Marking with Low Temperature Acrylic Paint and High Build Acrylic Paint.
Striping shall be applied when the air and pavement temperatures are no less than 45 °F for waterborne and high-build paint, and 35°F for low temperature waterborne paint on asphalt or portland cement concrete pavements. The pavement surface shall be dry and clean, and free of all latent materials, in
accordance with manufacturer recommendations. Weather conditions shall be conducive to satisfactory results.

Glass beads shall be applied into the paint by means of a low pressure, gravity drop bead applicator.

In subsection 627.04 delete the table and replace it with the following:

<table>
<thead>
<tr>
<th>Description</th>
<th>Pavement Marking Paint</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low Temp</td>
</tr>
<tr>
<td>Alignment Lateral Deviation</td>
<td>2.0 inch per 200 foot Max</td>
</tr>
<tr>
<td>Coverage Rate Sq. Ft. per Gallon</td>
<td>89-93</td>
</tr>
<tr>
<td>Thickness Mil</td>
<td>17-18</td>
</tr>
<tr>
<td>Width Inches</td>
<td>Per Plans +/- 0.25</td>
</tr>
<tr>
<td>Dry Time Minutes</td>
<td>5-10</td>
</tr>
<tr>
<td>Beads Application Rate, lbs./gal</td>
<td>7-8</td>
</tr>
</tbody>
</table>

Subsection 627.13 shall include the following:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pavement Marking Paint (High Build)</td>
<td>Gallon</td>
</tr>
<tr>
<td>Pavement Marking Paint (Low Temperature)</td>
<td>Gallon</td>
</tr>
</tbody>
</table>

Delete subsection 708.05 and replace with the following:

**708.05 Pavement Marking Materials.** All pavement marking materials shall be selected from the Department’s Approved Products List (APL). Prior to start of work, a Certificate of Compliance (COC) for all pavement marking materials shall be submitted in accordance with subsection 106.13.

(a) **Color.** The pavement marking paint, without drop-on beads, shall correspond following requirements:

- White – Federal Standard No. 595B-17925. The Yellowness Index (YI) of white shall not exceed 8.0 per ASTM E-313-10 initially. The color after drying shall be a flat-white, free from tint, and shall provide the maximum amount of opacity and visibility under both daylight and artificial light.

- Yellow – Materials for pavement markings shall meet the initial daytime chromaticity that fall within the box created by the following corner points:

<table>
<thead>
<tr>
<th>x</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>0.530</td>
<td>0.510</td>
<td>0.455</td>
<td>0.472</td>
</tr>
<tr>
<td></td>
<td>0.456</td>
<td>0.485</td>
<td>0.444</td>
<td>0.400</td>
</tr>
</tbody>
</table>

(b) **Low Temperature Acrylic Waterborne Paint.** Low Temperature Acrylic Waterborne Paint binder (nonvolatile portion of vehicle) shall be 100 percent XSR acrylic polymer, by weight, as determined by infrared analysis or other chemical analysis available to the Department.
(c) *High Build Acrylic Waterborne Paint.* High build acrylic waterborne paint binder (nonvolatile portion of vehicle) shall be 100 percent HD 21 acrylic cross linking polymer, by weight, as determined by infrared analysis or other chemical analysis available to the Department.

Low Temperature Acrylic Waterborne Paint, and High Build Acrylic Waterborne paint shall meet the following requirements:

**Performance Requirements:** The paint shall be water resistant and shall show no softening or blistering.

**Table 708-1**

<table>
<thead>
<tr>
<th>Property</th>
<th>White</th>
<th>Yellow</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonvolatile portion of vehicle (white and yellow), %</td>
<td>43.0 (min)</td>
<td>43.0 (min)</td>
<td>ASTM D 2205</td>
</tr>
<tr>
<td>Pigment Composition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent by weight♦</td>
<td>60.0</td>
<td>60.0</td>
<td>ASTM D 4451, ASTM D 3723</td>
</tr>
<tr>
<td>Paint</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Titanium Dioxide Content, lb./gal</td>
<td>1.0 (min)</td>
<td></td>
<td>ASTM D 5381</td>
</tr>
<tr>
<td>Properties of the Finished Paint</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Non-volatiles, (solids) % by weight</td>
<td>77.0 (min)</td>
<td>77.0 (min)</td>
<td>FTMS 141C - Method 4053.1, ASTM D 2369, or ASTM D 4758</td>
</tr>
<tr>
<td>Density, lbs./gal</td>
<td>14.0-14.6</td>
<td>13.7-14.3</td>
<td>ASTM D 2205</td>
</tr>
<tr>
<td>Consistency (Viscosity) White and Yellow, Krebs-Stormer Units</td>
<td>85-95</td>
<td>85-95</td>
<td>ASTM D 562</td>
</tr>
<tr>
<td>Freeze Thaw Stability</td>
<td>Shall complete 5 or more test cycles successfully</td>
<td></td>
<td>ASTM D 2243</td>
</tr>
<tr>
<td>Fineness of Grind, Cleanliness Rating B, minimum</td>
<td>3</td>
<td>3</td>
<td>ASTM D 1210</td>
</tr>
<tr>
<td>Scrub Resistance</td>
<td>800</td>
<td>800</td>
<td>ASTM D2486</td>
</tr>
<tr>
<td>Directional Reflectance: [15 mil Wet Film]</td>
<td>88 (min)</td>
<td>50 (min)</td>
<td>ASTM E 1347</td>
</tr>
<tr>
<td>Dry Opacity (Contrast Ratio): [5 mil Wet Film]</td>
<td>0.95 (min)</td>
<td>0.95 (min)</td>
<td>ASTM D 2805</td>
</tr>
</tbody>
</table>

♦Percent by weight shall include percent of organic yellow pigment.
Section 203 of the Standard Special Provisions is hereby deleted for this project and replaced with the following:

DESCRIPTION

203.01 General. This work consists of excavation, hauling, disposal, placement, and compaction of all material encountered within the limits of the work, including construction of dikes and the excavation for ditches and channels, necessary for the construction of the roadway in accordance with the Contract.

MATERIALS

203.02 Definitions. All excavation will be defined as, “unclassified excavation”, “stripping”, “removal of unsuitable material”, “rock excavation”, “borrow”, or “potholing” as described below:

(a) Unclassified Excavation. Unclassified Excavation shall consist of the excavation of all materials of whatever character required for the work, obtained within the right of way, including surface boulders and excavation for ditches and channels that is not removed under some other item.

(b) Stripping. Stripping shall consist of removing overburden or other specified material from borrow pits, and the replacement of overburden or other specified material over the disturbed area of the site or pit after the underlying material has been removed.

(c) Removal of Unsuitable Material. Removal of Unsuitable Material shall consist of the removal of soils or mixtures of soil and organic matter identified in the Contract or as directed by the Engineer that would be detrimental to the roadway or embankment if left in place in its existing condition.

(d) Rock Excavation. Rock Excavation shall consist of igneous, metamorphic, and sedimentary rock which cannot be excavated without blasting or with the use of rippers, including all boulders or other detached stones having a volume of ½ cubic yard or more. Unless specified in the Contract, Rock Excavation is material that meets one of the following field test criteria to be conducted by the Contractor:

1. Ripping Test: Material that cannot be broken down by one pass with a single tooth ripper mounted on a crawler type tractor in low gear with a minimum net flywheel power rating of 235 horsepower; or material that cannot be broken down with a 48000 pound tracked excavator utilizing a bucket with rock teeth.

2. Seismic Test: Material that has a seismic velocity of 6,000 feet per second or greater. The Contractor shall submit the qualifications of the individual performing or interpreting the seismic testing to the Engineer a minimum of 14 days prior to testing. The ripping test will be used to resolve differences if seismic velocities fall below 6,000 feet per second.

3. Handling Test: Any boulder or detached stone having a volume of ½-cubic yard or more that cannot be readily broken down with the excavation equipment described above in 1.

(e) Borrow. Borrow shall consist of approved material obtained from outside the right of way, required for the construction of the project.

(f) Potholing. Potholing consists of exposing and verifying the location of existing utilities at locations as directed.
203.03 Embankment Materials. Embankment Material shall consist of approved material acquired from excavations or borrow pits, and hauled and placed in embankments. Approval of Embankment Material shall be contingent on the material meeting the Atterberg Limit and gradation requirements specified in the Contract. Approval of the embankment material in the upper 2 feet of embankment below the subgrade elevation is contingent on the material meeting one of the following as specified in the Contract:

1. the specified resistance value when tested by the Hveem Stabilometer, or equivalent resilient modulus
2. the specified Atterberg Limit and gradation requirements
3. the specified resistance value when tested by the Hveem Stabilometer, or equivalent resilient modulus, and the specified Atterberg Limit and gradation requirements

Non-durable bedrock shall be identified and classified using Colorado Procedure CP-L 3104. Any material that classifies as Soil-like Non-durable (S-N) as defined in the procedure shall be pulverized, broken down and processed to 6-inch maximum particle sizes before incorporation into embankment fill. These materials shall be placed and compacted as “Soil Embankment” in accordance with subsection 203.07 (a). Non-durable bedrock particles in excess of 6 inches shall not be placed into embankment fill.

If recycled concrete or asphalt are to be incorporated into embankment fill; the maximum dimension permitted for concrete is 24 inches and the maximum dimension permitted for asphalt is 12 inches.

Embankment Material imported onto the project will be tested for water soluble sulfates using CP-L 2103 Method B. The average of three consecutive tests shall show that the sulfate content is not greater than that corresponding to the sulfate exposure level specified in the Contract. No single test shall have a sulfate content more than 20 percent greater than that corresponding to the sulfate exposure level specified in the Contract. A single failing test shall have the remaining sample split into four equal portions. CDOT Region Lab shall receive one portion, the Contractor shall receive one portion and the remaining two portions shall go to the CDOT Central lab. The CDOT Region Lab, CDOT Central Lab and the Contractor’s Lab shall retest the sample. If the results from the three Labs are within 10 percent of each other, the results will be averaged. The averaged result will be used for determining Contract compliance. If the results from the Labs are not within 10 percent of each other, the remaining split sample will be sent to an independent laboratory for testing using CP-L 2103. The independent laboratory will be mutually agreed upon by the Department and the Contractor. The Independent Lab’s test result will be used for determining Contract compliance.

If the water soluble sulfate content is less than that corresponding to the sulfate exposure level specified in the Contract, CDOT will bear all costs associated with the independent lab test. If the soluble sulfate content is greater than that corresponding to the sulfate exposure level specified in the Contract, all costs associated with independent lab testing shall be at the Contractor’s expense. Embankment represented by failing tests shall be removed from the project and replaced at the Contractor’s expense.

Imported Material used for backfilling pipes (storm sewer, cross culverts, side drains, etc) shall be tested for compatibility with the selected pipe material. When Non-reinforced Concrete Pipe or Reinforced Concrete Pipe is used, the imported material shall be tested for sulfate and pH. When Corrugated Steel Pipe, Bituminous Coated Corrugated Steel Pipe or Pre-coated Corrugated Steel Pipe is used, the imported material shall be tested for sulfates, chlorides, pH and resistivity. When Aramid Fiber Bonded Corrugated Steel Pipe or Corrugated Aluminum Pipe is used, the imported material shall be tested for pH and resistivity. When Plastic pipe is selected, the imported material does not need to be tested for sulfates, chlorides, pH or resistivity.

Sulfates, chlorides, pH and resistivity shall be determined by the following procedures:

1. Water soluble sulfates using CP-L 2103 Method B
2. Chlorides using CPL 2104
3. Resistivity using ASTM G57
4. pH using ASTM G51
The average of three consecutive tests shall show the imported material’s sulfate, chloride, pH and resistivity is not greater than the limits corresponding to the Pipe Class in Table 203-1 or 203-2 for the pipe class specified in the Contract. No single test shall have a result more than 20 percent greater than that corresponding to the limit in Table 203-1 or Table 203-2 for sulfates, chlorides and resistivity. No single test shall have a result more than 5 percent outside the limit in Table 203-1 for pH. The remaining sample material from a single failing test shall be split into three equal portions. CDOT shall receive one portion, the Contractor shall receive one portion and the remaining portion shall be retained by the Project. CDOT and the Contractor’s Lab shall retest the failed sample; if the results from those tests are within 10 percent of each other, the results will be averaged. The averaged result will be used for Contract compliance. If the results from the Labs are not within 10 percent of each other, the remaining sample portion will be sent to an independent laboratory for testing using the testing requirements specified above. The independent laboratory will be mutually agreed upon by the Department and the Contractor. The Independent Lab’s test result will be used for Contract compliance.

If the imported material’s sulfates, chlorides, and resistivity are less than the limits and the pH is within the limits in Table 203-1 or 203-2, CDOT will bear all costs associated with the independent lab test. If the imported material’s sulfates, chlorides, and resistivity is greater than the limits and the pH is outside the limits in Table 203-1 or 203-2, all costs associated with independent lab testing shall be at the Contractor’s expense.

Embankment represented by failing tests shall be removed from the project and replaced at the Contractor’s expense.

### Table 203-1
**SULFATE, CHLORIDE AND pH OF IMPORTED MATERIAL**

<table>
<thead>
<tr>
<th>Pipe Class</th>
<th>Sulfate (SO₄)</th>
<th>Chloride (Cl)</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>0, 7</td>
<td>0.05</td>
<td>0.05</td>
<td>6.0-8.5</td>
</tr>
<tr>
<td>1, 7</td>
<td>0.10</td>
<td>0.10</td>
<td>6.0-8.5</td>
</tr>
<tr>
<td>2, 8</td>
<td>0.20</td>
<td>0.20</td>
<td>6.0-8.5</td>
</tr>
<tr>
<td>3, 9</td>
<td>0.50</td>
<td>0.50</td>
<td>6.0-8.5</td>
</tr>
<tr>
<td>4, 9</td>
<td>1.00</td>
<td>1.00</td>
<td>5.0-9.0</td>
</tr>
<tr>
<td>5, 10</td>
<td>2.00</td>
<td>2.00</td>
<td>5.0-9.0</td>
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<tr>
<td>6, 10</td>
<td>&gt;2.00</td>
<td>&gt;2.00</td>
<td>&lt;5 or &gt;9</td>
</tr>
</tbody>
</table>

### Table 203-2
**RESISTIVITY AND pH OF IMPORTED MATERIAL**

<table>
<thead>
<tr>
<th>SOIL SIDE</th>
<th>Resistivity, R (Ohm – cm)</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≥1,500</td>
<td>5.0-9.0</td>
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<tr>
<td></td>
<td>≥250</td>
<td>3.0-12.0</td>
</tr>
</tbody>
</table>
Embankment Material shall be classified into one of the material groups listed below, and placed and compacted in accordance with the appropriate methods specified in subsection 203.07. If any material does not meet the criteria for one of the following classifications, it shall be processed on site to meet the requirements for one of the material groups listed below, or disposed of at the Contractor’s expense.

(a) *Soil Embankment*. Soil Embankment shall have all particle sizes less than 6 inches. The material shall be classified in accordance with AASHTO M 145 and placed and compacted in accordance with subsection 203.07 (a).

(b) *Rock Embankment*. Rock Embankment shall meet all of the following requirements:

   (1) Contains 50 percent or more retained on the 4.75 mm (No. 4) sieve.
   (2) Contains > 30 percent retained on the 19.0 mm (¾-inch) sieve.
   (3) Classifies as an AASHTO A-1 soil type.
   (4) All particle sizes shall be less than 6 inches.
   (5) Particles retained on the 4.75mm (No. 4) sieve shall not be composed of non-durable bedrock types.

   Rock Embankment can be placed without moisture density control as described in subsection 203.07 (b).

(c) *Rock Fill*. Rock Fill shall meet all of the following requirements:

   (1) A minimum of 50 percent of the material shall be retained on a 100 mm (4-inch) sieve.
   (2) Maximum dimension of any particle permitted is 36 inches.
   (3) Shall be well-graded by visual inspection.
   (4) Shall contain less than 20 percent by volume of material passing the 75 μm (No. 200) sieve based on visual inspection. This requirement shall be at the discretion of the Engineer.
   (5) Particles retained on the 4.75 mm (No. 4) sieve shall not be composed of non-durable bedrock types.

   Rock Fill can be placed without moisture density control as described in subsection 203.07 (c).

**CONSTRUCTION REQUIREMENTS**

203.04 General. The excavations and embankments shall be finished to smooth and uniform surfaces conforming to the typical sections specified. Variation from the subgrade plan elevations specified shall not be more than 0.08 foot. Where asphalt or concrete surfacing materials are to be placed directly on the subgrade, the subgrade plane shall not vary more than 0.04 foot. Materials shall not be wasted without written permission of the Engineer. Excavation operations shall be conducted so material outside of the slope limits will not be disturbed. Prior to beginning grading operations, all necessary clearing and grubbing in that area shall have been performed in accordance with Section 201.

The Contractor shall notify the Engineer not less than five working days prior to beginning excavation so the necessary cross sections may be taken. The Contractor shall not excavate beyond the dimensions and elevations established.

Archaeological and paleontological materials encountered during the work shall be dealt with in accordance with subsection 107.23.

All excavation activities in areas where asbestos is encountered or expected to be encountered shall conform to the Colorado Department of Public Health and Environment’s Asbestos-Contaminated Soil Guidance Document or the State of Colorado’s Asbestos Contaminated Soil Statewide Management Plan (ACS), whichever is more recent at the time of advertisement and in accordance with subsection 250.07(d) and the Air Quality Control Commission Regulation No. 8 Part B or Section 5.5 of the solid Waste Regulation 6 CCR 1007-2, as applicable.
**203.05 Excavation.** Excavation shall be one or more of the following:

(a) *Rock.* Unless otherwise specified, rock shall be excavated to a minimum depth of 0.5 foot and a maximum depth of 1 foot below subgrade, within the limits of the roadbed. Rock removed in excess of 1 foot below subgrade will not be paid for. Backfilling of the depth in excess of 1 foot below subgrade shall be at the Contractor’s expense. Approved embankment material shall be used to bring the rock-excavated areas to subgrade elevations within the tolerances specified in subsection 203.04.

Undrained pockets shall not be left in the rock surface and depressions shall be drained at the Contractor’s expense.

Any change to cut slopes by the Department will be made prior to the next drilling operations.

When required for rock excavation, controlled blasting shall be conducted in accordance with the Contract.

(b) *Unclassified.* Excess or unsuitable excavated material, including rock and boulders, that cannot be used in embankments may be placed on the side slopes of the nearest fill as approved.

Unless otherwise specified by the Engineer, intercepting ditches shall be made above the top of cut slopes and carried to outlets near the ends of the cuts. In order to blend the intersection of cut slopes with the slope of the adjacent natural ground surfaces in a uniform manner, the tops of all cut slopes, except those in solid rock, shall be flattened and rounded in accordance with typical sections and details specified. Earth overburden lying above solid rock cuts shall be treated in the same manner as earth cuts.

The Department reserves the right to change cut slopes during the progress of excavation.

(c) *Unsuitable Material.* Unsuitable materials encountered in the subgrade that are determined to be detrimental to the roadway or embankment shall be removed to the depth and extents as directed by the Engineer. The excavated area shall be backfilled to the finished graded section with approved material. Materials that contain organics or that cannot be dried or moisture conditioned, then compacted to the required density will be disposed of and cannot be reused as embankment fill. Materials not containing organics and that can be dried or moisture conditioned and compacted to the required density can be reused as embankment fill as approved by the Engineer.

(d) *Borrow.* If the Contractor places more borrow than is specified or approved and causes a waste of roadway excavation, the quantity of waste will be deducted from the borrow volume. All borrow areas shall be bladed and shaped to permit accurate measurements after excavation is completed. The finished borrow areas shall be graded to a smooth and uniform surface and shall be finished so water will not collect or stand therein, unless otherwise specified.

(e) *Stripping.* Overburden shall be removed to the depth required for the production of acceptable material, and at least 5 feet beyond the working limits of the area being excavated.

(f) *Potholing.* All necessary potholing as determined by the Contractor and agreed to by the Engineer shall be completed under this item with appropriate equipment as approved.

The Contractor shall acquire necessary permits, locate utilities, excavate all materials of whatever character required to expose the utilities, survey the location of the utilities, and backfill the excavation to existing grade lines with the excavated or other approved materials. Backfilling shall be accomplished in accordance with subsection 206.03.

The Contractor shall use extreme caution during this work. All damage to existing utility lines or adjacent facilities shall be repaired promptly at the Contractor’s expense.
203.06 General Embankment Construction Requirements. When Contractor Process Control is required, the Contractor’s Process Control Representative shall be certified for WAQTC Embankment and Base Testing and CDOT’s Excavation, Embankment, and Soil Inspection certification course.

Embarkment construction shall include preparation of the areas upon which embankments are to be placed, construction of dikes, placing and compacting of approved material within roadway areas including holes, pits, and other depressions within the roadway area. Only approved materials shall be used in the construction of embankments and fills.

All sod, vegetable and other organic matter, stumps, and roots shall be removed from the surface upon which the embankment is to be placed in accordance with Section 201. Unless a thickness is otherwise specified in the Contract, the upper 4 inches of the ground surface will be considered top soil and shall be removed in accordance with Section 207 prior to placement of Embankment Fill.

The cleared surface shall be completely broken up by plowing or scarifying to a minimum depth of 6 inches or as specified in the Contract, the moisture content increased or reduced as necessary, and compacted to the specified embankment density for the material type present.

When embankment is placed on a slope that is steeper than 4H:1V, as measured in the steepest direction, the existing slope shall be benched as the embankment is placed in layers. A 2-foot deep key shall be excavated at the base of the existing slope and backfilled with approved and compacted material. The embankment shall be placed in layers from that key. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous bench. Excavated material from benching may be placed and compacted with the embankment material at the Contractor’s expense.

During the course of construction, embankment side slopes shall be built a minimum of 12 inches beyond the final grade indicated in the Contract to allow for compaction equipment to compact the outer edges of the embankment. Once the specified level of compaction is achieved, the side slopes shall be trimmed back to final grade. Excess material placement and removal to satisfy this requirement shall be at the Contractor’s expense.

If embankment can be placed on only one side of structures such as retaining walls, abutments, wing walls, piers, or culvert headwalls, compaction shall be accomplished without initiating movement or deformation of the structure and without placing excessive pressure against the structure. When noted in the Contract, the fill adjacent to the abutment of a bridge shall not be placed higher than the bottom of the backwall until the superstructure is in place. When embankment is placed on both sides of a concrete wall or box type structure, the embankment shall be brought up equally on both sides of the structure.

Where embankment is to be placed and compacted and end dumping is permitted, the slopes of the original ground or embankment shall be deep plowed or scarified before starting end dumping.

Embankment fill other than A-1 soil types shall not be placed within standing water, unless otherwise noted in the Contract. During the construction of the embankment, the top surface shall be maintained so that it is well drained at all times.

Frozen materials shall not be used in construction of embankments. Frozen material will be identified by the visual observation of ice crystals within the foundation or embankment material, or by measuring the surface temperature of the ground surface.

203.07 Embankment Placement and Compaction Requirements. Materials incorporated into embankment fill shall be placed and compacted according to the following requirements:

(a) Soil Embankment. All Soil Embankment shall be placed in horizontal layers not to exceed 8 inches in loose lift thickness. Each layer shall be compacted prior to the placement of subsequent layers. Spreading equipment shall be used to obtain uniform thickness prior to compaction. As the compaction progresses, continuous mixing, leveling, and manipulating shall be done to assure uniform moisture and density. Additional work involved in drying Soil Embankment to the required moisture content shall be included in the contract price paid for excavating or furnishing the material with no additional
compensation.

Soil Embankment that classifies as A-1 material can be used to bridge across standing water or swampery ground within the embankment foundation, and can be placed in lift thicknesses greater than 8 inches if used for this purpose as approved by the Engineer.

Soil Embankment with less than or equal to 30 percent retained on the 19mm (¾-inch) sieve shall be tested for compaction using CP 80. Materials that classify as AASHTO A-1, A-2-4, A-2-5, and A-3 soils shall be compacted at ± 2 percent of Optimum Moisture Content (OMC) and to at least 95 percent of maximum dry density determined in accordance with AASHTO T 180 as modified by CP 23. All other soil types will be compacted to 95 percent of the maximum dry density determined in accordance with AASHTO T 99 as modified by CP 23. Soils with 35 percent fines or less shall be compacted at ± 2 percent of OMC. Soils with greater than 35 percent fines shall be compacted at a moisture content equal to or above OMC to achieve stability of the compacted lift. Stability is defined as the absence of rutting or pumping as observed and documented by the Contractor’s Process Control Representative and as approved by the Engineer. If the soils cannot be compacted and prove to be unstable at a moisture content equal to or above OMC, then the required moisture content for compaction can be reduced below OMC as approved by the Engineer.

Prior to placing any Soil Embankment with greater than 30 percent retained on the 19 mm (¾-inch) sieve, the Contractor will be required to construct a test strip to the dimensions specified in the Contract or as directed by the Engineer. The test strip can be incorporated into the final embankment. The Contractor will be responsible for determining the moisture conditioning necessary to achieve compaction, and will determine the equipment and number of passes necessary to achieve adequate compaction. The Contractor is required to use compression-type or vibratory rollers on granular materials and sheepsfoot rollers on cohesive soils. Adequate compaction will be demonstrated by the absence of rutting, pumping, or deflection following a proof roll of the test strip using any piece of construction equipment that exerts a minimum 18-kip per axle load. The proof roll will be observed and accepted by the Engineer. Once the test strip passes a proof roll, the Contractor can resume embankment construction with the same moisture conditioning and compaction methods as the test strip was constructed.

Placement, moisture conditioning, and compaction of every lift of soil embankment with greater than 30 percent retained on the 19 mm (¾-inch) sieve will be observed by the Contractor’s Process Control Representative, and accepted by the Engineer. Adequate compaction of each lift will be demonstrated as the absence of rutting, pumping, or deflection as construction equipment is routed over a lift following the compactive efforts that were used and accepted for the respective test strip. The Engineer may request a proof roll at any time to document the condition of a lift.

Significant changes in the material being hauled for soil embankment with greater than 30 percent retained on the 19 mm (¾-inch) sieve will require construction of a new test strip, and demonstration of adequate compaction methods using a proof roll. The Contractor’s Process Control representative shall be authorized to require additional test strips at their discretion. However, the requirement for an additional test strip shall not be waived without the written approval of the Engineer.

Non-durable bedrock shall be watered to promote slaking and break down, and pulverized/processed to a maximum particle size of 6 inches. These materials shall be placed and compacted as Soil Embankment; except they shall be compacted with a heavy tamping foot roller, weighing at least 30 tons. Each tamping foot shall protrude from the drum a minimum of 4 inches. Each embankment layer shall receive a minimum of four passes with the tamping foot roller. The roller shall be operated at a uniform speed not exceeding 3 miles per hour. No additional compensation will be made for additional roller passes to achieve specified density requirements.

Non-durable Bedrock shall not be used to bridge over standing water or swamppy ground within an embankment foundation. Non-durable bedrock shall also not be placed within 2 feet of the final subgrade elevation.
(b) **Rock Embankment and Rock Fill.** Rock Embankment shall be placed in horizontal layers not to exceed 8 inches in loose lift thickness. The lift thickness can be increased when bridging over standing water or swampy ground in the embankment foundation as directed by the Engineer. Each layer shall be compacted prior to the placement of subsequent layers. Spreading equipment shall be used to obtain uniform thickness prior to compaction.

Rock Fill shall be placed in horizontal layers not to exceed a loose lift thickness equivalent to the average particle size up to a maximum permitted lift thickness of 18 inches. Particles with a maximum dimension of 36 inches are permitted; however, rocks larger than the lift thickness shall be separated enough to allow compaction equipment to operate in between. Material shall be placed to fill in voids between larger stones with finer particle sizes and to avoid nesting. Spreading equipment shall be used to obtain uniform thickness prior to compaction. If the use of leveling equipment is not practical, the Engineer may permit rock fill material to be cast or end dumped. In such cases sufficient hand or machine work will be required to construct a compact, stable fill and to finish the slopes to a neat and smooth appearance. Rock Fill shall not be placed within 2 feet of the final subgrade elevation. When a Rock Fill is placed over any structure, the structure shall be covered with a minimum of 2 feet of compacted Soil or Rock Embankment material before the Rock Fill is placed.

The Contractor will be responsible for determining the moisture conditioning necessary to achieve compaction for Rock Embankment or Rock Fill. Vibratory or compression-type rollers will be used to compact these materials. At a minimum, compression-type rollers weighing 20 tons shall complete 4 passes over the entire width of a lift at a speed not to exceed 3 miles per hour. Vibratory rollers shall exert a minimum dynamic force of 30,000 pounds of impact per vibration, and achieve a minimum 1,000 vibrations per minute. Vibratory rollers shall complete a minimum of 4 passes over the entire width of a lift at a speed not to exceed 1.5 miles per hour.

Prior to placing Rock Embankment or Rock Fill, the Contractor will be required to construct a test strip to the dimensions specified in the Contract, or as directed by the Engineer. The test strip can be incorporated into the final embankment. Adequate compaction of the Rock Embankment or Rock Fill test strip will be demonstrated by the absence of rutting, pumping, or deflection following a proof roll of the test strip using any piece of construction equipment that exerts a minimum 18-kip per axle load. The proof roll will be observed and accepted by the Engineer. Once the test strip passes a proof roll, the Contractor can resume Rock Embankment or Rock Fill construction with the same moisture conditioning and compaction methods as the test strip was constructed. Placement, moisture conditioning, and compaction of every lift of Rock Embankment and Rock Fill will be observed by the Contractor’s Process Control Representative, and accepted by the Engineer. Adequate compaction of each lift will be demonstrated as the absence of rutting, pumping, or deflection as construction equipment is routed over a lift following the compactive efforts that were used and accepted for the respective test strip. The Engineer may request a proof roll at any time to document the condition of a lift.

Significant changes in the characteristics of material being hauled for Rock Embankment or Rock Fill will require construction of a new test strip, and demonstration of adequate compaction methods using a proof roll. The Contractor’s Process Control representative shall be authorized to require additional test strips at their discretion. However, the requirement for an additional test strip shall not be waived without the written approval of the Engineer.

If the Contractor wishes to deviate from the minimum equipment and compactive efforts specified above for Rock Embankment or Rock Fill, the Contractor must first demonstrate the adequacy of their proposed methods with a test strip and passing proof roll. In addition, a proof roll will be required for every lift placed for the first 2,000 cubic yards of Rock Embankment or Rock Fill placed. The proof rolls used to demonstrate adequate compaction of the first 2,000 cubic yards placed will not be measured and paid separately, but will be performed at the Contractor’s expense.

Recycled concrete and asphalt can be incorporated into embankment material, and shall be processed, placed, and compacted in accordance with 203.07 (a) or (b); depending on the overall classification of the embankment material once the recycled material is incorporated. Rebar shall not extend more than one inch beyond the edges of recycled concrete particles. Recycled concrete or asphalt shall not be
permitted in the upper 2 feet of the final subgrade elevation or within 2 feet of the final finished side slopes unless otherwise noted in the Contract.

203.08 Proof Rolling. Proof rolling with pneumatic tire equipment shall be performed using a minimum axle load of 18 kips per axle. A weigh ticket from an approved scale shall be furnished by the Contractor to substantiate this weight.

The subgrade shall be proof rolled after the required compaction has been obtained and the subgrade has been shaped to the required cross section.

The proof roller shall be operated in a systematic manner so that a record may be readily kept of the area tested and the working time required for the testing. Areas that are observed to have soft spots in the subgrade, where deflection is not uniform or is excessive as determined by the Engineer, shall be ripped, scarified, dried or wetted as necessary and recompacted to the requirements for density and moisture at the Contractor's expense. After recompaction, these areas shall be proof rolled again and all failures again corrected at the Contractor's expense.

Upon approval of the proof rolling, the sub base, base course, or initial pavement course shall be placed within 48 hours. If the Contractor fails to place the sub base, base course, or initial pavement course within 48 hours or the condition of the subgrade changes due to weather or other conditions, proof rolling and correction shall be performed again at the Contractor's expense.

203.09 Blading. Blading shall consist of furnishing motor graders of the specified horsepower rating, with operators, for shaping roadway, shoulders, or other areas as designated by the Engineer.

When scarifying is specified the motor grader shall be equipped with an independently operated "V" type scarifier and attachments.

203.10 Dozing. Dozing shall consist of furnishing crawler-type tractors of the specified horsepower rating, complete with operators and bulldozer blades. Rippers, if specified, will not be measured and paid for separately, but shall be included in the work.

METHOD OF MEASUREMENT

203.11 Items paid for by volume will be the quantities designated in the Contract. Exceptions will be made when field changes are ordered or when it is determined that there are discrepancies in the Contract in an amount of at least plus or minus two percent of the plan quantity.

(a) Excavation. The original cross-sections will be used for determination of volumes of excavated material removed, unless changes have been directed. These measurements will include authorized excavation of rock, shale, or other unsuitable material. All accepted stripping will be measured in stockpiled locations by cross-sectioning.

When the excavation conforms to the staked lines and grades, the original cross-sections and the staked sections shall be used for the determination of volumes excavated. Volumes will be computed from the cross-sections by the average end area or other acceptable method.

When topsoil or wetland topsoil is included as an additional pay item and is specified, the measured volume of excavation will be reduced by the volume of topsoil or wetland topsoil removed from the area shown as excavation in the Contract.

Measurements will include over-breakage in rock excavation from the back slopes to an amount not to exceed, in any half station of 50 feet, 10 percent of the actual quantity required for that half station.

Costs associated with ripping tests or seismic tests to evaluate if a material meets the criteria for "Rock
Excavation” shall not be measured or payed separately, but shall be incurred by the Contractor and included in the cost for excavation.

(b) *Embankment.* If provided in the Contract, embankment material will be measured in its final compacted position in the roadway. Measurement will be made upward from the original ground line without any allowance for subsidence due to compaction of the base under the embankment. The original cross-sections will be used for determination of volumes of embankment material placed, unless changes have been directed.

The measured volume of embankment material will be increased by the volume of topsoil or wetland topsoil removed from the area below the original ground line and under the embankment.

(c) *Rock Fill.* Rock fill will be measured as the volume in cubic yards in its final position, unless otherwise specified, and shall be limited to the elevations specified.

(d) *Blading and Dozing.* The quantity measured under blading and dozing will be the number of hours that each motor grader or bulldozer is actually used as ordered. A minimum of four hours for any half shift or part thereof will be paid for unless the equipment is inoperative due to breakdown or other causes determined to be the Contractor’s responsibility. Time involved in moving onto or off the project will not be measured and paid for.

Time will be paid for moving motor graders or bulldozers from one location on the project to another, if directed; but time will not be allowed for moves which are made for the convenience of the Contractor.

Payment for a minimum of four hours will not be allowed in cases where the motor grader, bulldozer, or operator is assigned to work on other pay items connected with the project.

(e) *Potholing.* Potholing will be measured by the total number of hours that excavation and backfilling equipment is actually used as directed. All other related work, including removal of existing pavement, backfilling, shoring, and labor will not be measured and paid for separately, but shall be included in the work.

(f) *Proof Rolling.* Proof rolling will be measured by the actual number of hours that the pneumatic equipment is used as a proof roller.

The time to be measured under this item will be the number of hours that each piece of equipment is actually used as ordered.

Proof rolling will be measured and paid for only once for each test strip required during construction; for final verification of subgrade prior to placement of subbase, base coarse, or pavement; or for each incident where the Engineer directs it through the course of construction. Additional proof rolling that is required due to failure of embankment fill; due to the Contractor’s failure to place subbase, base course, or initial pavement course within 48 hours of the initial proof roll; or due to the condition of the subgrade changing due to weather; or additional proof rolls deemed necessary due to the Contractor’s choice to deviate from minimum equipment and compaction efforts specified herein, shall be at the Contractor’s expense.
REVISION OF SECTION 203
EXCAVATION AND EMBANKMENT

BASIS OF PAYMENT

203.12 The accepted quantities will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
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<td>Rock Fill</td>
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</tr>
<tr>
<td>Blading</td>
<td>Hour</td>
</tr>
<tr>
<td>Dozing</td>
<td>Hour</td>
</tr>
<tr>
<td>Potholing</td>
<td>Hour</td>
</tr>
<tr>
<td>Proof Rolling</td>
<td>Hour</td>
</tr>
</tbody>
</table>

Water will not be measured and paid for separately but shall be included in the work.

Compaction will not be measured and paid for separately, but shall be included in the work.

Payment for replacement of Unsuitable Material shall be as follows: If excavated material can be re-used as embankment fill by moisture conditioning and compaction, replacement shall be included in the cost for Removal of Unsuitable Material. If the material cannot be re-used as embankment fill, payment for replacement of Unsuitable Material shall be for the volume that is placed in the excavated area at the respective unit price for the material that is approved by the Engineer and used.

Payment for Unclassified Excavation (Complete in Place), Embankment Material (Complete in Place), and Borrow (Complete in Place) shall be full compensation for all work necessary to complete the item including construction of embankments, rework of existing materials to satisfy benching requirements, unclassified excavation, borrow, compaction, compaction of bases of cuts and fills, all work in available materials pits, and disposal of excess excavated material.

All costs associated with reducing the size of the claystone particles, removing the oversized particles, and disposal of the oversized particles will not be paid for separately but shall be included in the work.

Pavement replacement if required due to potholing, shall be accomplished, measured, and paid for in accordance with appropriate sections of the specifications.

Pneumatic tire equipment and load required to achieve the desired weight of proof rolling equipment will not be measured and paid for separately, but shall be included in the work.
REVISION OF SECTION 206
IMPORTED MATERIAL FOR STRUCTURE BACKFILL

Section 206 of the Standard Specifications is hereby revised for this project as follows:

Subsection 206.02 (a) shall include the following:

Imported Material used as structure backfill for pipes (storm sewer, cross culverts, side drains, etc) shall be tested for compatibility with the selected pipe material.

When Nonreinforced Concrete Pipe or Reinforced Concrete Pipe is used, the imported material shall be tested for sulfate and pH.

When Corrugated Steel Pipe, Bituminous Coated Corrugated Steel Pipe or Precoated Corrugated Steel Pipe is used, the imported material shall be tested for sulfates, chlorides, pH and resistivity.

When Aramid Fiber Bonded Corrugated Steel Pipe or Corrugated Aluminum Pipe is used, the imported material shall be tested for pH and resistivity.

When Plastic pipe is selected, the imported material does not need to be tested for sulfates, chlorides, pH and resistivity.

Sulfates, chlorides, pH and resistivity shall be determined by the following procedures:

1. Water soluble sulfates using CP-L 2103 Method B.
2. Chlorides using CPL 2104
3. Resistivity using ASTM G57

The average of three consecutive tests shall show the imported material’s sulfate, chloride, pH and resistivity is not greater than the limits corresponding to the Pipe Class in Table 206-1 or 206-2 for the pipe class specified on the plans. No single test shall have a result more than 20 percent greater than that corresponding to the limit in Table 206-1 or Table 206-2 for sulfates, chlorides and resistivity. No single test shall have a result more than 5 percent outside the limit in Table 206-1 for pH. The remaining sample material from a single failing test shall be split into three equal portions. CDOT shall receive one portion, the Contractor shall receive one portion and the remaining portion shall be retained by the Project. CDOT and the Contractor’s Lab shall retest the failed sample; if the results from those tests are within 10 percent of each other, the results will be averaged. The averaged result will be used for Contract compliance. If the results from the Labs are not within 10 percent of each other, the remaining sample portion will be sent to an independent laboratory for testing using the testing requirements specified above. The independent laboratory will be mutually agreed upon by the Department and the Contractor. The Independent Lab’s test result will be used for Contract compliance.

If the imported material’s sulfates, chlorides, and resistivity are less than the limits and the pH is within the limits in Table 203-1 or 203-2, CDOT will bear all costs associated with the independent lab test. If the imported material’s sulfates, chlorides, and resistivity is greater than the limits and the pH is outside the limits in Table 206-1 or 206-2, all costs associated with independent lab testing shall be at the Contractor’s expense.

Embankment represented by failing tests shall be removed from the project and replaced at the Contractor’s expense.
### Table 206-1
**SULFATE, CHLORIDE AND pH OF IMPORTED MATERIAL**

<table>
<thead>
<tr>
<th>Pipe Class</th>
<th>Sulfate (SO₄)</th>
<th>Chloride (Cl)</th>
<th>pH</th>
<th>% max</th>
<th>% max</th>
</tr>
</thead>
<tbody>
<tr>
<td>0, 7</td>
<td>0.05</td>
<td>0.05</td>
<td>6.0-8.5</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>1, 7</td>
<td>0.10</td>
<td>0.10</td>
<td>6.0-8.5</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>2, 8</td>
<td>0.20</td>
<td>0.20</td>
<td>6.0-8.5</td>
<td>0.20</td>
<td>0.20</td>
</tr>
<tr>
<td>3, 9</td>
<td>0.50</td>
<td>0.50</td>
<td>6.0-8.5</td>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>4, 9</td>
<td>1.00</td>
<td>1.00</td>
<td>5.0-9.0</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>5, 10</td>
<td>2.00</td>
<td>2.00</td>
<td>5.0-9.0</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td>6, 10</td>
<td>&gt;2.00</td>
<td>&gt;2.00</td>
<td>&lt;5 or &gt;9</td>
<td>&gt;2.00</td>
<td>&gt;2.00</td>
</tr>
</tbody>
</table>

### Table 206-2
**RESISTIVITY AND pH OF IMPORTED MATERIAL**

<table>
<thead>
<tr>
<th>SOIL SIDE</th>
<th>Resistivity, R (Ohm – cm)</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≥1,500</td>
<td>5.0-9.0</td>
</tr>
<tr>
<td></td>
<td>≥250</td>
<td>3.0-12.0</td>
</tr>
</tbody>
</table>
Section 206 of the Standard Specifications is hereby revised for this project as follows:

Delete subsection 206.02 (a) and replace with the following:

(a) **Structure Backfill.** Class 1 and Class 2 structure backfill shall be composed of non-organic mineral aggregates and soil from excavations, borrow pits, or other sources. Material shall conform to the requirements of subsection 703.08. Class of material shall be as specified in the Contract or as designated.

Structure backfill (Flow-Fill) meeting the following requirements shall be used to backfill bridge abutments. The Contractor may substitute structure backfill (Flow-Fill) for structure backfill (Class 1) or structure backfill (Class 2) to backfill culverts and sewer pipes.

Flow-Fill is a self-leveling low strength concrete material composed of cement, fly ash, aggregates, water, chemical admixtures and/or cellular foam for air-entrainment. Flow-fill shall have a slump of 7 to 10 inches, when tested in accordance with ASTM C143 or a minimum flow consistency of 6 inches when tested in accordance with ASTM D6103. Flow-Fill shall have a minimum compressive strength of 50 psi at 28 days, when tested in accordance with ASTM D4832. Flash Fill shall not be used in lieu of Flow Fill.

Flow-Fill placed in areas that require future excavation, such as utility backfill shall have a Removability Modulus (RM) of 1.5 or less.

Removability Modulus, RM, is calculated as follows:

\[
RM = \frac{W^{1.5} \times 104 \times C^{0.5}}{10^6}
\]

where:
- \(W\) = unit weight (pcf)
- \(C\) = 28-day compressive strength (psi)

Materials for structure backfill (Flow-Fill) shall meet the requirements specified in the following subsections:

<table>
<thead>
<tr>
<th>Material</th>
<th>Subsection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fine Aggregate</td>
<td>703.01</td>
</tr>
<tr>
<td>Coarse Aggregate</td>
<td>703.02</td>
</tr>
<tr>
<td>Portland Cement</td>
<td>701.01</td>
</tr>
<tr>
<td>Fly Ash</td>
<td>701.02</td>
</tr>
<tr>
<td>Water</td>
<td>712.01</td>
</tr>
<tr>
<td>Air Entraining Admixture</td>
<td>711.02</td>
</tr>
<tr>
<td>Chemical Admixtures</td>
<td>711.03</td>
</tr>
</tbody>
</table>

1 Fine aggregate not meeting the requirements of subsection 703.01 may be used if testing indicates acceptable results for strength and air content.
2 Coarse aggregate not meeting the requirements of subsection 703.02 may be used if testing indicates acceptable results for strength and air content.
3 Fly ash not meeting the requirements of subsection 701.02 may be used if testing indicates acceptable results for strength and air content.
4 Industrial by-product aggregates (foundry sand, bottom ash, etc..) and fly ash not meeting the requirements of subsection 701.02 shall submit a report from the supplier documenting the results of testing in accordance with the Toxicity Characteristic Leaching Procedure (TCLP) described in 40 CFR 261. The report shall include the results of TCLP testing for heavy metals and other contaminants. Materials shall not exceed the TCLP limits of 40 CFR 261.24 for heavy metals.

Cellular foam shall conform to ASTM C869 and ASTM C796

Recycled broken glass (glass cullet) is acceptable as part or all of the aggregate. Aggregate including glass must conform to the required gradations. All containers used to produce the cullet shall be empty prior to processing. Chemical, pharmaceutical, insecticide, pesticide, or other glass containers containing or having contained toxic or hazardous substances shall not be allowed and shall be grounds for rejecting the glass
cullet. The maximum debris level in the cullet shall be 10 percent. Debris is defined as any deleterious material which impacts the performance of the structure backfill (Flow-Fill) including all non-glass constituents.

The Contractor may use aggregate which does not meet the above specifications if the aggregate conforms to the following gradation:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.0 mm (1 inch)</td>
<td>100</td>
</tr>
<tr>
<td>75 μm (No. 200)</td>
<td>0 - 10¹</td>
</tr>
</tbody>
</table>

¹ The amount of material passing the 75 μm (No. 200) screen may exceed 10 percent if testing indicates acceptable results for strength and air content.

The Contractor shall submit a structure backfill (Flow-Fill) mix design for approval prior to placement. The mix design shall include the following laboratory test data:

1. ASTM C231, Air content
2. ASTM D6023, Unit Weight
3. ASTM C143, Slump or ASTM D6103 flow consistency
4. ASTM D4832 28-day Compressive Strength
5. Removability Modulus (RM)

In subsection 206.03, delete the thirteenth through fifteenth paragraphs and replace with the following:

Compaction of structure backfill (Flow-Fill) shall not be performed.

The maximum layer thickness for structure backfill (Flow-Fill) shall be 3 feet unless otherwise approved by the Engineer. The Contractor shall not place structure backfill (Flow-Fill) in layers that are too thick to cause damage to culverts, pipes and other structures, or that will cause formwork or soil failures during placement. Structure backfill (Flow-Fill) shall have an indentation diameter less than 3 inches and the indentation shall be free of visible water when tested in accordance with ASTM D6024 by the Contractor prior to placing additional layers of structure backfill (Flow-Fill). Testing structure backfill (Flow-Fill) in accordance with ASTM D6024 will be witnessed by the Engineer. Damage resulting from placing structure backfill (Flow-Fill) in layers that are too thick or from not allowing sufficient time between placements of layers shall be repaired at the Contractor’s expense.

The Contractor shall secure culverts, pipes and other structures to prevent floating and displacement of these items during the placement of the structure backfill (Flow-Fill).

Prior to the placement of structure backfill (Flow-Fill), the Contractor shall sample the structure backfill (Flow-Fill) in accordance with ASTM D5971. The Contractor shall test the structure backfill (Flow-Fill) unit weight in accordance with ASTM D6023. The Contractor shall test the structure backfill (Flow-Fill) for slump in accordance with ASTM C143 or flow consistency according to ASTM D6103.

The Contractor shall sample and test the first three loads of structure backfill (Flow-Fill) for each placement and then randomly once every 50 cubic yards. Sampling and testing will be witnessed by the Engineer.

When structure backfill (Flow-Fill) is placed in areas that require future excavation, the unit weight of the placed structure backfill (Flow-Fill) shall not exceed the unit weight of the approved mix design by more than 2.0 pcf.

Structure backfill (Flow-Fill) shall not be allowed to freeze during placement and until it has set sufficiently according to ASTM D6024. Frozen structure backfill (Flow-Fill) shall be removed and replaced at the Contractor’s expense.

When the Contractor substitutes Structure Backfill (Flow-Fill) for Structure Backfill (Class 1) or (Class 2), the trench width may be reduced to provide a minimum 6 inch clearance between the outside diameter of the culvert and the trench wall.
Section 206 of the Standard Specifications is hereby revised for this project as follows:

In subsection 206.02 (a), delete the first sentence of the second paragraph and replace with the following:

Structure backfill (Class 1) with mechanical reinforcement shall be used to backfill bridge abutments, unless otherwise shown on the Plans. When structure backfill (flow-fill) is called for, it shall meet the following requirements.
Sections 206, 304 and 613 of Standard Specifications are hereby revised for this project as follows:

In subsection 206.03, delete the fourth and fifth paragraphs and replace with the following:

Backfill shall consist of approved materials uniformly distributed in layers brought up equally on all sides of the structure. Each layer of backfill shall not exceed 6 inches and shall be compacted to the required density before successive layers are placed. Structure backfill (Class 1) shall be compacted to a density of not less than 95 percent of maximum dry density determined in accordance with AASHTO T 180 as modified by CP 23. Backfill shall be compacted at ± 2 percent of Optimum Moisture Content (OMC).

Structure backfill (Class 2) shall be compacted to a density of not less than 95 percent of maximum dry density. The maximum dry density and OMC for A-1, A-2-4, A-2-5 and A-3 materials will be determined in accordance with AASHTO T 180 as modified by CP 23. The maximum dry density and OMC for all other materials will be determined in accordance with AASHTO T 99 as modified by CP 23. Materials shall be compacted at ± 2 percent of Optimum Moisture Content (OMC). Materials having greater than 35 percent passing the 75 µm (No. 200) sieve shall be compacted at 0 to 3 percent above OMC.

In subsection 304.06, delete the first paragraph and replace with the following:

304.06 Shaping and Compaction. Compaction of each layer shall continue until a density of not less than 95 percent of the maximum density determined in accordance with AASHTO T 180 as modified by CP 23 has been achieved. The moisture content shall be at +/- 2 percent of optimum moisture content. The surface of each layer shall be maintained during the compaction operations so that a uniform texture is produced and the aggregates are firmly keyed. Moisture conditioning shall be performed uniformly during compaction.

In subsection 613.07, delete the 15th paragraph and replace with the following:

Trenching shall be backfilled and compacted as follows: Backfill shall be deposited in uniform layers. The thickness of each layer shall be 6 inches or less thick prior to compaction. The space under the conduit shall be completely filled. The remainder of the trench and excavation shall be backfilled to the finished grade. The backfill material shall be compacted to the density of not less than 95 percent of maximum dry density. The maximum dry density and optimum moisture content (OMC) for A-1, A-2-4, A-2-5 and A-3 materials will be determined in accordance with AASHTO T 180 as modified by CP 23. The maximum dry density and OMC for all other materials will be determined in accordance with AASHTO T 99 as modified by CP 23. Materials shall be compacted at ± 2 percent of Optimum Moisture Content (OMC). Materials having greater than 35 percent passing the 75 µm (No. 200) sieve shall be compacted at 0 to 3 percent above OMC. Each layer shall be mechanically compacted by tamping with power tools approved by the Engineer. Compaction methods or equipment that damage the conduit shall not be used.
Sections 206 and 601 of the Standard Specifications are hereby revised for this project as follows:

In subsection 206.03, delete the ninth paragraph and replace with the following:

Backfill material shall not be deposited against newly constructed masonry or concrete structures, until the concrete has developed a compressive strength of 0.8 $f'_c$, except in cases where the structures support lateral earth pressure. Concrete compressive strength for structures supporting lateral earth pressure shall conform to subsection 601.12 (o). Concrete compressive strength shall be determined by maturity meters.

In subsection 601.09, delete (h) and replace with the following:

(h) Removal of Forms. The forms for any portion of the structure shall not be removed until the concrete is strong enough to withstand damage when the forms are removed.

Unless specified in the plans, forms shall remain in place for members that resist dead load bending until concrete has reached a compressive strength of at least 80 percent of the required 28 day strength, 0.80$f'_c$. Forms for columns shall remain in place until concrete has reached a compressive strength of at least 1,000 psi. Forms for sides of beams, walls or other members that do not resist dead load bending shall remain in place until concrete has reached a compressive strength of at least 500 psi.

Forms and supports for cast-in-place concrete box culverts (CBCs) shall not be removed until the concrete compressive strength exceeds 0.6 $f'_c$ for CBCs with spans up to and including 12 feet, and 0.67 $f'_c$ for CBCs with spans exceeding 12 feet but not larger than 20 feet. Forms for CBCs with spans larger than 20 feet shall not be removed until after all concrete has been placed in all spans and has attained a compressive strength of at least 0.80$f'_c$.

Concrete compressive strength shall be determined by maturity meters. At the pre-pour conference, the Contractor shall submit the location where maturity meters will be placed.

The Contractor shall provide maturity meters and all necessary wires and connectors. The Contractor shall be responsible for the placement and maintenance of the maturity meter and wire. At a minimum a maturity meter will be placed at the mid-span of beams and at support locations. Placement shall be as directed by the Engineer.

For structures with multiple maturity meters, the lowest compressive strength shall determine when the forms can be removed.

Acceptance cylinders shall not be used for determining compressive strength to remove forms.

When field operations are controlled by maturity meters, the removal of forms, supports and housing, and the discontinuance of heating and curing may begin when the concrete is found to have the required compressive strength.

Forms for median barrier, railing or curbs, may be removed at the convenience of the Contractor after the concrete has hardened.

All forms shall be removed except permanent steel bridge deck forms and forms used to support hollow abutments or hollow piers when no permanent access is available into the cells. When permanent access is provided into box girders, all interior forms and loose material shall be removed, and the inside of box girders shall be cleaned.
In subsection 601.11, delete (e) and replace with the following:

(e) **Falsework Removal.** Unless specified in the plans or specifications, falsework shall remain in place until concrete has attained a minimum compressive strength of 0.80f'c.

Falsework supporting any span of a simple span bridge shall not be released until after all concrete, excluding concrete above the bridge deck, has attained a compressive strength of at least 0.80f'c.

Falsework supporting any span of a continuous or rigid frame bridge shall not be released until after all concrete, excluding concrete above the bridge deck, has been placed in all spans and has attained the compressive strength of at least 0.80f'c.

Falsework for arch bridges shall be removed uniformly and gradually, beginning at the crown, to permit the arch to take its load slowly and evenly.

Falsework supporting overhangs and deck slabs between girders shall not be released until the deck concrete has attained a compressive strength of at least 0.80f'c.

Falsework for pier caps which will support steel or precast concrete girders shall not be released until the concrete has attained a compressive strength of at least 0.80f'c. Girders shall not be erected onto such pier caps until the concrete in the cap has attained the compressive strength of at least 0.80f'c.

Falsework for cast-in-place prestressed portions of structures shall not be released until after the pre-stressing steel has been tensioned.

Concrete compressive strength shall be determined by maturity meters. At the pre-pour conference, the Contractor shall submit the location that maturity meters will be placed.

The Contractor shall provide maturity meters and all necessary wires and connectors. The Contractor shall be responsible for the placement and maintenance of the maturity meters and wires. At a minimum a maturity meter will be placed at the mid-span of beams and at support locations. Placement shall be as directed by the Engineer.

For structures with multiple maturity meters, the lowest compressive strength shall determine when the falsework can be removed.

Acceptance cylinders shall not be used for determining compressive strength to remove falsework.

Subsection 601.12 (i) shall include the following after the first paragraph:

Concrete compressive strength shall be determined by maturity meters.

Subsection 601.12 shall include the following:

(o) **Backfilling Structures that Support Lateral Earth Pressure.** Concrete compressive strengths shall reach f'c before backfilling operations can begin with heavy equipment, such as skid-steers or self-powered riding compactors. Concrete compressive strengths shall reach 0.8 f'c before backfilling operations can begin with hand operated equipment. Concrete compressive strength shall be determined by maturity meters.
Delete subsections 601.13 (2) and 601.13 (3) and replace with the following:

(2) The minimum curing period shall be from the time the concrete has been placed until the concrete has met a compressive strength of 80 percent of the required field compressive strength. The Contractor shall develop a maturity relationship for the concrete mix design in accordance with CP 69. The Contractor shall provide the maturity meter and all necessary thermocouples, thermometers, wires and connectors. The Contractor shall place, protect and maintain the maturity meters and associated equipment. Locations where the maturity meters are placed shall be protected in the same manner as the rest of the structure.

Subsection 601.17 shall include the following:

(f) Maturity Meter Strength. When maturity meters are specified for determining strength for removing forms, removing false work, backfilling against structures or loading the structure, the Contractor shall provide the Engineer a report of maturity relationships in accordance with CP 69 prior to placement of concrete.

If a maturity meter fails, is tampered with, is destroyed or was not placed, the following shall apply:

The minimum curing time or waiting time for removing forms, removing false work, backfilling against structures or loading the structure shall be 28 days.

The Contractor may choose at his own expense to core the structure represented by the maturity meter. Cores will be obtained and tested according to CP 65. Cores will be a minimum of 4 inches in diameter. A minimum of three cores in a two square foot area will be obtained. If the compressive strength of any one core differs from the average by more than 10 percent that compressive strength will be deleted and the average strength will be determined using the compressive strength of the remaining two cores. If the compressive strength of more than one core differs from the average by more than 10 percent the average strength will be determined using all three compressive strengths of the cores. The average compressive strength of the cores shall be achieve the specified compressive strength of the structure. A structure may only be cored once.
Section 208 is hereby deleted from the Standard Specifications for this project and replaced with the following:

**DESCRIPTION**

**208.01** This work consists of constructing, installing, maintaining, and removing when required, Best Management Practices (BMPs) during the life of the Contract to prevent or minimize erosion, sedimentation, and pollution of any State waters as defined in subsection 107.25, including wetlands.

The Contractor shall coordinate the construction of temporary BMPs with the construction of permanent BMPs to assure economical, effective, and continuous erosion and sediment control throughout the construction period.

When a provision of Section 208 or an order by the Engineer requires that an action be immediate or taken immediately, it shall be understood that the Contractor shall at once begin effecting completion of the action and pursue it to completion in a manner acceptable to the Engineer, and in accordance with the Colorado Discharge Permit System Stormwater Construction Permit (CDPS-SCP) requirements.

**MATERIALS**

**208.02** Erosion control materials are subject to acceptance in accordance with subsection 106.01. Erosion control materials shall be subject to the following approval process:

<table>
<thead>
<tr>
<th>Material</th>
<th>Approval Process</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erosion Bales (Weed Free)</td>
<td>COC</td>
<td>The Contractor shall provide a transit certificate number or a copy of the transit certificate as supplied from the producer.</td>
</tr>
<tr>
<td>Silt Fence</td>
<td>COC</td>
<td></td>
</tr>
<tr>
<td>Silt Berm</td>
<td>APL</td>
<td></td>
</tr>
<tr>
<td>Erosion Log (Type 1 and 2)</td>
<td>COC</td>
<td></td>
</tr>
<tr>
<td>Silt Dikes</td>
<td>COC</td>
<td></td>
</tr>
<tr>
<td>Pre-fabricated Concrete Washout Structures (above ground)</td>
<td>APL</td>
<td></td>
</tr>
<tr>
<td>Pre-fabricated Vehicle Tracking Pad</td>
<td>APL</td>
<td></td>
</tr>
<tr>
<td>Aggregate Bag</td>
<td>COC</td>
<td></td>
</tr>
<tr>
<td>Storm Drain Inlet Protection (Type I, II and III)</td>
<td>APL</td>
<td></td>
</tr>
</tbody>
</table>

The material for BMPs shall conform to the following:

(a) **Erosion Bales.** Material for erosion bales shall consist of Certified Weed Free hay or straw. The hay or straw shall be certified under the Colorado Department of Agriculture Weed Free Forage Certification Program and inspected as regulated by the Weed Free Forage Act, Title 35, Article 27.5, CRS. Each certified weed free erosion bale shall be identified by blue and orange twine binding the bales.

The Contractor shall not place certified weed free erosion bales or remove their identifying twine until the Engineer has inspected and accepted them.

The Contractor may obtain a current list of Colorado Weed Free Forage Crop Producers who have completed certification by contacting the Colorado Department of Agriculture, Weed Free Forage Program, 305 Interlocken Pkwy, Broomfield, CO 80021, Contact: Weed Free Forage Coordinator at (303) 869-9038. Also available at [www.colorado.gov/ag/csd](http://www.colorado.gov/ag/csd).
Bales shall be approximately 5 cubic feet of material and weigh at least 35 pounds. Stakes shall be wood and shall be 2 inch by 2 inch nominal.

(b) Silt Fence. Silt fence posts shall be wood with a minimum length of 42 inches. Wood posts shall be 1.5 inch by 1.5 inch nominal. Geotextile shall be attached to wood posts with three or more staples per post.

Silt fence geotextile shall conform to the following requirements:

### Physical Requirements for Silt Fence Geotextiles

<table>
<thead>
<tr>
<th>Property</th>
<th>Wire Fence Supported Requirements</th>
<th>Self-Supported Requirements Geotextile Elongation</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grab Strength, lbs</td>
<td>90 minimum</td>
<td>124 minimum</td>
<td>ASTM D 4632</td>
</tr>
<tr>
<td>Permitivity sec-1</td>
<td>0.05</td>
<td>0.05</td>
<td>ASTM D 4491</td>
</tr>
<tr>
<td>Ultraviolet Stability</td>
<td>Minimum 70% Strength Retained</td>
<td>Minimum 70% Strength Retained</td>
<td>ASTM D 4355</td>
</tr>
</tbody>
</table>

Silt Fence (Reinforced). Silt fence posts shall be metal "studded tee" T-post with a minimum length of 66 inches. Metal posts shall be "studded tee" with .095 inch minimum wall thickness. Wire fabric reinforcement for the silt fence geotextile shall be a minimum of 14 gauge, with a maximum mesh spacing of 6 inches. Geotextile shall be attached to welded wire fabric with ties or nylon cable ties 12 inch O.C. at top, mid and bottom wire. Welded wire fabric shall be attached to the post with a minimum three 12 gauge wire ties per post. Vinyl or rubber safety caps shall be installed on all T-post.

(c) Temporary Berms. Temporary berms shall be constructed of compacted soil.

(d) Temporary Slope Drains. Temporary slope drains shall consist of fiber mats, plastic sheets, stone, concrete or asphalt gutters, half round pipe, metal or plastic pipe, wood flume, flexible rubber or other materials suitable to carry accumulated water down the slopes. Outlet protection riprap shall conform to section 506. Erosion control geotextile shall be a minimum Class 2, conforming to subsection 712.08.

(e) Silt Berm. Silt berm shall consist of an ultraviolet (UV) stabilized high-density polyethylene, shall be triangular in shape, and shall have the following dimensions:

<table>
<thead>
<tr>
<th>Property</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>6 - 11 inches</td>
</tr>
<tr>
<td>Height</td>
<td>6 - 10 inches</td>
</tr>
<tr>
<td>Weight</td>
<td>0.3 - 1.4 lbs./sq. ft.</td>
</tr>
<tr>
<td>Percent Open Area</td>
<td>30 – 50%</td>
</tr>
</tbody>
</table>

Securing spikes shall be 10 to 12 inch x 0.375 inch diameter (minimum).

(f) Rock Check Dam. Rock Check dams shall be constructed of stone. Stone shall meet the requirements of Section 506.

(g) Sediment Trap. In constructing an excavated Sediment Trap, excavated soil may be used to construct the dam embankment, provided the soil meets the requirements of subsection 203.03. Outlet protection riprap shall be the size specified in the Contract and shall conform to Section 506. Erosion control geotextile shall be a minimum Class 1, conforming to subsection 712.08.
(h) **Erosion log.** Shall be one of the following types unless otherwise shown on the plans:

(1) Erosion Log (Type 1) shall be curled aspen wood excelsior with a consistent width of fibers evenly distributed throughout the log. The casing shall be seamless, photo-degradable tube netting and shall have minimum dimensions as shown in Table 208-1, based on the diameter of the log called for on the plans. The curled aspen wood excelsior shall be fungus free, resin free, and free of growth or germination inhibiting substances.

(2) Erosion Log (Type 2) shall consist of a blend of 30-40 percent weed free compost and 60-70 percent wood chips. The compost/wood blend material shall pass a 50 mm (2 inch) sieve with a minimum of 70 percent retained on the 9.5 mm (3/8 inch) sieve and comply to subsection 212.02 for the remaining compost physical properties. The compost/wood chip blend may be pneumatically shot into a geotextile cylindrical bag or be pre-manufactured. The geotextile bag shall consist of material with openings of 1/8 to 3/8 inches of HDPE or polypropylene mesh (knitted, not extruded), and contain the compost/wood chip material while not limiting water infiltration.

Erosion log (Type 1 and Type 2) shall have minimum dimensions as shown in Table 208-1, based on the diameter of the log.

<table>
<thead>
<tr>
<th>Diameter Type 1 (Inches)</th>
<th>Diameter Type 2 (Inches)</th>
<th>Length (feet)</th>
<th>Weight (minimum) (pounds/foot)</th>
<th>Stake Dimensions (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Min.</td>
<td>Max.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>8</td>
<td>10</td>
<td>180</td>
<td>1.6</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>10</td>
<td>180</td>
<td>2.5</td>
</tr>
<tr>
<td>20</td>
<td>18</td>
<td>10</td>
<td>100</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Stakes to secure erosion logs shall consist of pinewood or hardwood.

(i) **Silt Dikes.** Silt dikes shall be pre-manufactured triangular shaped urethane foam covered with a woven geotextile fabric. The fabric aprons shall extend a minimum of two feet beyond each side of the triangle.

Each silt dike shall have the following dimensions:

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center height</td>
<td>8 to 10 inches</td>
</tr>
<tr>
<td>Base</td>
<td>16 to 21 inches</td>
</tr>
<tr>
<td>Section length</td>
<td>3 to 7 feet</td>
</tr>
<tr>
<td>Section width including fabric extensions</td>
<td>5.6 feet</td>
</tr>
</tbody>
</table>

Staples shall be 6 gauge and at least 8 inches long.

(j) **Concrete Washout Structure.** The Contractor shall construct a washout structure that will contain washout from concrete placement and construction equipment cleaning operations. Embankment required for the concrete washout structure may be excavated material, provided that this material meets the requirements of Section 203 for embankment.

A pre-fabricated concrete washout structure shall only be used when specified in the Contract. It shall consist of a watertight container designed to contain liquid and solid waste from concrete washout.
(k) **Vehicle Tracking Pad.** Aggregate for the vehicle tracking pad shall be crushed natural aggregate with at least two fractured faces that meets the following gradation requirements:

<table>
<thead>
<tr>
<th>Sieve size</th>
<th>Percent by weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>75 mm (3 inch)</td>
<td>100</td>
</tr>
<tr>
<td>50 mm (2 inch)</td>
<td>0-25</td>
</tr>
<tr>
<td>19.0 mm (¾ inch)</td>
<td>0-15</td>
</tr>
</tbody>
</table>

Recycled crushed concrete or asphalt shall not be used for vehicle tracking pads.

Erosion Control Geotextile shall be Class 2 and conform to the requirements of subsection 712.08.

Pre-fabricated vehicle tracking pads if specified in the Contract shall have the following properties.

Minimum overall dimensions of the modular systems shall be:

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of pad along edge of roadway</td>
<td>14 feet</td>
</tr>
<tr>
<td>Length of pad</td>
<td>30 feet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (min.) (lbs./sq. ft.)</td>
<td>8</td>
</tr>
<tr>
<td>Crush strength (min.) (psi)</td>
<td>400</td>
</tr>
</tbody>
</table>

(l) **Aggregate Bag.** Aggregate bags shall consist of crushed stone or recycled rubber filled fabric with the following properties:

<table>
<thead>
<tr>
<th>Diameter (inches)</th>
<th>Weight (minimum) (pounds per foot)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-8</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>12</td>
<td>15</td>
</tr>
</tbody>
</table>

Rubber used in bags shall be clean, 95 percent free of metal and particulates.

Crushed stone contained in the aggregate bags shall conform to subsection 703.09, Table 703-7 for Class C.

The aggregate bag shall consist of a woven geotextile fabric with the following properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grab Tensile Strength</td>
<td>90 lbs. min.</td>
<td>ASTM D 4632</td>
</tr>
<tr>
<td>Trapezoid Tear Strength</td>
<td>25 lbs. min.</td>
<td>ASTM D 4533</td>
</tr>
<tr>
<td>Mullen Burst</td>
<td>300 psi</td>
<td>ASTM D 3786</td>
</tr>
<tr>
<td>Ultraviolet Resistance</td>
<td>70%</td>
<td>ASTM D 4355</td>
</tr>
</tbody>
</table>

(m) **Storm Drain Inlet Protection.** Storm drain inlet protection shall consist of aggregate filled fabric with the following dimensions:
The storm drain inlet protection (Type I, II and III) shall consist of a woven geotextile fabric with the following properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Unit</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grab tensile strength</td>
<td>ASTM D 4632</td>
<td>lbs.</td>
<td>minimum 350X280</td>
</tr>
<tr>
<td>Mullen Burst Strength</td>
<td>ASTM D 3786</td>
<td>lbs.</td>
<td>600</td>
</tr>
<tr>
<td>Trapezoid Tear Strength</td>
<td>ASTM D 4533</td>
<td>lbs.</td>
<td>minimum 110X95</td>
</tr>
<tr>
<td>Percent Open Area</td>
<td>COE-22125-86</td>
<td>%</td>
<td>28</td>
</tr>
<tr>
<td>Water Flow Rate</td>
<td>ASTM D 4491</td>
<td>gal./min./sq. ft.</td>
<td>250</td>
</tr>
<tr>
<td>Ultraviolet Resistance</td>
<td>ASTM D 4355</td>
<td>%</td>
<td>70</td>
</tr>
</tbody>
</table>

Curb roll for storm drain inlet protection (Type I and II) shall have an approximate weight of 7 to 10 pounds per linear foot of device. The device shall be capable of conforming to the shape of the curb. Aggregate contained in the storm drain inlet device shall consist of gravel or crushed stone conforming to Table 703-7 for Class C.

Storm drain inlet protection (Type III) shall have insert containment (option A) or insert without storage capacity (option B).

**CONSTRUCTION REQUIREMENTS**

**208.03 Project Review, Schedule, and Transportation Erosion Control Supervisor.** Prior to construction, an on-site Environmental Pre-construction Conference shall be held. The conference shall be attended by:

1. The Engineer,
2. The Superintendent,
3. The Contractor's SWMP Administrator
4. Supervisors or Foremen of subcontractors working on the project,
5. The Region Water Pollution Control Manager (RWPCM), and
(6) CDOT personnel (e.g., CDOT Landscape Architect) who prepared or reviewed the Stormwater Management Plan (SWMP).

At this conference, the attendees shall discuss the SWMP, CDPS-SCP, sensitive habitats on site, wetlands, other vegetation to be protected, and the enforcement mechanisms for not meeting the requirements of this specification.

Prior to beginning construction the Contractor shall evaluate the project site for storm water draining into or through the site. When such drainage is identified, BMPs (i.e., Control Measures) shall be used if possible to divert stormwater from running on-site and becoming contaminated with sediment or other pollutants. The diversion may be accomplished with a temporary pipe or other conveyance to prevent water contamination or contact with pollutants. Run-on water that cannot be diverted shall be treated as construction runoff and adequate BMPs shall be employed.

The SWMP Administrator shall evaluate all non-stormwater coming onto the site, such as springs, seeps, and landscape irrigation return flow. If such flow is identified, BMPs shall be used to protect off-site water from becoming contaminated with sediment or other pollutants.

The SWMP Administrator shall review existing inlets and culverts to determine if inlet protection is needed due to water flow patterns. Prior to beginning construction, inlets and culverts needing protection shall be protected and the location of the implemented BMP added to the SWMP site map.

Prior to construction, the Contractor shall implement appropriate BMPs for protection of wetlands, sensitive habitat and existing vegetation from ground disturbance and other pollutant sources, in accordance with the approved project schedule as described in subsection 208.03(b).

When additional BMPs are required and approved by the Engineer, the Contractor shall implement the additional BMPs and the SWMP Administrator shall record and describe them on the SWMP site map. The approved BMPs will be measured and paid for in accordance with subsections 208.11 and 208.12.

(a) Project Review. The Contractor may submit modifications to the Contract’s BMPs in a written proposal to the Engineer. The written proposal shall include the following information:

1. Reasons for changing the BMPs.
2. Diagrams showing details and locations of all proposed changes.
3. List of appropriate pay items indicating new and revised quantities.
4. Schedules for accomplishing all erosion and sediment control work.
5. Effects on permits or certifications caused by the proposed changes.

The Engineer will approve or reject the written proposal in writing within 5 working days after the submittal. The Engineer may require additional control measures prior to approving the proposed modifications. Additional modifications and additional BMPs will be paid for at the Contract Unit Price for the specific items involved. If no items exist, they will be paid for as extra work in accordance with subsection 109.04.

(b) Erosion and Sediment Control Activities. The erosion and sediment control activities shall be included in the weekly meeting update. The project schedule shall specifically indicate the sequence of clearing and grubbing, earthwork operations, and construction of temporary and permanent erosion control features and stabilization. Project schedule shall include erosion and sediment control work for haul roads, borrow pits, storage and asphalt or concrete batch sites, and all areas within the project limits. If during construction the Contractor proposes changes which would affect the Contract’s BMPs, the Contractor shall propose revised BMPs to the Engineer for approval in writing. If necessary, the SWMP Administrator shall update proposed sequencing of major activities in the SWMP. Revisions shall not be implemented until the proposed measures have been approved in writing by the Engineer.

(c) Erosion Control Management (ECM). Erosion Control Management for this project shall consist of Erosion Control Inspection and the Administration of the Stormwater Management Plan (SWMP). All ECM staff shall have working knowledge and experience in construction, and shall have successfully completed the Transportation Erosion Control Supervisory Certificate Training (TECS) as provided by the Department. The Superintendent will not be permitted to serve in an ECM role. The Erosion Control Inspector and the Stormwater Administrator may be the same person in projects involving less than 40 acres of disturbed area.
1. Stormwater Management Plan (SWMP) Administration. The SWMP Plan shall be maintained by a SWMP Administrator. The SWMP Administrator shall have completed the TECS certification training as provided by the Department. In the case of a project requiring only one TECS, the SWMP Administrator may also be the Erosion Control Inspector for the project. The name of the SWMP Administrator shall be recorded on SWMP Plan Section 3. B. The SWMP Administrator shall have full responsibility to maintain and update the SWMP Plan and identify to the Superintendent critical action items needed to conform to the CDPS-SCP as follows:

(1) Complete the SWMP Notebook as described in subsection 208.03 (d).

(2) Participate in the Environmental Pre-construction Conference

(3) Attend weekly meetings

(4) Attend all Headquarter and Region water quality control inspections. The Contractor and the Contractor’s SWMP Administrator will be notified a minimum of five days in advance of each inspection by the CDOT region or headquarter water quality staff.

(5) Coordinate with the Superintendent to implement necessary actions to reduce anticipated or presently existing water quality or erosion problems resulting from construction activities.

(6) Coordinate with the Superintendent to ensure that all labor, material, and equipment needed to install, maintain, and remove BMPs are available as needed.

(7) During construction, update and record the following items on the SWMP site map as changes occur:

   (i) Limits of Construction (LOC).
   (ii) Areas of disturbance (AD)
   (iii) Limits of Disturbance (LDA)
   (iv) Limits of cut and fill.
   (v) Areas used for storage of construction materials, equipment, soils, or wastes.
   (vi) Location of any dedicated asphalt or concrete batch plants.
   (vii) Location of construction offices and staging areas.
   (viii) Location of work access routes during construction.
   (ix) Location of borrow and waste.
   (x) Location of temporary, interim and permanent stabilization.
   (xi) Location of outfall(s)
   (xii) Arrows showing direction of surface flow
   (xiii) Structural and non-structural BMPs
   (xiv) LDA and LOC lines as defined in subsection 107.25

(8) Amend the SWMP whenever there are: additions, deletions, or changes to BMPs. SWMP revisions shall be recorded immediately. Items shall be dated and initialed by the SWMP Administrator. Specifically, amendments shall include the following:

   (i) A change in design, construction, operation, or maintenance of the site which would require the implementation of new or revised BMPs; or

   (ii) Changes when the SWMP proves to be ineffective in achieving the general objectives of
controlling pollutants in stormwater discharges associated with construction activity.

(iii) Changes when BMPs are no longer necessary and are removed.

(9) Complete vegetative survey transects when required in accordance with CDOT Erosion Control and Stormwater Quality Guide.

(10) Start a new site map before the current one becomes illegible. All site maps shall remain in the SWMP notebook.

(11) Document all inspection and maintenance activities. The SWMP and documentation shall be kept on the project site.

(12) When adding or revising BMPs on the SWMP, add a narrative explaining what, when, where, why, and how the BMP is being used, and add a detail to the SWMP notebook.

   (i) How to install and inspect the BMP

   (ii) Where to install the BMP

   (iii) When to maintain the BMP

(13) If using existing topography, vegetation, etc. as a BMP, label it as such on the SWMP site map; add a narrative as to when, where, why, and how the BMP is being used.

(14) Indicate BMPS in use or not in use by recording on Standard Plans M-208-1, M-216-1, and M-615-1 in the SWMP notebook.

(15) Record on the SWMP, the approved Method Statement for Containing Pollutant Byproducts.

(16) Update the potential pollutants list in the SWMP notebook and Spill Response Plan throughout construction.

2. Erosion Control Inspection.

Erosion control inspection shall be performed by TECS certified staff assigned as Erosion Control Inspector (ECI) to the project. One ECI is required for every 40 acres of total disturbed area which is currently receiving temporary and interim stabilization measures as defined in subsection 208.04 (e). An ECI shall not be responsible for more than 40 acres in the project. Accepted permanent stabilization methods as defined in subsection 208.04 (e) will not be included in the 40 acres.

ECI duties shall be as follows:

(1) Coordinate with the SWMP Administrator on reporting the results of inspections

(2) Review the construction site for compliance with the Stormwater Construction Permit.

(3) Inspect with the Superintendent and the Engineer (or their designated representatives) the stormwater management system at least every seven calendar days. Post storm event inspections shall be conducted within 24 hours after the end of any precipitation or snow melt event that may cause surface erosion. If no construction activities will occur following a storm event, post-storm event inspections shall be conducted prior to commencing construction activities, but no later than 72 hours following the storm event. The occurrence of delay in inspections shall be documented in the inspection report. Form 1176 shall be used for all 7 day inspections and inspections following storm events. The Contractor shall notify the Erosion control inspector when a storm event occurs. Failure to perform inspections on time will result in liquidated damages in accordance with subsection 208.09.
Inspections are not required at sites when construction activities are temporarily halted, when snow cover exists over the entire site and melting conditions do not pose a risk of surface erosion. This exception shall be applicable only during the period where melting conditions do not exist, and applies to the routine 7 day, Headquarters and Region inspections, as well as the post-storm event inspections. The following information shall be documented on Form 1176 for use of this exclusion: dates when snow cover occurred, date when construction activities ceased, and date melting conditions began.

The order of precedence for required inspections shall be as follows:

(i) Headquarter water quality inspections

(ii) Region water quality inspections

(iii) Post-storm event inspections

(iv) 7 day inspections

When one of the listed inspections is performed, the inspections listed below it need not be performed on that day if the required CDOT and Contractor personnel participated in the inspection.

For example: A 7 day inspection is not required on the same day a headquarters or Region inspection is conducted. A sheet shall be placed in the inspections area of the SWMP Notebook to refer to the date inspection performed.

(4) Follow all other agency Stormwater requirements and inspections unless a waiver or other agreement has been made.

(5) The ECI shall immediately report to the Contractor’s Superintendent and the SWMP Administrator the following instances of noncompliance:

(i) Noncompliance which may endanger health or the environment.

(ii) Spills or discharge of hazardous substance or oil which may cause pollution of waters of the State.

(iii) Discharge of stormwater which may cause an exceedance of a water quality standard.

(iv) Upset conditions that occur on site.

(6) Spills, leaks, or overflows that result in the discharge of pollutants shall be documented on the Form 1176 by the ECI. The ECI shall record the time and date, weather conditions, reasons for spill, and how it was remediated.

(d) Documentation Available on the Project. The following Contract documents and references will be made available for reference at the CDOT field office during construction:

1. SWMP Notebook. The Engineer will provide a SWMP Notebook at the Preconstruction Conference, which is and shall remain the property of CDOT. CDOT will initially provide the documentation for the first four items when available. The Contractor shall provide the contents required for items (5) through (18). The notebook shall be stored in the CDOT field office or at another on-site location approved by the Engineer. The SWMP Administrator shall modify and update the notebook as needed to reflect actual site conditions, prior to or as soon as practicable but in no case more than 72 hours after the change. The following Contract documents and reports shall be kept, maintained, and updated in the notebook under
the appropriate items by the SWMP Administrator:

(1) SWMP Plan Sheets - Notes, tabulation, sequence of major activities, area of disturbance, existing soil data, existing vegetation percent cover, potential pollutant sources, receiving water, non-stormwater discharges and environmental impacts.

(2) Site Map and Plan Title Sheet - Construction site boundaries, ground surface disturbance, limits of cut and fill, flow arrows, structural BMPs, non-structural BMPs, Springs, Streams, Wetlands and surface water. Also included on the sheets is the protection of trees, shrubs and cultural resources.

(3) Specifications - Standard and Project special provisions related to Stormwater and Erosion Control.

(4) Standard Plans M-208-1, M-216-1 and M-615-1

(5) BMP Details not in Standard Plan M-208-1 - Non-standard details.

(6) Weekly meeting sign in sheet.

(7) Calendar of Inspections - Calendar of inspections marking when all inspections take place.

(8) Form 1176 – Weekly meeting notes and inspection report

(9) Region and Headquarter Water Quality Reports and Form 105(s) relating to Water Quality.

(10) Description of Inspection and Maintenance Methods - Description of inspection and maintenance methods implemented at the site to maintain all BMPs identified in the SWMP and Items not addressed in the design

(11) Spill Response Plan - Reports of reportable spills submitted to CDPHE

(12) List and Evaluation of Potential Pollutants - List of potential pollutants as described in subsection 107.25 and approved Method Statement for Containing Pollutant Byproducts.

(13) Other Correspondence e.g., agreements with other MS4s, approved deferral request, CDPHE audit documentation, Water Quality Permit Transfer to Maintenance Punch List and other miscellaneous documentation.

(14) TECS Certifications of the SWMP Administrator and all ECIs, keep current through the life of the project.

(15) Environmental Pre-construction Conference – Conference agenda with a certification of understanding of the terms and conditions of the CDPS-SCP and SWMP. The certification shall be signed by all attendees. A certification shall also be signed by all attendees of meetings held for new subcontractors beginning work on the project that could adversely affect water quality after the Environmental Pre-construction Conference has been held.

(16) All Project Environmental Permits - All project environmental permits and associated applications and certifications, including, CDPS-SCP, Senate Bill 40, USACE 404, temporary stream crossings, dewatering, biological opinions and all other permits applicable to the project, including any separate CDPS-SCP obtained by the Contractor for staging area on private property, asphalt or concrete plant, etc.

(17) Photographs Documenting Existing Vegetation – Project photographs shall be time stamped on paper with a maximum of four colored images per 8 ½ inch by 11 inch sheet and/or a digital copy of all photographs on CD-ROM/Flash Drive in (JPG format), documenting existing vegetation prior to construction commencing. On the bottom of each photograph shall be a description using Station
Number or Mile Post of where the photograph was taken.

(18) Permanent Water Quality Plan Sheets - Plan sheets and specifications for permanent water quality structures, riprap.

The Engineer will incorporate the documents and reports available at the time of award. The Contractor shall provide and insert all other documents and reports as they become available during construction. The SWMP Administrator shall finalize the SWMP for CDOT Maintenance use upon completion of the project. SWMP completeness shall be approved by the Engineer, corrections to the SWMP shall be at the Contractor’s expense. The following Reference materials shall be used:

(1) CDOT Erosion Control and Stormwater Quality Guide.
(2) CDOT Erosion Control and Stormwater Quality Field Guide.

(e) Weekly Meetings. The Engineer, Superintendent and the SWMP Administrator shall conduct a weekly meeting with supervisors involved in construction activities that could adversely affect water quality. The meeting shall follow an agenda prepared by the Engineer or a designated representative, and have a sign in sheet on which the names of all attendees shall be recorded. The SWMP Administrator shall take notes of water quality comments and action items at each weekly meeting, and place the agenda and sign in sheet in the SWMP notebook. At this meeting the following shall be discussed and documented on Form 1176:

(1) Requirements of the SWMP.
(2) Problems that may have arisen in implementing the site specific SWMP or maintaining BMPs.
(3) Unresolved issues from inspections and concerns from last inspection.
(4) BMPs that are to be installed, removed, modified, or maintained.
(5) Planned activities that will effect stormwater in order to proactively phase BMPs.
(6) Recalcitrant inspection findings.

All subcontractors who were not in attendance at the Environment Pre-construction conference shall be briefed on the project by the Engineer, Superintendent, and the SWMP Administrator prior to start of work. The SWMP Administrator shall record the names of these subcontractors as an addendum to the list of attendees, and added the SWMP Notebook.

208.04 Best Management Practices (BMPs) for Stormwater.

The SWMP Administrator shall modify the SWMP to clearly describe and locate all BMPs implemented at the site to control potential sediment discharges.

Vehicle tracking control shall be used at all vehicle and equipment exit points from the site to prevent sediment exiting the Limits of Construction (LOC) of the project site. Access shall be provided only at locations approved by the Engineer. The SWMP Administrator shall record vehicle tracking control pad locations on the SWMP site map.

New inlets and culverts shall be protected during their construction. Appropriate protection of each culvert and inlet shall be installed immediately. When riprap is called for at the outlet of a culvert, it shall be installed within 24 hours of completion of each pipe. The Contractor shall remove sediment, millings, debris, and other pollutants from within the newly constructed drainage system in accordance with the CDPS-SCP, prior to use, at the Contractor’s expense. All removed sediment shall be disposed of outside the project limits in accordance with all applicable regulations.

Concrete products wasted on the ground during construction shall include, but shall not be limited to: excess concrete removed from forms, spills, slop, and all other unused concrete are potential pollutants that shall be contained or protected by an approved BMP at a pre-approved containment area. The concrete shall be picked up and recycled in accordance with 6 CCR 1007-2 (CDPHE Regulations Pertaining to Solid Waste Sites and Facilities) at regular intervals, as directed. The uses of recycled concrete from approved recycling facilities shall be in accordance with Section 203.
REVISION OF SECTION 208
EROSION CONTROL

(a) **Unforeseen Conditions.** The Contractor shall design and implement erosion and sediment BMPs for correcting conditions unforeseen during the design of the project, or for emergency situations, that develop during construction. The Department's "Erosion Control and Stormwater Quality Guide" shall be used as a reference document for the purpose of designing erosion and sediment BMPs. Measures and methods proposed by the Contractor shall be reviewed and approved in writing by the Engineer prior to installation.

(b) **Other Agencies.** If CDPHE, US Army Corps of Engineers (USACE), or the Environmental Protection Agency (EPA) reviews the project site and requires additional measures to prevent and control erosion, sediment, or pollutants, the Contractor shall cease and desist activities resulting in pollutant discharge and immediately implement these measures. If the work may negatively affect another MS4, the Contractor shall cease and desist activities resulting in the discharge and shall implement appropriate measures to protect the neighboring MS4, including installing additional measures. Implementation of these additional measures will be paid for at contract unit price.

(c) **Work Outside the Right of Way.** Disturbed areas, including staging areas, which are outside CDOT ROW and outside easements acquired by CDOT for construction, are the responsibility of the Contractor. These areas may be subject to a separate CDPS-SCP or other permits. The Contractor shall acquire these permits and submit copies to the Engineer prior to any disturbance. These permits, shall be acquired and all erosion and sediment control work performed at the Contractor's expense. These areas are subject to inspections by CDOT or any other agency, as agreed upon in writing.

(d) **Construction Implementation.** The Contractor shall incorporate BMPs into the project as outlined in the accepted schedule.

(e) **Stabilization.** Once earthwork has started, the Contractor shall continue erosion BMPs until permanent stabilization of the area has been completed and accepted. Clearing, grubbing and slope stabilization measures shall be performed regularly to ensure final stabilization. Failure to properly maintain erosion control and stabilization methods, either through improper phasing or sequencing will require the Contractor to repair or replace sections of earthwork at his expense. The Contractor shall schedule and implement the following stabilization measures during the course of the project:

1. **Temporary Stabilization.** At the end of each day, the Contractor shall stabilize disturbed areas by surface roughening, vertical tracking, or a combination thereof. Disturbed areas are locations where actions have been taken to alter the existing vegetation and/or underlying soil of a site, such as clearing, grading, road bed preparation, soil compaction, and movement and stockpiling of top soils. Other stabilization measures may be implemented, as approved. The maximum area of temporary stabilization shall not exceed 20 acres.

2. **Interim Stabilization.** Stockpiles and disturbed areas as soon as known with reasonable certainty that work will be temporarily halted for 14 days or more shall be stabilized using one or more of the specified following methods:

   (i) Application of 1.5 tons of mechanically crimped certified weed free hay or straw in combination with an approved organic mulch tackifier.

   (ii) Placement of bonded fiber matrix in accordance with Section 213.

   (iii) Placement of mulching (hydraulic) wood cellulose fiber mulch with tackifier, in accordance with Section 213.

   (iv) Application of spray-on mulch blanket in accordance with Section 213. Magnesium Chloride, Potassium Chloride and Sodium Chloride, or other salt products, will not be permitted as a stabilization method.

   Protection of the interim stabilization method is required. Reapplication may be required as approved.

3. **Summer and Winter Stabilization.** Summer and winter stabilization is defined as months when seeding will not be permitted. As soon as the Contractor knows shutdown is to occur, interim stabilization shall be applied to the disturbed area. Protection of the interim stabilization method is required. Reapplication of
interim stabilization may be required as directed.

(4) Permanent Stabilization. Permanent stabilization is defined as the covering of disturbed areas with seeding, mulching with tackifier, soil retention coverings, and such non-erodible methods such riprap, road shouldering, etc., or a combination thereof as required by the Contract. Other permanent stabilization techniques may be proposed by the Contractor, in writing, and shall be used when approved in writing by the Engineer. Permanent stabilization shall begin within 48 hours after topsoil placement, soil conditioning, or combination thereof starts and shall be pursued to completion.

(5) Final Stabilization. Final stabilization is defined as when all ground disturbing activities at the site have been completed, and uniform vegetative cover has been established with an individual plant density of at least 70 percent of pre-disturbance levels, or equivalent permanent physical erosion reduction methods have been employed.

(f) Maintenance. Erosion and sediment control practices and other protective measures identified in the SWMP as BMPs for stormwater pollution prevention shall be maintained in effective operating condition until the CDPS-SCP has been transferred to CDOT. BMPs shall be continuously maintained in accordance with good engineering, hydrologic and pollution control practices, including removal of collected sediment when silt depth is 50 percent or more of the height of the erosion control device. When possible, the Contractor shall use equipment with an operator rather than labor alone to remove the sediment.

Maintenance of erosion and sediment control devices shall include replacement of such devices upon the end of their useful service life as recommended by the Contractor and approved by the Engineer. Maintenance of rock check dams and vehicle tracking pads shall be limited to removal and disposal of sediment or addition of aggregate. Damages resulting from failure to maintain BMPs shall be paid at the contractors expense.

Complete site assessment shall be performed as part of comprehensive inspection and maintenance procedures, to assess the adequacy of BMPs at the site and the necessity of changes to those BMPs to ensure continued effective performance. Where site assessment results in the determination that new or replacement BMPs are necessary, the BMPs shall be installed to ensure continuous effectiveness. When identified, BMPs shall be maintained, added, modified or replaced as soon as possible, immediately in most cases.

Approved new or replaced BMPs will be measured and paid for in accordance with subsections 208.11 and 208.12. Devices damaged due to the Contractor's negligence shall be replaced at Contractor's expense.

From the time seeding and mulching work begins until the date the Contract work is accepted, the Contractor shall maintain all seeded areas. Damage to seeded areas or to mulch materials shall be immediately restored. Damage to seeded areas or to mulch materials due to Contractor negligence shall be immediately restored at the Contractor's expense. Restoration of other damaged areas will be measured and paid for under the appropriate bid item.

Temporary BMPs may be removed upon completion of the project, as determined by the Water Quality Partial Acceptance walk-through. If removed, the area in which these BMPs were constructed shall be returned to a condition similar to that which existed prior to its disturbance. Removed BMPs shall become the property of the Contractor.

If a project delay occurs, the Contractor shall be responsible to continue erosion and sediment control operations beyond the original contract time.

Sediment removed during maintenance of BMPs and material from street sweeping may be used in or on embankment, provided it meets conditions of Section 203 and is distributed evenly across the embankment.

Whenever sediment collects on the paved surface, the surface shall be cleaned. Street washing will not be allowed. Storm drain inlet protection shall be in place prior to shoveling, sweeping, or vacuuming. Sweeping shall be completed with a pickup broom or equipment capable of collecting sediment. Sweeping with a kick broom will not be allowed.
Material from pavement saw cutting operations shall be cleaned from the roadway surface during operations using a vacuum. A BMP, such as a berm, shall be placed to contain slurry from joint flushing operations until the residue can be removed from the soil surface. Aggregate bags, erosion logs or other permeable BMPs shall not be used. Residue shall not flow into driving lanes. It shall be removed and disposed of in accordance with subsection 107.25(b) 13. Material containment and removal will not be paid for separately, but shall be included in the work.

208.05 Construction of BMPs. BMPs shall be constructed in accordance with Standard Plans M-208-1, M-216-1 and with the following.

(a) Seeding, Mulching, Sodding, Soil Retention Blanket. Seeding, mulching, sodding, and soil retention blanket shall be performed in accordance with Sections 212, 213, and 216.

(b) Erosion Bales. The bales shall be anchored securely to the ground with wood stakes.

(c) Silt Fence. Silt fence shall be installed in locations specified in the Contract prior to any grubbing or grading activity.

(d) Temporary Berms. Berms shall be constructed to the dimensions shown in the Contract, and sufficiently compacted to prevent erosion or failure. If the berm erodes or fails, it shall be immediately repaired or replaced at the Contractor's expense.

(e) Temporary Diversion. Diversions shall be constructed to the dimensions shown in the Contract, and graded to drain to a designated outlet. The berm shall be sufficiently compacted to prevent erosion or failure. If the diversion erodes or fails, it shall be immediately repaired or replaced at the Contractor's expense.

(f) Temporary Slope Drains. Temporary slope drains shall be installed prior to installation of permanent facilities or growth of adequate ground cover on the slopes. All temporary slope drains shall be securely anchored to the slope. The inlets and outlets of temporary slope drains shall be protected to prevent erosion.

(g) Silt Berm. Prior to installation of silt berms, the Contractor shall prepare the surface of the areas in which the berms are to be installed such that they are free of materials greater than 2 inches in diameter and are suitably smooth for the installation of the silt berms, as approved. Silt berms shall be secured with spikes. The Contractor shall install the silt berm in a manner that will prevent water from going around or under the silt berm. Silt berms shall be installed on top of soil retention blanket.

(h) Rock Check Dam. Rock shall be installed at locations shown on the plans. Rock check dams shall conform to the dimensions shown on the plans.

(i) Riprap Outlet Protection. Geotextile used shall be protected from cutting or tearing. Overlaps between two pieces of geotextile shall be 1 foot minimum. Riprap size shall be as shown on the plans.

(j) Storm Drain Inlet Protection. Prior to installation, the Contractor shall sweep the surface of the area in which the storm drain inlet protection devices are to be installed such that the pavement is free of sediment and debris. The ends of the inlet protection Type 1 and Type 2 shall extend a minimum of 1 foot past each end of the inlet.

The Contractor shall protect storm drain facilities adjacent to locations where pavement cutting operations involving wheel cutting, saw cutting, sand blasting, or abrasive water jet blasting are to take place.
(k) **Sediment Trap.** Sediment traps shall be installed to collect sediment laden water and to minimize the potential of pollutants leaving the project site. Locations shall be as shown on the plans or as directed.

Sediment traps shall be constructed prior to disturbance of upslope areas and shall be placed in locations where runoff from disturbed area can be diverted into the trap.

The area under the embankment shall be cleared, grubbed and stripped of any vegetation and roots.

Fill material for the embankment shall be free of roots or other vegetation, organic material, large stones, and other objectionable material.

Sediment shall be removed from the trap when it has accumulated to one half of the wet storage depth of the trap and shall be disposed of in accordance with subsection 208.04(f).

(l) **Erosion Logs.** Erosion logs shall be embedded 2 inches into the soil. Stakes shall be embedded to a minimum depth of 12 inches. At the discretion of the Engineer, a shallower depth may be permitted if rock is encountered.

The Contractor shall maintain the erosion logs during construction to prevent sediment from passing over or under the logs.

(m) **Silt Dikes.** Prior to installation of silt dikes, the Contractor shall prepare the surface of the areas in which the silt dikes are to be installed such that they are free of materials greater than two inches in diameter and are suitably smooth for the installation of the silt dikes, as approved by the Engineer.

(n) **Concrete Washout Structure.** The concrete washout structure shall meet or exceed the dimensions shown on the plans or be used in accordance with manufacturer’s recommendations. Work on this structure shall not begin until written acceptance is provided by the Engineer.

Concrete washout structure shall conform to standard plan M-208-1 and shall meet the following requirements:

1. Structure shall contain all washout water.
2. Stormwater shall not carry wastes from washout and disposal locations.
3. The site shall be located a minimum of 50 horizontal feet from State waters and shall meet all requirements for containment and disposal as defined in subsection 107.25.
4. The site shall be signed as “Concrete Washout”.
5. The site shall be accessible to appropriate vehicles.
6. Freeboard capacity shall be included into structure design to reasonably ensure the structure will not overtop during or because of a precipitation events.
7. The Contractor shall prevent tracking of washout material out of the washout structure.
8. Solvents, flocculents, and acid shall not be added to wash water.
9. The structure shall be surrounded on three sides by a compacted berm.
10. The structure shall be fenced with orange plastic construction fencing to provide a barrier to construction equipment and to aid in identification of the concrete washout area.
11. Concrete waste, liquid and solid, shall not exceed 2/3 the storage capacity of the washout structure.
Pre-fabricated concrete washout structures shall meet the following requirements:

(1) Structure shall contain all washout water.

(2) Structure shall be located 50 horizontal feet away from State waters, and shall be confined so that no potential pollutants will enter State waters and other sensitive areas as defined in the Contract. Locations shall be as approved by the Engineer. The site shall be delineated with orange plastic fence or other means and signed as “Concrete Washout”.

(3) The site shall be accessible to appropriate vehicles.

(4) Freeboard capacity shall be included into structure design to reasonably ensure the structure will not overtop during or because of a precipitation event.

(5) Solvents, flocculants, and acid shall not be added to wash water.

(6) Concrete waste, liquid and solid, shall not exceed 2/3 the storage capacity of the washout structure.

(7) Prefabricated structures cannot be moved when they contain liquid, unless otherwise approved.

(8) The concrete washout structure shall be completed and ready for use prior to concrete placement operations.

(9) Washout areas shall be checked and maintained as required. On site permanent disposal of concrete washout waste is not allowed.

All liquid and solid wastes, including contaminated sediment and soils generated from concrete washout shall be hauled away from the site and disposed of properly at the Contractor’s expense.

(o) Vehicle Tracking Pad (VTP). Vehicle tracking pads shall be constructed to the minimum dimensions shown in the Contract, unless otherwise directed by the Engineer. Construction of approved vehicle tracking pads shall be completed before any disturbance of the area.

The Contractor shall maintain each vehicle tracking pad during the entire time that it is in use for the project. The vehicle tracking pad shall be removed at the completion of the project unless otherwise directed by the Engineer. Additional aggregate may be required for maintenance and will be paid for under Pay Item, Maintenance Aggregate (Vehicle Tracking Pad).

(p) Detention Pond. Permanent detention ponds shown on the construction plans may be used as temporary BMPs if all the following conditions are met:

(1) The pond is designated as a construction BMP in the SWMP.

(2) The pond outfall and outlet are designed and implemented for use as a BMP during construction in accordance with good engineering, hydrologic, and pollution control practices. The stormwater discharges from the outfall shall not cause degradation or pollution of State waters, and shall have BMPs, as appropriate.

(3) All silt shall be removed and the pond returned to the design grade and contour prior to project acceptance

(q) Aggregate Bag. Aggregate bags shall be placed on a stable surface, consisting of pavement, grass or gravel. Aggregate bags shall be placed to conform to the surface without gaps. Discharge water shall not cause
erosion.

(r) Surface Roughening. Surface roughening creates horizontal grooves along the contour of the slope. Roughening may be accomplished by furrowing, scarifying, ripping or disk the soil surface to create a 2 to 4 inch minimum variation in soil surface. Surface roughening will not be paid for separately, but shall be included in the work.

(s) Vertical Tracking. Vertical tracking involves driving a tracked vehicle up and down the soil surface and creating horizontal grooves and ridges along the contour of the slope. Sandy soils or soils that are primarily rock need not be tracked. Vertical tracking will not be paid for separately, but shall be included in the work.

208.06 Materials Handling and Spill Prevention. The SWMP Administrator shall clearly describe and record on the SWMP, all practices implemented at the site to minimize impacts from procedures or significant material that could contribute pollutants to runoff. Areas or procedures where potential spills can occur shall have a Spill Response Plan in place as specified in subsections 107.25(b) 6 or 208.06(c). Construction equipment, fuels, lubricants, and other petroleum distillates shall not be stored or stockpiled within 50 horizontal feet of any State waters or more if the Contractor determines necessary. Equipment fueling and servicing shall occur only within approved designated areas.

(a) Bulk Storage Structures. Bulk storage structures for petroleum products and other chemicals shall have impervious secondary containment or equivalent adequate protection so as to contain all spills and prevent any spilled material from entering State waters. Secondary containment shall be capable of containing the combined volume of all the storage containers plus at least 10 percent freeboard. For secondary containment that is used and may result in accumulation of stormwater within the containment, a plan shall be implemented to properly manage and dispose of all accumulated stormwater which is deemed to be contaminated (e.g., has an unusual odor or sheen).

(b) Lubricant Leaks. The Contractor shall inspect equipment, vehicles, and repair areas daily to ensure petroleum, oils, and lubricants (POL) are not leaking onto the soil or pavement. Absorbent material or containers approved by the Engineer shall be used to prevent leaking POL from reaching the soil or pavement. The Contractor shall have onsite approved absorbent material or containers of sufficient capacity to contain any POL leak that can reasonably be foreseen. The Contractor shall inform all Spill Response Coordinators in accordance with the Spill Response Plan if unforeseen leakage is encountered. All materials resulting from POL leakage control and cleanup shall become the property of the Contractor and shall be removed from the site. Control, cleanup, and removal of by-products resulting from POL leaks shall be performed at the Contractor's expense.

(c) Spill Response Plan. A spill Response Plan shall be developed and implemented to establish operating procedures for handling potential pollutants and preventing spills. The Response Plan shall contain the following information:

1. Identification and contact information of each Spill Response Coordinator

2. Locations of areas on project site where equipment fueling and servicing operations are permitted.

3. Location of cleanup kits.

4. Quantities of chemicals and locations stored on site.

5. Label system for chemicals and Safety Data Sheets (SDS) for products.

6. Clean up procedures to be implemented in the event of a spill that does not enter State waters or ground water.

7. Procedures for spills of any size that enter surface waters or ground water, or have the potential to do so. CDOT's Erosion Control and Stormwater Quality Guide contains Spill notification contacts and
phone numbers required in the Spill Response Plan.

(8) A summary of the employee training provided.

Information in items (1) through (8) shall be updated in the SWMP Notebook when they change.

208.07 Stockpile Management. Material stockpiles shall be located 50 horizontal feet away from State waters, and shall be confined so that no potential pollutants will enter State waters and other sensitive areas as defined in the Contract. Locations shall be approved by the Engineer.

Erodible stockpiles (including topsoil) shall be contained with acceptable BMPs at the toe (or within 20 feet of the toe) throughout construction. BMPs shall be approved by the Engineer. The SWMP Administrator shall describe, detail, and record the sediment control devices on the SWMP.

208.08 Limits of Disturbance. The Contractor shall limit construction activities to those areas within the limits of disturbance shown on the plans and cross-sections. Construction activities, in addition to the Contract work, shall include the on-site parking of vehicles or equipment, on-site staging, on-site batch plants, haul roads or work access, and all other action which would disturb existing soil conditions. Staging areas within the LDA shall be as approved by the Engineer. Construction activities beyond the limits of disturbance due to Contractor negligence shall be restored to the original condition by the Contractor at the Contractor’s expense. The SWMP Administrator shall tabulate additional disturbances not identified in the CDPS_SCP application and indicate changes to locations and quantities on the SWMP. The Contractor shall report the changes and additional disturbances to the Engineer, Water Quality Control Division of CDPHE and all other involved agencies. The Contractor shall pursue and stabilize all disturbances to completion.

208.09 Failure to Perform Erosion Control. Failure to implement the Stormwater Management Plan is a violation of the CDPS – SCP and CDOT specifications. CDOT is obligated to implement enforcement mechanisms in accordance with CDOT’s MS4 Permit COS000005 for Stormwater Management and erosion control Best Management Practices. Penalties may be assessed to the Contractor by the appropriate agencies. Penalties will be assessed by the Department as liquidated damages for failure to meet the Permit. All fines assessed to the Department for the Contractor’s failure to implement the SWMP will be deducted from moneys due the Contractor in accordance with subsection 107.25(c) 2.

The Contractor will be subject to liquidated damages for incidents of failure to perform erosion control as required by the Contract. Liquidated damages will be applied for failure to comply with the CDPS-SCP and these specifications, including the following:

(1) Failure to include erosion control in the project schedule or failure to include erosion control in each schedule update as specified in subsection 208.03(b).

(2) Failure of the Contractor to perform the inspections required by subsection 208.03(c) 2.

(3) Failure of the Contractor to implement necessary actions required by the Engineer as required by subsection 208.03(c).

(4) Failure to amend the SWMP and implement BMPs as required by subsection 208.04.

(5) Failure to keep documentation and records current.

(6) Failure to construct or implement erosion control or spill containment measures required by the Contract, or failure to construct or implement them in accordance with the Contractor’s approved schedule as required by subsection 208.06(c).

(7) Failure to limit temporary stabilization to 20 or fewer acres as required by subsection 208.04 (e).
(8) Failure to replace or perform maintenance on an erosion control feature after notice from the Engineer or from a water quality inspection as required by subsection 208.04(f).

(9) Failure to remove and dispose of sediment from BMPs as required.

(10) Failure to install and properly utilize a concrete washout structure for containing washout from concrete placement operations.

(11) Failure to perform stabilization as required by subsection 208.04 (e).

(12) Failure of the Superintendent or designated representative to attend inspections as required by subsection 208.03(c) and record findings in the appropriate form.

(13) Failure to prevent discharges not composed entirely of stormwater from leaving the Construction Site.

(14) Failure to provide the survey of Permanent Water Quality BMPs when required on the project in accordance with 208.10.

The Engineer will immediately notify the Contractor of each incident of failure to perform erosion control in accordance with the CDPS-SCP and these specifications, including items (1) through (14) above by issuing the Form 105. Correction shall be made as soon as possible but no later than 48 hours from the date of notification to correct the failure. The Contractor will be charged liquidated damages in the amount of $970 for each day after the 48 hour period has expired, that one or more of the incidents of failure to perform the requirements for each Form 105 remains uncorrected. Liquidated damages will begin at Midnight of the date the 48 hours has expired. This deduction will not be considered a penalty, but will be considered liquidated damages based on estimated additional construction engineering costs. The liquidated damages will accumulate, for each cumulative day that one or more of the incidents remain uncorrected. The number of days for which liquidated damages are assessed will be cumulative for the duration of the project; that is: the damages for a particular day will be added to the total number of days for which liquidated damages are accumulated on the project. The liquidated damages will be deducted from any monies due the Contractor.

If all other failures are not corrected within 48 hours after liquidated damages have begun to be assessed, the Engineer will issue a Stop Work Order in accordance with subsection 105.01. Work shall not resume until the Engineer has approved a written corrective action plan submitted by the Contractor that includes measures to prevent future violations and a schedule for implementation.

If the Contractor requires more than 96 hours to perform the corrective work from the date on the Form 105, the Contractor shall submit a request for deferment. The deferment request shall be in writing and shall include the specific failure, temporary measures until final correction is made, the methodology which will be employed to make the correction and interim milestones to completing the work. The Region Water Pollution Control Manager (RWPCM), Engineer, the SWMP Administrator and the Contractor shall concur on this deferral and set a proposed date of completion. If approved, the Contractor shall complete the corrective measures by Midnight of the proposed completion date. If corrective work is not corrected by the completion date the Engineer will issue a Stop Work Order. Liquidated Damages will apply retroactively back to the 48 hours after the 105 date of notification. Liquidated Damages will assessed until the corrective work has been completed and accepted. Deferment of work to correct failures to perform erosion control will not affect the Contractor’s other contractual responsibilities, notifications for other non-compliance, nor the final completion date of the project. Liquidated Damages for other non-compliance notifications will continue to apply during the deferment period in addition to liquidated damages associated with the deferment.

Based on the submittal date of the approved deferment Liquated Damages and a Stop Work Order may not be mandated to the Contractor.

Disagreements regarding the suggested corrective action for a BMP compliance issue between the Project Engineer, SWMP Administrator, and Superintendent, shall be discussed with the Resident Engineer and Region Water Pollution Control Manager. If after the discussions, the Project Engineer and the Contractor are still in
disagreement and feel that additional compensation is owed, the Contractor will follow the decision of the Project Engineer, keep track of the costs and negotiate further with the Project Engineer. If after pursuing the issue, the Contractor is unable to reach agreement with the Project Engineer, then the Contractor can follow the dispute process outlined in subsection 105.22.

If the Contractor’s corrective action plan and schedule are not submitted and approved within 96 hours of the initial notice, the Engineer will issue a Stop Work Order and have an on-site meeting with the Superintendent, SWMP Administrator, and the Superintendent’s supervisor. This meeting will also be attended by the Resident Engineer, the Region Water Pollution Control Manager, and the Region Program Engineer. This meeting will identify and document needed corrective actions and a schedule for completion. If after the meeting, the unacceptable work is not remedied within the schedule as agreed to in the meeting, the Engineer will take action to effect compliance with the CDPS-SCP and these specifications by utilizing CDOT Maintenance personnel or other non-Contractor forces and deduct the cost from any moneys due or to become due to the Contractor pursuant to subsection 105.17. Delays due to these Stop Work Orders shall be considered non-excusable. The Stop Work Order shall be in place until the project is in CDPS-SCP compliance.

If the Contractor remains non-responsive to requirements of the on-site meeting, the Engineer will start default or Contract termination procedures in accordance with subsections 108.09 and 108.10. CDOT will proceed with corrective or disciplinary action in accordance with the Rules for Prequalification, Debarment, Bidding and Work on Transportation, Road, Highway and Bridge Public Projects.

When a failure meets any of the following conditions, the Engineer will immediately issue a Stop Work Order in accordance with subsection 105.01 irrespective of any other available remedy:

1. It may endanger health or the environment.
2. It consists of a spill or discharge of hazardous substances or oil which may cause pollution of the waters of the state.
3. It consists of a discharge which may cause a violation of a water quality standards.

208.10 Items to Be Completed Prior to Requesting Partial Acceptance of Water Quality Work.

(a) Reclamation of Washout Areas. After concrete operations are complete, washout areas shall be reclaimed in accordance with subsection 208.05(n) at the Contractor’s expense.

(b) Survey. When Permanent Water Quality BMPs (Permanent BMP) are required on the project, the Contractor shall survey the BMPs to confirm that they conform to the configuration and grade shown on the Plans. The survey shall conform to Section 625. The results of the survey shall be submitted as Microstation or AutoCad drawing files and PDF files, showing both designed and final elevations and configurations. Paper versions of the drawings shall be submitted with the stamp and seal of the Contractor’s Surveyor.

The Engineer and the CDOT Hydraulics Engineer for the region will perform a walkthrough of the Permanent BMPs to confirm conformance to material requirements, locations and dimensions of the Permanent BMPs. Permanent BMPs not meeting the Contract requirements will be identified in writing by the Engineer, and shall be repaired or replaced at the Contractor’s expense. Correction surveys shall be performed at the Contractor’s expense to confirm the locations and dimensions of each Permanent BMP. Final as-built plans of the Permanent BMPs shall be provided to the Engineer and the CDOT Region and Headquarter Permanent Water Quality Control Specialist for their records.

(c) Locations of Temporary BMPs. The Engineer will identify locations where modification, cleaning or removal of temporary BMPs are required, and will provide these in writing to the Contractor. Upon completion of work required, the SWMP Administrator shall modify the SWMP to provide an accurate depiction of BMPS to remain on the project site.
METHOD OF MEASUREMENT

208.11 Erosion Control Management will be measured as the actual number of days of ECM work performed onsite, regardless of the number of ECIs required, including erosion control inspections, documentation, meeting participation, SWMP Administration, and the preparation of the SWMP notebook.

Erosion bales will be measured by the actual number installed and accepted.

Silt fence, silt berms, erosion logs, aggregate bags, silt dikes, temporary berms, rock check dams, temporary diversions, and temporary slope drains, will be measured by the actual number of linear feet that are installed and accepted. Measured length will not include required overlap.

Concrete washout structure will be measured by the actual number of structures that are installed and accepted.

Storm drain inlet protection will be measured by linear foot or actual number of devices that are installed and accepted.

Sediment trap quantities will be measured by the actual number installed and accepted.

Removal of trash that is not generated by construction activities will be measured by the actual number of hours that Contractor workers actively remove trash from the project. Each week the Contractor shall submit to the Engineer a list of workers and the hours spent collecting such trash.

Removal of accumulated sediment from traps, basins, areas adjacent to silt fences and erosion bales, and other clean out excavation of accumulated sediment, and the disposal of such sediment, will be measured by the number of hours that equipment, labor, or both are used for sediment removal.

Vehicle tracking pads will be measured by the actual number constructed and accepted.

Additional aggregate required for maintaining vehicle tracking pads will be measured as the actual number of cubic yards installed and accepted.

BASIS OF PAYMENT

208.12 ECM and BMPs will be paid for at the Contract unit price for each of the items listed below that appear in the bid schedule.

Payment will be made under:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate Bag</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>Concrete Washout Structure</td>
<td>Each</td>
</tr>
<tr>
<td>Erosion Bales (Weed Free)</td>
<td>Each</td>
</tr>
<tr>
<td>Erosion Control Management</td>
<td>Day</td>
</tr>
<tr>
<td>Erosion Log (Type 1) (____ Inch)</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>Erosion Log (Type 2) (______Inch)</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>Pre-Fabricated Concrete Washout Structure</td>
<td>Each</td>
</tr>
<tr>
<td>Pre-Fabricated Vehicle Tracking Pad</td>
<td>Each</td>
</tr>
<tr>
<td>Maintenance Aggregate (Vehicle Tracking Pad)</td>
<td>Cubic Yard</td>
</tr>
<tr>
<td>Removal and Disposal of Sediment (Equipment)</td>
<td>Hour</td>
</tr>
<tr>
<td>Removal and Disposal of Sediment (Labor)</td>
<td>Hour</td>
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<tr>
<td>Removal of Trash</td>
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<td>Rock Check Dam</td>
<td>Each</td>
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<tr>
<td>Sediment Basin</td>
<td>Each</td>
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<tr>
<td>Sediment Trap</td>
<td>Each</td>
</tr>
<tr>
<td>Silt Berm</td>
<td>Linear Foot</td>
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<tr>
<td>Silt Dike</td>
<td>Linear Foot</td>
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<tr>
<td>Silt Fence</td>
<td>Linear Foot</td>
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</tbody>
</table>
Payment for Erosion Control Management (ECM) will be full compensation for all labor, materials and equipment necessary for the SWMP Administrator and Erosion Control Inspectors to perform all the work described in this specification. This includes assembling items 5-19 and required updates to the SWMP Notebook on site.

The SWMP Administrator and ECI’s commute times will not be measured and paid for separately, but shall be included in the work.

Modifications to the SWMP Notebook due to construction errors or survey errors by the contractor shall be at the Contractor’s expense.

Temporary erosion control will be measured and paid for by the BMPs used. Surface roughening and vertical tracking will not be measured and paid for separately but shall be included in the work. Payment for each BMP item will be full compensation for all work and materials required to furnish, install, maintain and remove the BMP when directed.

Payment for Removal and Disposal of Sediment (Equipment) will be full compensation for use of the equipment, including the operator. Payment for Removal and Disposal of Sediment (Labor) will be full compensation for use of the labor.

Payment for concrete washout structure, whether constructed or prefabricated, will be full compensation for all work and materials required to install, maintain, and remove the item. Maintenance and relocation, as required, of these structures throughout the duration of the project will not be measured and paid for separately, but shall be included in the work.

Silt berm spikes will not be measured and paid for separately, but shall be included in the work. When required, soil retention blankets will be measured and paid for in accordance with Section 216. Silt dike staples will not be measured and paid for separately, but shall be included in the work.

Spray–on mulch blankets required by the Contract, including those used in both interim and final stabilization, will be measured and paid for in accordance with Section 213.

Payment for storm drain inlet protection will be full compensation for all work, materials, and equipment required to complete the item, including surface preparation, maintenance throughout the project, and removal upon completion of the work. Aggregate will not be measured and paid for separately, but shall be included in the work.

Sweeping, when used as a BMP as shown in the Contract, will be measured by the number of hours that a pickup broom or equipment capable of collecting sediment, authorized by the Engineer, is used to remove sediment from the roadway or other paved surfaces. Each week the Contractor shall submit to the Engineer a statement detailing the type of sweeping equipment used and the number of hours it was used to pick up sediment. Operator will not be measured and paid for separately, but shall be included in the work.
Stakes, anchors, connections, geotextile, riprap and tie downs used for temporary slope drains will not be measured and paid for separately, but shall be included in the work.

Payment for vehicle tracking pad will be full compensation for all work, materials and equipment required to construct, maintain, and remove the entrance upon completion of the work. Aggregate and geotextile will not be measured and paid for separately, but shall be included in the work. If additional aggregate for maintenance of vehicle tracking pads is required, it will be measured by the cubic yard in accordance with Section 304 and will be paid for under this Section.

Seeding, sod, mulching, soil retention blanket, and riprap will be measured and paid for in accordance with Sections 212, 213, 216, and 506.

Geotextile (Erosion Control) (Class 2) will be measured and paid for in accordance with Section 420.

All work and materials required to perform the permanent BMP survey and furnish the electronic files shall be included in the original unit price bid for surveying. Surveying will be measured and paid for in accordance with Section 625.

Payment will be made for BMPs replaced as approved by the Engineer. Temporary erosion and sediment BMPs required due to the Contractor’s negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled or ordered by the Engineer or for the Contractor’s convenience, shall be performed at the Contractor’s expense. If the Contractor fails to complete construction within the contract time, payment will not be made for Section 208 pay items for the period of time after expiration of the contract time. These items shall be provided at the Contractor’s expense.
Section 212 of the Standard Specifications is hereby revised for this project as follows:

In subsection 212.02 (a), delete the first paragraph and replace with the following:

(a) **Seed.** All seed shall be furnished in bags or containers clearly labeled to show the name and address of the supplier, the seed name, the lot number, net weight, origin, the percent of weed seed content, the guaranteed percentage of purity and germination, pounds of pure live seed (PLS) of each seed species, and the total pounds of PLS in the container. All seeds shall be free from noxious weed seeds in accordance with current state and local lists and as indicated in Section 213. The Contractor shall furnish to the Engineer a signed statement certifying that the seed is from a lot that has been tested by a recognized laboratory for seed testing within thirteen months prior to the date of seeding. The Engineer may obtain seed samples from the seed equipment, furnished bags or containers to test seed for species identification, purity and germination. Seed tested and found to be less than 10 percent of the labeled certified PLS and different than the specified species will not be accepted. Seed which has become wet, moldy, or damaged in transit or in storage will not be accepted.
REVISION OF SECTION 213
MULCHING

Section 213 of the Standard Specifications is hereby revised for this project as follows:

In subsection 213.01, delete the last paragraph and replace with the following:

This work includes furnishing and applying spray-on mulch blanket or bonded fiber matrix on top of rock cuts and slopes after seeding or as temporary stabilization as shown on the plans or as directed by the Engineer.

In subsection 213.02, delete the eighth paragraph and replace with the following:

The hydromulch material for hydraulic mulching shall consist of virgin wood fibers manufactured expressly from clean whole wood chips. The chips shall be processed in such a manner as to contain no growth or germination inhibiting factors. Fiber shall not be produced from recycled materials such as sawdust, paper, cardboard, or residue from pulp and paper plants. The wood cellulose fibers of the mulch must maintain uniform suspension in water under agitation. Upon application, the mulch material shall form a blotter like mat covering the ground. This mat shall have the characteristics of moisture absorption and percolation and shall cover and hold seed in contact with the soil. The Contractor shall obtain certifications from suppliers that laboratory and field testing of their product has been accomplished, and that it meets all of the foregoing requirements pertaining to wood cellulose fiber mulch.

In subsection 213.02, delete the eleventh paragraph and replace with the following:

Material for mulch tackifier shall consist of a free-flowing, noncorrosive powder produced either from the natural plant gum of Plantago Insularis (Desert Indianwheat) or pre-gelatinized 100 percent natural corn starch polymer. The powders shall possess the following properties:

**Plantago Insularis (Desert Indianwheat):**

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) pH 1% solution</td>
<td>6.5 - 8.0</td>
<td></td>
</tr>
<tr>
<td>(2) Mucilage content</td>
<td>75% min.</td>
<td>ASTM D7047</td>
</tr>
</tbody>
</table>

Pre-gelatinized 100 percent natural corn starch polymer:

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Organic Nitrogen as protein</td>
<td>5.5-7%</td>
</tr>
<tr>
<td>(2) Ash content</td>
<td>0-2%</td>
</tr>
<tr>
<td>(3) Fiber</td>
<td>4-5%</td>
</tr>
<tr>
<td>(4) pH 1% solution</td>
<td>6.5 – 8.0</td>
</tr>
<tr>
<td>(5) Size</td>
<td>100% thru 850 microns (20 mesh)</td>
</tr>
<tr>
<td>(6) Settleable solids</td>
<td>&lt;2%</td>
</tr>
</tbody>
</table>

All fibers shall be colored green or yellow with a biodegradable dye.

Delete the last paragraph in subsection 213.02 and replace with the following:

(a) **Spray-on Mulch Blanket.** Spray on mulch blanket shall be one of the following, unless otherwise shown on the plans:

1. Spray-on Mulch Blanket (Type 1) shall be a hydraulically applied matrix containing organic fibers, water soluble cross-linked tackifier, reinforcing natural and/or synthetic interlocking fibers. Mulch Blanket (Type 1) shall conform to the following:
REVISION OF SECTION 213
MULCHING

<table>
<thead>
<tr>
<th>Properties</th>
<th>Requirement</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic Fibers</td>
<td>71% Min.</td>
<td>ASTM D 2974</td>
</tr>
<tr>
<td>Cross linked Tackifiers</td>
<td>10% +/- 2% Min.</td>
<td></td>
</tr>
<tr>
<td>Reinforcing Interlocking Fibers</td>
<td>10% +/- 1% Min.</td>
<td></td>
</tr>
<tr>
<td>Biodegradability</td>
<td>100%</td>
<td>ASTM D 5338</td>
</tr>
<tr>
<td>Ground Cover @ Application Rate</td>
<td>90% Min.</td>
<td>ASTM D 6567</td>
</tr>
<tr>
<td>Functional Longevity</td>
<td>12 Months Min.</td>
<td></td>
</tr>
<tr>
<td>Cure Time</td>
<td>&lt; 8 hours</td>
<td></td>
</tr>
</tbody>
</table>

**Application**

Application Rate 3,000 lb./acre

The organic fiber shall not contain lead paint, printing ink, varnish, petroleum products, seed germination inhibitors, or chlorine bleach. The organic fibers and reinforcing interlocking fibers cannot be produced from sawdust, cardboard, paper, or paper by-products.

(2) Spray-on Mulch Blanket (Type 2) shall be a hydraulically applied matrix pre-packaged in 50 pound bags containing both a soil and fiber stabilizing compound and thermally processed wood fiber.

The sterilized weed-free wood fiber mulch shall be manufactured through a thermo-mechanical defibrating process containing a specific range of fiber lengths averaging 0.25 inches or longer.

Mulch Blanket (Type 2) shall meet the following requirements:

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiber Retention On 28-Mesh Screen</td>
<td>≥ 40%</td>
<td>Tyler Ro-Tap Method</td>
</tr>
<tr>
<td>Moisture Content</td>
<td>12% ± 2%</td>
<td>Total Air Dry Weight Basis</td>
</tr>
<tr>
<td>Organic Matter</td>
<td>99.2% ± 0.2%</td>
<td>Oven Dry Weight Basis</td>
</tr>
<tr>
<td>Ash Content</td>
<td>0.8% ± 0.2%</td>
<td>Oven Dry Weight Basis</td>
</tr>
<tr>
<td>pH At 3% Consistency In Water</td>
<td>4.5-7.0 ± 0.5%</td>
<td></td>
</tr>
<tr>
<td>Sterilized Weed-Free</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Non-Toxic To Plant Or Animal Life</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

The soil and fiber stabilizing compound shall be composed of linear anionic copolymers of acrylamide pre-packed within the bag having a minimum content of 1.0 percent. The compound shall conform to the following:

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular Weight</td>
<td>≥ 12x106</td>
</tr>
<tr>
<td>Charge Density</td>
<td>&gt; 25%</td>
</tr>
<tr>
<td>Non-Toxic To Plant Or Animal Life</td>
<td>Yes</td>
</tr>
</tbody>
</table>

(b) Bonded Fiber Matrices (BFM). BFM shall consist of hydraulically-applied matrix with a minimum of 70 percent non-toxic thermally processed or refined long strand organic fibers and water soluble tackifier to provide erosion control and designed to be functional for a minimum of 9 months. BFMs form an erosion-resistant
REVISION OF SECTION 213
MULCHING

blanket that promotes vegetation and prevents soil erosion. The BFM shall be 100 percent biodegradable. The binder in the BFM should also be biodegradable. Biodegradable BFMs should not be applied immediately before, during, or immediately after rainfall if the soil is saturated. BFM shall conform to the following requirements:

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Cover (%)</td>
<td>95</td>
<td>ASTM 6567</td>
</tr>
<tr>
<td>Bio-degradability (%)</td>
<td>100</td>
<td>ASTM 5338</td>
</tr>
<tr>
<td>Functional Longevity (months)</td>
<td>9 month minimum</td>
<td></td>
</tr>
<tr>
<td>Cure Time (hours)</td>
<td>24-48</td>
<td></td>
</tr>
<tr>
<td>Cross-linked tackifier</td>
<td>10% minimum</td>
<td></td>
</tr>
</tbody>
</table>

Application

| Application Rate (lbs./Acre)    | 3000              |

The fibers shall not contain lead paint, printing ink, varnish, petroleum products, seed germination inhibitors, or chlorine bleach. Fiber shall not be produced from sawdust, cardboard, paper, or paper by-products.

In subsection 213.03 (b) 2, delete the second paragraph and replace with the following:

Application Rate: Apply this as an overspray at the following rate or as approved by the Engineer.

<table>
<thead>
<tr>
<th>Powder</th>
<th>Fiber</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 lbs./Acre</td>
<td>300 lbs./Acre</td>
<td>2000 gal./Acre</td>
</tr>
</tbody>
</table>

In subsection 213.03, delete (f) and replace with the following:

(f) Spray-on Mulch Blanket. Spray-on Mulch Blanket shall strictly comply with the Manufacturer’s mixing recommendations and installation instructions. No chemical additives with the exception of fertilizer, soil pH modifiers, extended-term dyes and bio nutrients will be permitted. Apply Spray-on mulch blanket in a uniform application using a minimum 22 degree arc type nozzle. Apply hydro slurry in two direction (from top of slope down and from toe of the slope up, as well as, be applied at a minimum of two layers).

Hydromulching vessel shall be filled with water to at least 1/3 capacity (high enough to cover agitators) prior to adding any material. Continue to fill vessel with water and slowly add the fibers while agitators are in motion. Run agitators at ¾ speed. Continue to mix tank a minimum of 10 minutes prior to application.

Co-polymer shall not be used in channels, swales, or other areas where concentrated flows are anticipated and should not be used on saturated soils that have groundwater seeps.

Subsection 213.03 shall include the following:

(g) Bonded Fiber Matrices (BFM). Bonded fiber matrices shall strictly comply with the Manufacturer’s mixing recommendations and installation instructions. No chemical additives with the exception of fertilizer, soil pH modifiers, extended-term dyes and bio stimulant materials shall be permitted. BFM shall be applied in a uniform application using a minimum 22 degree arc type nozzle. Apply BFM in two direction (from top of slope down and from toe of the slope up, as well as, be applied at a minimum of two layers).

Biodegradable BFMs should not be applied immediately before, during, or immediately after rainfall if the soil is saturated.
Product shall not be used use in channels, swales, or other areas where concentrated flows are anticipated and should not be used on saturated soils that have groundwater seeps.

Foot traffic, mechanical traffic or grazing shall not be permitted on treated areas until vegetated. Treated areas damaged due to circumstances beyond Contractor’s control shall be repaired or re-applied as ordered. Payment for corrective work, when ordered, shall be at contract rates.

In subsection 213.04, delete the first paragraph and replace with the following:

The quantity of hay and straw mulch, wood chip mulch, wood fiber and, spray-on mulch tackifier, bonded fiber matrix and tackifier will not be measured but shall be the quantity designated in the Contract, except that measurements will be made for revisions requested by the Engineer, or for discrepancies of plus or minus five percent of the total quantity designated in the Contract. Measurement for acres will be by slope distances.

In subsection 213.04, delete the fourth paragraph and replace with the following:

Spray-on Mulch Blanket and Bonded Fiber Matrix will be measured by the acre or by the actual pounds of product applied, as shown on the plans. The area will be calculated on the basis of actual or computed slope measurements. The Contractor shall verify prior to application, weight of spray on mulch blanket and bonded fiber matrix bags for certification of materials and application rate.

Subsection 213.05 shall include the following:

Payment will be made under:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonded Fiber Matrix</td>
<td>Acre</td>
</tr>
<tr>
<td>Bonded Fiber Matrix</td>
<td>Pound</td>
</tr>
<tr>
<td>Spray on Mulch Blanket</td>
<td>Pound</td>
</tr>
</tbody>
</table>

Payment for spray-on mulch blanket and bonded fiber matrix will be full compensation for all work and materials necessary to complete this item.
Section 216 of the Standard Specifications is hereby deleted for this project and replaced with the following:

**DESCRIPTION**

216.01 This work consists of furnishing, preparing, applying, placing, and securing soil retention blankets and turf reinforcement mats for erosion control on roadway slopes or channels as designated in the Contract.

**MATERIALS**

216.02 Soil retention covering shall be either a soil retention blanket or a turf reinforcement mat as specified in the Contract. It shall be one of the products listed on CDOT's Approved Products List and shall conform to the following:

(a) *Soil Retention Blanket*. Soil retention blanket shall be composed of degradable natural fibers mechanically bound together between two slowly degrading synthetic or natural fiber nettings to form a continuous matrix and shall conform to the requirements of Tables 216-1 and 216-2. The blanket shall be of consistent thickness with the fiber evenly distributed over the entire area of the mat.

When specified lightweight polypropylene netting shall be 1.5 pounds per 1000 square feet; heavyweight netting shall be 2.9 pounds per 1000 square feet.

When biodegradable blanket is specified, the thread shall be 100 percent biodegradable; polypropylene thread is not allowed.

When photodegradable netting is specified the thread shall be polyester, biodegradable or photodegradable.

Blankets and nettings shall be non-toxic to vegetation and shall not inhibit germination of native seed mix as specified in the Contract. The materials shall not be toxic or injurious to humans. Class 1 blanket shall be an extended term blanket with a typical 24 month functional longevity. Class 2 blanket shall be a long term blanket with a typical 36 month functional longevity. The class of blanket is defined by the physical and performance characteristics.

1. *Soil Retention Blanket (Straw-Coconut)*. Soil Retention Blanket (Straw-Coconut) shall be a machine produced mat consisting of 70 percent certified weed free agricultural straw or Colorado native grass straw and 30 percent coconut fiber. The blanket shall be either biodegradable or photodegradable. Blankets shall be sewn together on a maximum 2 inch centers.

   Netting shall be as follows:

   When biodegradable netting is specified, the top and bottom netting shall be 100 percent biodegradable organic jute fiber. Netting shall be constructed using a weave unattached at intersections which allows the strands of the net to move independently of each other.

   When photodegradable netting is specified, the bottom side shall be lightweight polypropylene. The top side shall be heavyweight or lightweight polypropylene.

2. *Soil Retention Blanket (Excelsior)*. Soil Retention Blanket (Excelsior) blanket shall consist of a machine produced mat of 100 percent curled wood excelsior, 80 percent of which shall be 6 inches or longer in fiber length. It shall be either biodegradable or photodegradable. Blankets shall be sewn together at a maximum of 4 inch centers.

   Netting shall be as follows:

   When biodegradable netting is specified, the top and bottom netting shall be 100 percent biodegradable organic jute fiber. Netting shall be constructed using a weave unattached at intersections which allows the strands of the net to move independently of each other.

   When photodegradable netting is specified, the bottom side shall be lightweight polypropylene. The top side shall be heavyweight or lightweight polypropylene.

3. *Soil Retention Blanket (Coconut)*. Soil Retention Blanket (Coconut) shall be a machine produced mat consisting of 100 percent coconut fiber. It shall be either biodegradable or photodegradable.
REVISION OF SECTION 216
SOIL RETENTION COVERING

Netting shall be as follows:

When biodegradable netting is specified, the top and bottom netting shall be 100 percent biodegradable organic jute fiber. Netting shall be constructed using a weave which is unattached at the intersections, and which allows the strands of the net to move independently of each other.

When photodegradable netting is specified, the bottom and top side shall be heavyweight polypropylene.

Table 216-1
PHYSICAL REQUIREMENTS FOR SOIL RETENTION BLANKET – PHOTODEGRADABLE OR BIODEGRADABLE BLANKETS

<table>
<thead>
<tr>
<th>Photo/Bio Degradable Class</th>
<th>Minimum Roll Width</th>
<th>Minimum Thickness ASTM D 6525</th>
<th>Acceptable Matrix Fill Material</th>
<th>Min. Mass per Unit Area ASTM D 6475</th>
<th>Size of Net Opening</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>6.5 ft.</td>
<td>250 mils</td>
<td>Straw/Coconut</td>
<td>8 oz/sy</td>
<td>Minimum: 0.50&quot;x0.50&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Maximum: 0.75&quot;x0.75&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Minimum: 0.50&quot;x0.50&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Maximum: 1.0&quot;x2.0&quot;</td>
</tr>
<tr>
<td>2</td>
<td>6.5 ft.</td>
<td>200 mils</td>
<td>Coconut</td>
<td>8 oz/sy</td>
<td>Minimum: 0.50&quot;x0.50&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Maximum: 0.75&quot;x0.75&quot;</td>
</tr>
</tbody>
</table>

Table 216-2
PERFORMANCE REQUIREMENTS FOR SOIL RETENTION BLANKET – PHOTODEGRADABLE OR BIODEGRADABLE BLANKETS

<table>
<thead>
<tr>
<th>Photo/Bio Degradable Class</th>
<th>Slope Application “C” Factor¹ ASTM D 6459</th>
<th>Minimum Tensile Strength MD² ASTM D 6818</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>&lt; 0.10@3:1</td>
<td>8.33 lb/in</td>
</tr>
<tr>
<td>2</td>
<td>&lt; 0.10@3:1</td>
<td>10.42 lb/in</td>
</tr>
</tbody>
</table>

Notes:
¹ "C" Factor calculated as ratio of soil loss from soil retention blanket protected slope (tested at specified or greater gradient, 3H:1V) to ratio of soil loss from unprotected (control) plot in large-scale testing.
² MD is for machine direction testing (along the length of the roll).

Blankets shall be tested for physical properties and have published data from an independent testing facility.

Large scale testing of Slope Erosion Protection ("C" factor) shall be performed by an independent testing facility.
(b) **Turf Reinforcement Mat.** Turf reinforcement mat (TRM) shall be a rolled mat consisting of UV stabilized, corrosion resistant, non-degradable synthetic fibers, filaments, or nets processed into a permanent three-dimensional matrix of the thickness specified in Tables 216-3 and 216-4. TRMs shall provide sufficient thickness, strength and void space to permit soil filling and retention, and the development of vegetation within the matrix. The class of TRM is defined by the physical and performance characteristics as specified in the following tables.

### Table 216-3
**PHYSICAL REQUIREMENTS\(^1\) FOR TURF REINFORCEMENT MAT**

<table>
<thead>
<tr>
<th>Product Class</th>
<th>Minimum Roll Width</th>
<th>Minimum Thickness ASTM D 6525</th>
<th>Acceptable Matrix Fill Material(^2)</th>
<th>Size of Net Opening(^2)</th>
</tr>
</thead>
</table>
| 1             | 6.5 ft.           | 250 mils                    | Excelsior, Straw/Coconut, Coconut, or Polymer fibers | Minimum: 0.50"x0.50"
                              |                        |                             | Maximum: 0.75"x0.75"            |
| 2             | 6.5 ft.           | 250 mils                    | 100% UV Stabilized Synthetic or Coconut Fibers | Maximum 0.50"x 0.50"          |
| 3             | 6.5 ft.           | 250 mils                    | 100% UV Stabilized Synthetic Fibers | Maximum 0.50"x 0.50"          |

**Notes:**
1. For TRMs containing degradable components, all property values shall be obtained on the non-degradable portion of the matting alone.
2. For TRMs with nets and fill material. Netted TRMs shall be sewn together on a maximum 2 inch centers.

### Table 216-4
**PERFORMANCE REQUIREMENTS FOR TURF REINFORCEMENT MAT**

<table>
<thead>
<tr>
<th>Product Class</th>
<th>Tensile Strength MD ASTM D 6818</th>
<th>Minimum UV Stability @ 500 Hours ASTM D 4355</th>
<th>Minimum Permissible Shear Stress(^1) (Unvegetated) ASTM D 6460</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>125 lbs/ft</td>
<td>80%</td>
<td>1.8 lbs/sf</td>
</tr>
<tr>
<td>2</td>
<td>150 lbs/ft</td>
<td>80%</td>
<td>2.5 lbs/sf</td>
</tr>
<tr>
<td>3</td>
<td>175 lbs/ft</td>
<td>80%</td>
<td>3.1 lbs/sf</td>
</tr>
</tbody>
</table>

**Notes:**
1. Permissible shear stress is the minimum shear stress that a product must be able to sustain when placed on a channel un-vegetated without physical damage or excess soil loss. Failure is defined as ½ inch of soil loss during a 30 minute flow event in large scale testing.

TRMs shall be tested for physical properties and have published data from an independent testing facility. Large scale testing of Permissible Shear Stress will be performed by an independent testing facility.

(c) **Staples.** Staples shall be made of ductile steel wire, 0.165 inches in diameter, 8 inches long and have a 1 inch crown. “T” shaped staples will not be permitted.

A sample of the staples and a Certificate of Compliance (COC) including the manufacturer’s product data showing that the product meets the Contract requirements shall be submitted for approval at the
environmental preconstruction conference. Installation of the blanket will not begin until approval has been received from the Engineer in writing.

(d) *Earth Anchors.* The mechanical earth anchor shall be composed of a load bearing face plate, a tendon rod or wire rope, and a locking head or percussion anchor. Each element of the anchor shall be composed of corrosion resistant materials. The anchor and wire rope shall have a breaking strength of 9,500 pounds utilizing standard tensile testing and ASTM A1007 - 07. The anchor shall have a minimum 1,000 pounds ultimate holding strength in normal soil and a manufacturer's recommended minimum driven depth of 3.5 feet.

A sample of the anchors and a Certificate of Compliance (COC) including the manufacturer's product data showing that the product meets the Contract requirements shall be submitted for approval at the environmental preconstruction conference. Installation of the blanket will not begin until approval has been received from the Engineer in writing.

**CONSTRUCTION REQUIREMENTS**

216.03 The Contractor shall install soil retention coverings in accordance with Standard Plan M-216-1 and the following procedure:

(1) Prepare soil in accordance with subsection 212.06 (a).

(2) Apply topsoil or soil conditioning as directed in the Contract to prepare seed bed.

(3) Place seed in accordance with the Contract.

(4) Unroll the covering parallel to the primary direction of flow.

(5) Ensure that the covering maintains direct contact with the soil surface over the entirety of the installation area.

(6) Do not stretch the material or allow it to bridge over surface inconsistencies.

(7) Staple the covering to the soil such that each staple is flush with the underlying soil.

(8) Ensure that staples or earth anchors are installed full depth to resist pull out. No bent over staples will be allowed. Install anchor trenches, seams, and terminal ends as shown on the plans.

The Contractor shall install TRMs using the following procedure:

(1) Place 3 inches of topsoil or soil amended with soil conditioning.

(2) Apply half of the specified seed at the broadcast rate and rake into soil.

(3) Install TRM

(4) Place 1 inch of topsoil or soil amended with soil conditioning into the matrix to fill the product thickness.

(5) Apply the remaining half of the specified seed at the broadcast rate and rake into soil.

(6) Install soil retention blanket (Photodegradable or Biodegradable Class 1) over the seeded area and TRM.

When applicable, the covering shall be unrolled with the heavyweight polypropylene netting on top and the lightweight polypropylene netting shall be in contact with the soil.

216.04 *Slope Application.* Soil retention coverings shall be installed on slopes as follows:

The upslope end shall be buried in a trench 3 feet beyond the crest of the slope if possible. Trench depth shall be a minimum of 6 inches unless required by the manufacture to be deeper. Before backfilling begins, staples shall be placed across the width of the trench. The trench shall then be backfilled to grade with soil amended with soil conditioning or topsoil, compacted by foot tamping, and seeded. Fabric shall be brought back over trench and secured with staples or earth anchors at 1 foot on center.

There shall be an overlap wherever one roll of fabric ends and another begins with the uphill covering placed on top of the downhill covering. Staples shall be installed in the overlap.

There shall be an overlap wherever two widths of covering are applied side by side. Staples shall be installed in the overlap.

Staple checks shall be installed on the slope length at a maximum of every 35 feet. Each staple check shall consist of two rows of staggered staples.
REVISION OF SECTION 216
SOIL RETENTION COVERING

The down slope end shall be buried in a trench 3 feet beyond the toe of slope. Before backfilling begins, staples shall be placed across the width of the trench. The trench shall then be backfilled to grade with soil amended with soil conditioning or topsoil, compacted by foot tamping, and seeded. Fabric shall be brought back over trench and secured with staples or earth anchors. If a slope runs into State waters or cannot be extended 3 feet beyond the toe of slope, the end of covering shall be secured using a staple check as described above.

Coverings shall be securely fastened to the soil by installing staples or earth anchors at the minimum rate shown on the Standard Plan M-216-1. Staple or earth anchor spacing shall be reduced where required due to soil type or steepness of slope.

216.05 Channel Application. Soil retention coverings shall be installed as follows on a channel application:

Coverings shall be anchored at the beginning and end of the channel across its entire width by burying the end in a trench. Trench depth shall be a minimum of 6 inches, unless a larger depth is specified by the manufacturer recommendations. Before backfilling begins, staples shall be placed across the width of the trench. The trench shall then be backfilled to grade with soil amended with soil conditioning or topsoil and compacted by foot tamping, and seeded. Fabric shall be brought back over the trench and stapled.

Covering shall be unrolled in the direction of flow and placed in the bottom of the channel first. Seams shall not be placed down the center of the channel bottom or in areas of concentrated flows when placing rolls side by side.

There shall be an overlap wherever one roll of covering ends and another begins with the upstream covering placed on top of the downstream covering. Two rows of staggered staples shall be placed.

There shall be an overlap wherever two widths of covering are applied side by side. Staples shall be placed in the overlap.

The covering shall have a channel check slot every 30 feet along the gradient of the flowline. Check slots shall extend the entire width of the channel. The covering shall be buried in a trench. Before backfilling begins, staples shall be placed across the width of the trench. The trench shall then be backfilled to grade with soil amended with soil conditioning or topsoil, compacted by foot tamping, and seeded. Fabric shall be brought back over trench and continued down the channel.

Coverings shall be securely fastened to the soil by installing staples at the minimum rate shown on the plans. Staple spacing shall be reduced where needed due to soil type or high flows.

216.06 Maintenance. The Contractor shall maintain the soil retention coverings until all work on the Contract has been completed and accepted. Maintenance shall consist of the repair of areas where damage is due to the Contractor’s operations. Maintenance shall be performed at the Contractor’s expense. Repair of those areas damaged by causes not attributable to the Contractor’s operations shall be repaired by the Contractor and will be paid for at the contract unit price. Areas shall be repaired to reestablish the condition and grade of the soil and seeding prior to application of the covering.

METHOD OF MEASUREMENT

216.07 Soil retention coverings, including staples, complete in place and accepted, will be measured by the square yard of finished surface, excluding overlap, which is installed and accepted. Earth Anchors will be measured by the actual number of earth anchors complete in place and accepted.
BASIS OF PAYMENT

216.08 The accepted quantities of soil retention coverings will be paid for at the contract unit price per square yard. The accepted quantities of earth anchors will be paid for at the contract unit price per each installed.

Payment will be made under:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Retention Blanket (_)(Photodegradable Class _)</td>
<td>Square Yard</td>
</tr>
<tr>
<td>Soil Retention Blanket (_)(Biodegradable Class _)</td>
<td>Square Yard</td>
</tr>
<tr>
<td>Turf Reinforcement Mat (Class _)</td>
<td>Square Yard</td>
</tr>
<tr>
<td>Earth Anchors</td>
<td>Each</td>
</tr>
</tbody>
</table>

Preparation of seedbed, fertilizing, and seeding will be measured and paid for in accordance with Section 212.

Placing and preparation of seedbed, fertilizing, and seeding of soil under the TRM layer will be measured and paid for in accordance with Section 212.

Topsoil or amended soil and seed placed on the TRM will be measured and paid for in accordance with Sections 207 and 212.

Staples will not be measured and paid for separately, but shall be included in the work.
Section 250 of the Standard Specifications is hereby deleted for this projected and replaced with the following:

**DESCRIPTION**

**250.01** This work consists of protection of the environment, persons, and property from contaminants that may be encountered on the Project. This includes monitoring the work for encounters with contaminants or suspected soil and groundwater contaminants; the management of solid, special, and hazardous waste; and management of visual emissions associated with hazardous waste, when encountered on the project.

**250.02** The Contractor shall furnish all personnel, materials, equipment, laboratory services and traffic control necessary to perform the contamination monitoring, testing, and site remediation when required. Traffic control shall be in accordance with the requirements of Section 630.

Monitoring equipment used to detect flammable gas, oxygen level, and toxic gas shall be capable of detection to meet the following standards:

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Threshold Limit</th>
<th>Increments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammable Gas</td>
<td>1% LEL</td>
<td>1%</td>
</tr>
<tr>
<td>Oxygen</td>
<td>19%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Toxic Gas</td>
<td>1 PPM</td>
<td>1 PPM</td>
</tr>
</tbody>
</table>

LEL = lower explosive limit  
PPM = parts per million

**CONSTRUCTION REQUIREMENTS**

**250.03 General.** Prospective bidders, including subcontractors, are required to review the environmental documents available for this project. These documents are listed in subsection 102.05 as revised for this project.

This project may be in the vicinity of property associated with petroleum products, heavy metal based paint, landfill, buried foundations, abandoned utility lines, industrial area or other sites which can yield hazardous substances or produce dangerous gases. These hazardous substances or gases can migrate within or into the construction area and could create hazardous conditions. The Contractor shall use appropriate methods to reduce and control known landfill, industrial gases, and visible emissions from asbestos encounters and hazardous substances which exist or migrate into the construction area. The Contractor shall follow CDOT’s Asbestos-Contaminated Soil Management Standard Operating Procedure, dated August 22, 2011 for proper handling of asbestos-contaminated soil, and follow all applicable Solid and Hazardous Waste Regulations for proper handling of soils encountered that contain any other substance mentioned above.

Encountering suspected contaminated material, including groundwater, old foundations, building materials, demolition debris, or utility lines that may contain asbestos or be contaminated by asbestos, is possible at some point during the construction of this project. When suspected contaminated material, including groundwater, is encountered or brought to the surface, the procedures under subsection 250.03(d) and 250.05 shall be followed.

Transportation of waste materials on public highways, streets and roadways shall be done in accordance with Title 49, Code of Federal Regulations (CFR). All labeling, manifesting, transportation, etc. of waste materials generated on this project shall be coordinated with the Engineer. All hazardous waste manifests for waste materials generated on this project shall list the Colorado Department of Transportation as the generator of the waste materials except as otherwise noted. If the Contractor contaminates the site, the Contractor shall be listed as the generator on the hazardous waste manifests, permits, and other documents for such material. If the project is not on a State Highway or frontage road, then the appropriate local governmental entity having jurisdiction over the transportation system facility shall be listed as the hazardous waste generator.

If waste materials must be handled in a permitted treatment, storage and disposal (TSD) facility, the facility shall
be designated in writing by the Engineer. If the waste materials are the result of the Contractor's actions, the Contractor shall designate the facility.

The hazardous waste transportation phase of the work involves insurance required by law and regulations. If the waste materials are determined to be hazardous, the Contractor must submit proof that the transportation company is covered by the appropriate type and amount of insurance required by laws and regulations governing the transportation of hazardous waste.

The Contractor alone bears the responsibility for determining that the work is accomplished in strict accordance with all applicable federal, state and local laws, regulations, standards, and codes governing special waste, petroleum and hazardous substance encounters and releases.

The Contract will list known or suspected areas of contamination. Health and Safety Officer, Monitoring Technician, and Health and Safety Plan shall be required when so stated in the Contract.

(a) Health and Safety Officer (HSO). The Contractor shall designate a HSO, not the project superintendent, who shall have at least two years field experience in chemical related health and safety. The HSO shall be either a certified industrial hygienist (CIH), certified hazardous materials manager (CHMM), professional engineer (PE) licensed in the State of Colorado, certified safety professional (CSP), or registered environmental manager (REM) meeting the criteria set forth in 29 CFR 1926. When asbestos is present or is suspected to be present, the HSO shall have additional training and certification in accordance with the Air Quality Control Commission Regulation No. 8 Part B. The HSO shall meet the minimum training and medical surveillance requirements established by the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA) for a supervisory Site Safety Official per 29 CFR 1962.65. The Contractor shall furnish documentation to the Engineer, at the preconstruction conference, that the above requirements have been met. 250.03.

The HSO shall be equipped with the following:

1. Communication equipment as required in subsection 250.03(d)2.A. and a vehicle.
2. Monitoring and detection equipment for flammable gas, oxygen sufficiency, toxic gas, radiological screening and other hazards. This includes, as required, a combustible gas indicator, flame ionization or photo ionization detector, oxygen meter, radiation monitor with Geiger Mueller detector and other foreseeable equipment.
3. Depth gauging equipment, sampling equipment and sampling containers.
4. Personal protective equipment (levels C and D) when required.

The HSO shall recommend and supervise those actions which will minimize the risk of hazardous substance related injury to the workers, Department personnel, the general public, property and the environment. Hazardous substance is defined in 29 CFR 1926.32. The HSO shall prepare written procedures for the monitoring of confined space entry and working in or near excavations, including but not limited to trenches and drill holes associated with this project. The HSO shall conduct or supervise all hazardous substance and solid waste related testing, sampling, monitoring and handling for this project to ensure compliance with applicable statutes and regulations, and other applicable environmental requirements under subsections 107.01 and 107.02.

The HSO shall be available for consultation and assistance with contaminated materials related testing, sampling, and field monitoring as required by the Engineer.

The HSO shall prepare and submit a bound and indexed final site report to the Engineer at the end of the project. This site report shall include a detailed summary of all contaminated materials and contaminated water that were encountered and their final disposition.

During each week the HSO is utilized, the HSO shall prepare a daily diary which shall be submitted to the Contractor and the Engineer. This diary shall be submitted at the end of the week and shall become a part of the Department's records. The diary shall contain a chronological log of activities on the project.
including: dates and times on site, equipment used and calibrations, field monitoring results, visual
observations, conversations, directives both given and received, and disposition of suspected hazardous
substances. The Engineer will review this submittal and approve the actual number of hours to be paid.

(b) Monitoring Technician (MT). The Contractor shall designate a monitoring technician to be responsible for
monitoring of hazardous substances during work on the project. The MT shall have a minimum of two years
of actual field experience in assessment and remediation of hazardous substances that may be encountered
during highway construction projects. The MT shall be experienced in the operation of monitoring devices,
identifying substances based upon experience and observation, and field sampling (for testing) of all media
that may be found on the site. Completion of the 40 hour hazardous waste and 8 hour supervisory training
required by OSHA and U.S. EPA rules and regulations which complies with the accreditation criteria under
the provisions of the proposed 29 CFR 1910.121 is required prior to beginning work. The Contractor shall
furnish documentation at the Preconstruction Conference that demonstrates these requirements have been
met.

The MT shall be equipped with the following:

1. Communication equipment as required in subsection 250.03(d)2.A. and a vehicle.
2. Monitoring and detection equipment for flammable gas, oxygen sufficiency, toxic gas, radiological
screening and other hazards. This includes, as required, a combustible gas indicator, flame ionization or
photo ionization detector, oxygen meter, radiation monitor with Geiger Mueller detector and other
foreseeable equipment.
3. Personal protective equipment (levels C and D) when required.

The MT shall be present on site and perform monitoring as required by 250.03(d) when work is being
performed in areas of suspected contamination and on a predetermined basis throughout other work on the
project.

The MT shall monitor for compliance with regulations, the project Health and Safety Plan and the Materials
Management Plan (if they exist for the project), the Contract, and the environmental documents for the
project. The MT shall immediately notify the Contractor, the Engineer and the HSO of any hazardous
condition.

During each week the MT is utilized, the MT shall prepare a daily monitoring diary which shall be submitted
to the Contractor, HSO and the Engineer. This diary shall be submitted at the end of the week and shall
become a part of the Department’s records. The diary shall contain a chronological log of activities on the
project including: dates and times on site, equipment used and calibrations, field monitoring results, visual
observations, conversations, directives both given and received, and disposition of suspected hazardous
substances. The Engineer will review this submittal and approve the actual number of hours to be paid.

(c) Health and Safety Plan (HASP). The HSO shall prepare a written HASP for the project, formatted as
shown in Appendix B, Occupational Safety and Health Guidance Manual for Hazardous Waste Site
Activities, DHHS (NIOSH) Publication Number 85-115, available from the Superintendent of Documents,
U.S. Government Printing Office. The Contractor and the HSO shall review the environmental documents
listed prior to preparation of the HASP.

Four signed copies of the HASP shall be furnished to the Engineer for acceptance. The Engineer shall have
seven calendar days to review and accept or reject the proposed HASP. Within five calendar days after
acceptance, the HSO shall distribute signed and stamped (or sealed) copies of the accepted HASP to each
emergency response agency servicing the project area, the HASP designated emergency hospital, and five
copies to the Engineer. Earth or demolition work shall not occur until after the HASP is accepted and the
HASP has been distributed. The HASP shall also be available to the Contractor’s employees, their
representatives, and officials of OSHA, EPA, Colorado Department of Public Health and Environment
(CDPHE), local government health department, Federal Highway Administration, and other appropriate
agencies and officials as may be designated by the Engineer. The Engineer will distribute the accepted
HASP to appropriate Department personnel. The HASP shall be kept current and shall be revised by the
HSO as warranted by changes in the field conditions.

All on-site workers (Contractor’s, Department’s, Utilities’, and others) shall be briefed by the HSO on the contents of the HASP and any revisions thereof. The HSO shall conduct briefings (group or individual) to inform new employees, subcontractors, utility companies and other on-site workers of the HASP contents prior to their entry on site. All personnel involved in excavation or other soil disturbing activities shall receive the required two-hour Asbestos Awareness training by a Certified Asbestos Inspector, when asbestos discoveries are anticipated, or discoveries are made. A signature log of all briefing attendees shall be kept and furnished to the Engineer. The Contractor shall provide, as required, eye wash equipment and stations, emergency showers, hand and face washing facilities and first aid equipment.

The Contractor shall provide, as required, decontamination facilities for personnel and equipment employed in the work. The exact procedure for decontamination and frequency shall be included in the accepted HASP. Decontamination facilities shall meet the criteria set forth in the Code of Federal Regulations (29 CFR and 40 CFR).

(d) Precautions and Procedures. The following minimum precautions and procedures shall be followed during the construction of the project:

1. General construction precautions:
   A. All monitoring and piezometer wells and test borings shall be established or abandoned by the Contractor as regulated by the State Engineer’s Office. Copies of all required permits, notification, and abandonment documents shall be submitted to the Engineer prior to payment approval.
   B. Hazardous substance related activities shall have a work plan for each work phase which shall be coordinated with the Engineer at least three working days prior to commencement of each phase of the work.
   C. The Contractor shall properly handle all investigation derived waste generated by this project. Documentation shall be submitted to the Engineer of all tests performed for Treatment, Storage and Disposal (TSD) determination; classification of waste; hauling records; TSD acceptance; manifest (if required); etc. in accordance with applicable laws and regulations.
   D. When the work may involve air emissions, the Contractor shall contact the Colorado Department of Public Health and Environment (CDPHE), Air Pollution Control Division to ascertain if an air pollution emission notice (APEN) or permit is required for this operation. The Contractor shall be responsible for filing the APEN and obtaining said permit, if required. The processing of air pollution permits, if required, in non-attainment areas or where public hearings are required, likely will take more than 90 days.

2. For construction on a known or potentially contaminated site, the following conditions shall apply, in addition to those listed in subsection 250.03(d)1:
   A. The HSO shall be on site or readily available by radio, telephone or pager at all times during the work. When on site, the HSO shall have an operational portable or mobile cellular telephone available for immediate use in areas where such service is available. When on site in cellular telephone non-service areas, the HSO shall have available, for immediate use, radio access to a site with telephone service. The HSO shall be notified at least 24 hours prior to the start of confined space entry, storage tank removal, drilling, excavation, trenching, or dewatering operations.
   B. The HSO shall designate the onsite monitoring equipment for flammable gases, oxygen deficient or enriched atmosphere, and toxic gases, such as but not limited to, a flame ionization detector, photoionization detector, combustible gas indicator, and oxygen meter. This designated equipment shall be on site during all construction operations and be utilized during trenching, drilling, excavating, confined space entry, underground storage tank removal, and other appropriate construction operations. The exact equipment to fulfill this requirement shall be specified in the accepted HASP.
The HSO shall conduct or supervise the monitoring. The monitoring equipment shall be calibrated as recommended by the manufacturer.

C. When drilling, trenching, or excavating in the presence of detectable concentrations of explosive gases, the soil shall be wetted and the operating equipment shall be provided with spark proof exhausts.

D. The Contractor, through the HSO, is responsible for ensuring that 29 CFR 1926 is fully complied with during the construction of the project.

E. Affected excavation operations shall be discontinued and personnel shall be removed from the affected excavation sites where any of the following levels are detected:

1. 20.0 percent or more LEL flammable gas, or 10.0 percent in an underground or confined space,
2. Permissible Exposure Limit (PEL) of any toxic gas,
3. 19.5 percent or less oxygen,
4. 25.0 percent or more oxygen,
5. Greater than 2 mrem/hr. (Beta particle & photon radioactivity),
6. Greater than 15 pCi/L (Gross alpha particle activity), or
7. Other action levels as determined by the HSO.
8. Uncovering of suspect Asbestos Containing Material (ACM), including but not limited to, buried facility components, active or abandoned utility lines, buried foundations and demolition debris, or miscellaneous ACM dispersed in the soil. The Contractor shall follow the procedures outlined in the HASP and 29 CFR 1926 to address these conditions. Work shall resume in these areas when approved by the Engineer.

F. Personnel shall be issued and utilize appropriate Health and Safety equipment as determined by the HSO, who shall provide the Engineer with a written explanation of what personal protective equipment (PPE) shall be worn, when, and by which personnel. Except in emergency cases, the Engineer shall be advised by the HSO of changes in the degree of PPE prior to implementation.

G. Personnel shall avoid the area immediately downwind of any excavation unless the excavation is monitored and declared safe.

H. The operators of excavating, trenching, or drilling equipment shall wear appropriate PPE as required in the HASP.

I. Exhaust blowers shall be present at the location where required in the accepted HASP.

J. The Contractor shall accomplish the work with employees who have been trained and equipped as required by the HASP and applicable provisions of 29 CFR 1910 and 29 CFR 1926.

K. Fire extinguishers, electrical equipment and wiring shall conform to the applicable requirements of 29 CFR 1926 and 49 CFR.

L. Smoking shall not be permitted within 50 feet of any excavation.

3. For construction within 1000 feet of a known or potentially contaminated site, the following conditions, in addition to those listed in subsection 250.03(d) 1. shall apply:

A. The areas under construction shall be checked with a combustible gas indicator before excavation begins to determine if flammable or combustible gas is in the area.

B. Excavations, trenches and drill holes shall be monitored by the HSO for flammable gas, toxic gas and oxygen deficiency or enrichment. This shall be carried out continuously unless the presence of flammable, combustible or toxic gas, or oxygen deficiency or enrichment in the area can be ruled out by the HSO. The recommendation to discontinue monitoring must be agreed to by the Engineer and the Contractor. Prior to implementation, this agreement shall be written, and shall contain specific
conditions that will require re-evaluation of the area.

C. When flammable or toxic gas is found in the area, those precautions and procedures in subsection 250.03(d)2 shall apply.

4. The following procedures shall be followed if the level of contamination as documented in the environmental documents referenced in subsection 102.05 as revised for this project is exceeded, or if previously unidentified contaminated air, soil or water, is encountered during the construction of the project:

A. Work in the immediate area of the release or discovery of contamination shall cease. The Engineer shall be immediately notified.

B. If no HSO is required by the Contract, the Contractor shall designate an HSO as directed, in accordance with subsection 250.03(a).

C. The Engineer may direct the HSO to evaluate the material for potential hazardous substance or other contamination or unsafe conditions. This evaluation may include, but is not limited to, on site field monitoring, on site testing, and on or off site laboratory analysis. Removal of storage tanks and surrounding contaminated soils shall be in accordance with applicable laws, regulations and established procedures. If the contaminated material cannot be placed in the embankment or remediated on site, it must be removed to an appropriate TSD facility, as designated in writing by the Engineer. The HSO shall supervise the necessary testing required to make appropriate TSD determinations. Disposal of the unsuitable material shall be considered as remediation work as described in subsection 250.03(d)4.D and 250.03(d)4.E.

D. If this site is determined to be contaminated with petroleum products, hazardous substances or other solid waste in excess of that indicated in the above listed site investigation documents, a thorough Site Investigation and Waste Management Plan shall be accomplished under the supervision of the HSO The Site Investigation and Waste Management Plan shall be submitted to the Engineer for approval and shall determine the extent of contamination and propose at least three types of remedial action for the contaminated area as required by applicable statutes and regulations. The HSO shall be available to assist the Engineer in explaining this study to the regulatory agencies. When requested by the Engineer, the Contractor shall prepare a Remediation Plan based on the selected remedial method, and shall submit this to the Engineer for approval. The time required for the Engineer’s review of the Remediation Plan, including all necessary drawings, calculations, specifications, and other documentation will not exceed four weeks after a complete submittal is received. This work shall not be done unless authorized in writing by the Engineer.

E. If the site is determined to be contaminated with petroleum products; hazardous chemicals, materials, or wastes; or other solid wastes, and is required to be remediated, the HSO or other qualified individuals will supervise the Remediation Plan implementation as concurred to by the regulatory agencies, as directed. Hazardous Waste generated by remedial activities shall list the Colorado Department of Transportation as the hazardous waste generator on the required paperwork for projects on State Highways and their associated frontage roads. If this project is not on a State Highway or frontage road, then the appropriate local governmental entity having jurisdiction over the transportation system facility shall be listed as the hazardous waste generator. If the waste disturbed or produced was caused by Contractor negligence, the Contractor shall be listed as the hazardous waste generator. Remediation work shall be done only when authorized by the Engineer in writing.

250.04 Heavy Metal Based Paint Management. When the work includes the removal of paint or items covered with paint which may contain lead, chromium or other heavy metals, the requirements of this subsection shall apply in addition to the requirements of subsection 250.03.
The requirements of the HASP shall be in accordance with OSHA Publication Number 3142, *Working with Lead in the Construction Industry*.

Paint Removal and Waste Disposal work shall be performed in accordance with 29 CFR 1926.62, State and local air quality regulations, the Steel Structures Painting Council (SSPC) Guide for Containing Debris Generated During Paint Removal Operations, the *Industrial Lead Paint Removal Handbook* (SSPC 91-18), and the references contained therein.

The following minimum precautions and procedures shall be followed unless modified in the approved HASP or its updates:

(a) The Contractor shall contact the CDPHE, Air Pollution Control Division to ascertain if an air pollution permit is required for the cleaning or demolition work. If an air pollution permit is required, the Contractor shall obtain the permit. The Contractor shall furnish the Engineer with a copy of the permit application and the permit issued prior to starting cleaning or demolition activities. A copy of the Air Pollution Emission Notice [APEN] shall be provided to the Engineer, if such notice is required under the Colorado Air Quality Control Commission's regulations. The processing of air pollution permits in non-attainment areas, or where public hearings are required, likely will take more than 90 days.

(b) The Contractor shall contain paint chips, corrosion residues, and spent abrasives, herein referred to as waste materials, resulting from the cleaning or demolition operations. The Contractor shall not deposit or release waste material into the water, air or onto the ground below or adjacent to the structure. The Contractor shall conduct cleaning operations to minimize the waste materials produced. Prior to beginning the work, the Contractor shall submit to the Engineer for acceptance, a detailed methods statement for capturing, testing, and disposing of the removed materials. The Engineer will have seven calendar days to review, and accept or reject this methods statement.

(c) Abrasives utilized for blast cleaning shall be low-dusting and low waste. Unless approved otherwise, vacuum blasting or wheel blasting shall be used.

(d) The HSO shall sample and test the waste material for lead, chromium, and other paint associated heavy metals using the Toxicity Characteristic Leaching Procedure (TCLP) Test, Method 1311 of the EPA publication, *Test Methods for Evaluating Solid Waste 846*. Sample collection methodology and frequency shall be recommended by the HSO and accepted by the Engineer with an adequate number of samples taken to be representative of all waste material collected. If the waste material does not pass the TCLP test, it shall be disposed of in a permitted TSD facility as designated in writing by the Engineer. The waste materials handling decision shall be documented by a report (five copies) submitted to the Engineer. This documentation shall include a description of sample collection methodology, testing performed, test results and comparison of test results with hazardous waste requirements. The waste material shall not be held at an unpermitted TSD facility site in excess of Resource Conservation and Recovery Act (RCRA) temporary storage time limits.

(e) When an item coated with paint is removed, all loose paint shall be removed and collected from the item within 24 hours of the time it is removed or placed onto the ground. All loose paint shall be removed and collected from a painted item before it is removed from the site. The Contractor shall contain loose paint until it is removed and collected. Loose paint is defined as that which can be removed by manual scraping methods. Over waterways, the Contractor shall capture all paint debris by the method specified in the methods statement. The paint debris shall be collected on a daily basis and shall be stored in a properly labeled, tightly sealed container and placed in a secured location at the end of each working day.

(f) All painted steel components which are not designated to be salvaged shall be recycled. Contractor possession of the steel for future use shall be considered a form of recycling. Prior to transport of the components off-site, the Contractor shall obtain a letter from the recipients of the painted steel components stating that they have been fully informed of the contents of the paint and are capable of handling the paint. If the Contractor is to maintain future possession of the steel, the Contractor shall supply this letter. If there will
be more than one recipient of the painted material, one letter shall be obtained from each recipient. The Contractor shall provide a copy of each letter to the Engineer. If the painted steel components will be recycled by melting, the letter from the recipient is not required. The Contractor shall submit a letter stating the destination of the painted steel components and that they will be melted.

(g) When the work consists of the removal of a bridge or components of a bridge coated with paint which has been assumed to contain lead, chromium, other heavy metals, or a combination thereof the Contractor shall capture paint debris which is dislodged during removal operations. The Contractor may choose any method for dismantling the bridge, subject to the following required construction sequence limitations:

(1) The concrete deck shall be removed prior to removal of the steel superstructure.

(2) If the methods statement indicates that girders will be dropped to the ground during dismantling, all debris from the concrete deck removal operation shall be removed from the area below the bridge before any girders are dropped into this area.

(3) Girders may be cut and dropped only if the span is located entirely over land.

**250.05 Material Handling.** This work consists of the additional handling of groundwater and soils to be excavated for construction of the project which are suspected or known to be contaminated. This work also includes stockpiling or containerization, analytical sampling and testing, and final disposition of contaminated groundwater and soils requiring special handling.

The Contractor shall maintain vertical trench walls for the work in the specified areas of known or potential contamination, as shown on the plans. Shoring may be necessary to meet this requirement. The Contractor shall confine the removal of contaminated groundwater and soils encountered as a result of the excavation activities in the specified areas to the vertical and horizontal limits of structure excavation specified in the Contract. The Contractor shall be responsible for any contaminated materials generated beyond the limits of excavation. This shall include any sampling, analysis, and disposal required, and the costs thereof. The Contractor shall be listed as the generator of any such material. The limits of excavation shall be determined as 18 inches outside of structures, including sewers, water lines, inlets, manholes, and other underground structures to be constructed, or as directed.

Specific areas of known or potential contamination have been identified in the project plans. There is the potential of encountering contaminated groundwater and soil, which has not been summarized in the plans or specifications, at unknown locations on the site. Suspected contaminated soil and groundwater shall be handled by one of three methods as follows:

(a) **Materials Handling (Stockpile & Containerization).** When recommended by the HSO and authorized by the Engineer, material shall be stockpiled or containerized for analysis and characterization for proper handling and disposal, or both. Sampling and testing of materials shall be as described in the Contract. If analysis indicates that soil samples are designated as uncontaminated, as determined by the criteria shown in the Contract or as determined by the CDPHE, the associated soils will not require any special handling and will become the property of the Contractor and may be used on site, subject to other requirements of the Contract. Health and safety monitoring and strict fugitive dust control shall be conducted during the placement of these soils. If analysis indicates that groundwater samples are designated as uncontaminated, as determined by the criteria shown in the Contract or as determined by the CDPHE, the groundwater shall be handled in accordance with subsection 107.25.

Stockpiled and containerized materials shall be secured in compliance with the following provisions until they are determined to be uncontaminated:

1. The Contractor shall not store the material for more than 90 days.

2. The Contractor shall prevent any runoff from infiltrating the ground or running out of the containment area.
3. Soils and groundwater containing different contaminants shall be placed in separate containers or stockpiles.

4. The Contractor shall prevent the dispersion of materials or the dilution or mixing of containers and stockpiles.

5. The ground surface on which the contaminated soils will be placed shall be covered with plastic sheeting which will withstand the placement and removal of stockpiled materials without breaching.

6. The ground surface shall be graded to drain toward the edge of the soil piles and the berm or trench around them shall be covered by plastic sheeting.

7. Proper security shall be provided in accordance with 40 CFR.

(b) Solid Waste Disposal. Soils determined to be contaminated, but not hazardous, as established by criteria in the Contract or as determined by CDPHE or other regulatory agencies having jurisdiction, shall be handled and disposed of, or both as recommended by the HSO and approved by the Engineer. The Contractor shall haul this material to a solid waste disposal facility.

(c) Contaminated Groundwater Disposal. Groundwater determined to be contaminated, but not hazardous, as established by criteria in the Contract or as determined by CDPHE or other regulatory agencies having jurisdiction, shall be handled and disposed of, or both as recommended by the HSO and approved by the Engineer. The Contractor shall prepare a dewatering plan proposing at least three types of treatment and/or disposal options of contaminated groundwater as required by applicable statutes and regulations. One of the treatment options shall include permitting and onsite treatment prior to discharge or disposal. The dewatering plan shall be submitted to the Engineer for approval four weeks before dewatering activities begin.

(d) Hazardous Waste Disposal. Soils and groundwater that are designated or suspected to be hazardous shall be containerized immediately upon excavation or upon discovery. Hazardous material shall be labeled and transported to a permitted treatment, storage and disposal (TSD) facility or to a hazardous waste disposal facility approved by the Engineer.

(e) Additional Requirements. Stockpiled or containerized material characterized as uncontaminated, contaminated or hazardous shall be stored and disposed of in a manner consistent with current established federal, state, and local regulations for waste materials.

Materials with contaminants not specifically regulated shall be disposed of by the Contractor as directed, in consultation with CDPHE. All areas where wastes are generated shall be reviewed by the HSO to identify potential contaminant sources that may result in a contaminated waste stream.

Contaminated groundwater and soils, which have been identified as solid waste or hazardous waste, requiring disposal according to federal, state, and local regulations, shall be transported in accordance with 49 CFR by the Contractor to an appropriately permitted treatment facility, landfill, incinerator or asphalt plant or other facility approved to accept the waste. CDPHE and the landfill or other treatment or disposal facility shall be notified by the HSO of the material to be disposed of and the corresponding analytical test results prior to shipment. Potentially contaminated water collected from the lined trench of a stockpile shall be treated as required by Colorado Wastewater Discharge Permit System (CDPS) permits, 29 CFR and 40 CFR and reimbursed separately in accordance with Contract requirements.

250.06 Sample delivery. This work consists of the collection, containerization and delivery of material samples for analysis to the testing facility designated in the Contract.

Environmental Protection Agency (EPA) protocol and standards shall be followed in the collection, containerization and transport of samples to be analyzed, including the documentation of the proper chain of custody of all samples. The Contractor shall collect sufficient sample material to perform the required analysis and is responsible for ensuring that appropriate climate control has been provided for sample transport. Sample delivery shall be made within the maximum allowable holding time for each sample type, not to exceed 24 hours,
excluding weekends. The time period required for sample collection and delivery to the testing facility will not be considered an excusable delay. The analysis to be completed and turnaround time shall be approved by the Engineer.

The Contractor shall provide the Engineer with a copy of documentation indicating that proper chain of custody requirements have been followed for all samples.

Quality control samples shall be provided by the Contractor in accordance with the quality control requirements of the testing facility designated in the Contract (quality control requirements are available from the Engineer). The Contractor shall prepare, label and transport these samples to the testing facility in conjunction with the delivery of other samples authorized for analysis by the Engineer, at no additional cost.

The Engineer may request splits of samples, in advance of collection, which shall be provided at no additional cost by the Contractor.

250.07 Asbestos-Containing Material Management. Environmental documents or plans listed in the special provisions should include known or suspected locations that could involve encounters with ACM during excavation and other soil disturbing construction activities. Unexpected discoveries of ACM may be made during excavation and soil disturbing construction activities. Asbestos contaminated soil, shall be properly managed or remediated, in accordance with subsection 250.07(a).

All asbestos related activities shall be performed by Colorado certified asbestos professionals, contractors, or consultants. Certifications are issued by the Colorado Department of Public Health and Environment (CDPHE), Indoor Air Quality Unit. A Colorado Certified Asbestos professional shall manage the management and disposal of asbestos contaminated soil and other ACM. The Indoor Air Quality Unit within CDPHE is the only unit that certifies such professionals. The Contractor shall furnish a copy of the license to the Engineer.

(a) Regulatory Compliance. Asbestos contaminated soil management is governed by 6 CCR 1007-2, Section 5, which includes and references regulatory compliance with Asbestos Hazard Emergency Response Act (AHERA) Colorado Regulation 8; Inspection and reporting protocol and demolition standards are governed by AHERA; Demolition and notification standards are governed by National Emission Standards for Hazardous Air Pollutants (NESHAPS); Colorado Regulation 8 governs all asbestos activities, demolition, permitting, and certification of Certified Asbestos Professionals in the State of Colorado. Colorado Regulation 8 is more stringent than AHERA and NESHAPS and supersedes federal regulations. Conflicting regulatory requirements between AHERA and NESHAPS, if not specifically addressed in Colorado Regulation 8, shall be addressed and approved protocol negotiated with CDPHE. The Contractor shall conform to all current regulations, policy directives, or both, issued by the EPA, CDPHE, and the Department.

(b) Asbestos Management and Visual Inspections Asbestos management must be performed by a certified asbestos professional. Final Inspections of the area of asbestos contaminated soil removal shall be performed by an Asbestos Consultant to determine what, if any, controls must be instituted to allow future activity in the excavation area. All final visual inspections shall be conducted only when soil is dry.

(c) Permitting and Notification. The CDPHE requires notification of any soil disturbing activity where asbestos is known, suspected, or discovered. A 24-hour notification to CDPHE is required prior to any soil disturbing activity of an unplanned asbestos discovery. A 10 working day notification to CDPHE is required prior to any soil disturbing activity in an area with known or potential material suspected of containing asbestos in or on the soil or asbestos-contaminated soil. Removal of asbestos-containing material on a facility component, that is located on or in soil that will be disturbed, with asbestos quantities above the following trigger levels must be permitted and abated in accordance with the requirements of Air Quality Control Commission Regulation No. 8 (5 CCR 1001-10, Part B):
(1) 260 linear feet on pipes,
(2) 160 square feet on other surfaces, or
(3) The volume of a 55-gallon drum.

All permit applications shall be submitted to the Colorado Department of Public Health and Environment a minimum of 10 days prior to start of work for approval. The permit application and notification shall be submitted simultaneously. The Contractor shall obtain all required State and local permits and shall be responsible for all associated fees. Permit application, notification, and waiver request forms shall be submitted to:

Colorado Department of Public Health and Environment Permit Coordinator/APCD - SS - B1 4300 Cherry Creek Drive South Denver, CO 80246-1530 Phone: (303) 692-3100 Fax: (303) 782-0278

Application and waiver forms are available on the CDPHE website: asbestos@state.co.us

d) CDOT’s Asbestos-Contaminated Soil Management Standard Operating Procedure, dated August 22, 2011. Asbestos contaminated soil shall be managed in accordance with 6 CCR 1007-2, Section 5, Asbestos Waste Management Regulations. Regulations apply only upon discovery of asbestos materials during excavation and soil disturbing activities on construction projects, or when asbestos encounters are expected during construction. The contractor shall comply with procedures detailed in the CDPHE’s Asbestos-Contaminated Soil Guidance Document and CDOT’s approved Asbestos-Contaminated Soil Management Standard Operating Procedure, dated August 22, 2011, including the following minimum requirements:

(1) Immediate actions and implementation of interim controls to prevent visible emissions, exposure, and asbestos contamination in surrounding areas.

(2) Soil Characterization.

(3) Training required for all personnel involved in excavation and other soil disturbing activities, once asbestos is encountered during construction or on projects where asbestos encounters are expected. Asbestos Awareness Training shall be given by a qualified and certified Asbestos Building Inspector with a minimum of six months experience inspecting asbestos contaminated soil.

(4) Assessment for the presence and extent, within the proposed area of disturbance, of asbestos discoveries, whether expected or unexpected, by a Certified Asbestos Inspector.

(5) Investigation and sampling required for risk assessment and management. Investigation, if required, shall be conducted by a Certified Asbestos Inspector.

(6) Risk assessment and determinations for further management or abatement.

   (i) Risk assessment and determinations must be made by a Certified Asbestos Inspector, and coordinated with the Engineer.

   (ii) Soil remediation is not necessarily required, depending on the circumstances.

(7) Submit 24-hour Notification of Unplanned Asbestos Discovery.

(8) Submit 10-day Notification of Planned Asbestos Management.

(9) Submit 24-hour Notification of Unplanned Asbestos Discovery.

(10) Submit 10-day Notification of Planned Asbestos Management.
(e) **Risk Assessment and Determinations for Further Management Or Remediation.** Risk assessment and
determinations for further management or remediation must be closely coordinated with the Project Engineer
and Project Manager of the Statewide Management Plan.

**250.08 Methamphetamine Lab Sites.** Demolition of former Methamphetamine (meth) labs is enforced by the
Governing Authority, which varies from county to county. The Contractor shall demolish all buildings that are
identified as former meth labs, as listed in public listings by the Governing Authority. The Contractor shall provide
evidence of demolition to the Governing Authority, obtain receipt of such evidence by the Governing Authority,
and shall submit these to Engineer immediately following demolition.

Septic tank removal at known meth lab sites shall undergo preliminary assessment by an Industrial Hygienist or
Certified Industrial Hygienist to determine proper removal and disposal. Work shall proceed in accordance with
the recommendations of the Hygienist.

**METHOD OF MEASUREMENT**

**250.09 Environmental Health and Safety Management** will not be measured, but will be paid for on a lump sum
basis. This will include all work, materials, and hourly time charges by the HSO and other personnel required to
accomplish the following:

1. Preparation, submittal and briefing of the initial HASP
2. Preparation and submittal of the Waste Management Plan
   1. Preparation and Submittal of the Dewatering Plan
   2. Preparation and Submittal of the Remediation Plan
3. Procedures and equipment specified in subsections 250.03 - 250.07
4. PPE (levels C and D) for Contractor’s personnel for any contamination identified in the preconstruction
   investigations
5. Preparation and submittal of the final site report

The quantity to be measured for Health and Safety Officer will be the total number of hours that the Health and
Safety Officer is actually used, as authorized, for the following work:

1. Field monitoring necessary to ensure the safety of workers on the site;
2. Hours in excess of the items listed under Environmental Health and Safety Management;
3. Hours that are necessary due to unforeseen site conditions; and
4. Hours of additional consultation or field work that is requested by the Engineer.

Equipment specified in subsection 250.03(a), preparation and submittal of the daily HSO diary, travel to and from
the project site, and PPE (Levels C and D) required for use by the HSO will not be measured and paid for
separately, but shall be included in the hourly cost of the HSO.

The quantity to be measured for Monitoring Technician will be the total number of hours that Monitoring
Technician is actually used as authorized. Equipment specified in subsection 250.03(b), supervision of the MT,
preparation and submittal of the daily monitoring diary, travel to and from the project site, and PPE required for
use by the MT (Levels C & D) will not be measured and paid for separately, but shall be included in the hourly
cost of the MT.

Solid stockpiled materials will be measured by the cubic yard computed from cross sections by the average end
area or other requirements acceptable method. Disposal of solid waste and solid hazardous waste materials will
be measured by the cubic yard in the disposal container.

Materials Sampling and Delivery will be measured by the actual number of samples collected, containerized and
transported to the testing facility indicated in the Contract.
Additional environmental health and safety management work required and authorized by the Engineer, but not included in the items listed above, will be considered extra work to be paid for in accordance with subsection 109.04, unless such work is caused by the Contractor’s action.

**BASIS OF PAYMENT**

**250.10** Partial payment for Environmental Health and Safety Management, as determined by the Engineer, will be made as the work progresses. The Contractor shall submit a schedule of environmental related Health and Safety Management work before the first partial payment is made. The schedule shall indicate the environmental related Health and Safety Management time for each work item that requires Contractor environmental related Health and Safety Management effort and the total time for the project.

The accepted quantity for Health and Safety Officer will be the number of hours actually used and approved for payment by the Engineer and will be paid for at the Contract unit bid price.

The accepted quantity for Monitoring Technician will be the number of hours of onsite monitoring as approved by the Engineer and will be paid at the Contract unit price.

Environmental Health and Safety Management, Health and Safety Officer and Monitoring Technician bid items shall include vehicles, phone charges, supplies, printing, postage, office support, and all other miscellaneous costs associated with the work.

Payment for Groundwater Handling (Containerization & Analysis) will be paid for in accordance with subsection 109.04. Payment for Soil Handling (Stockpile) will be made at the contract unit price for all excavated material required to be stockpiled for analysis. The contract unit price will be full compensation for furnishing all materials, labor, equipment and incidentals necessary to complete this work, and all handling of the material prior to disposal. This includes haul, stockpile, and security. Payment for this work will be in addition to any payment made under other bid items for excavation, embankment or backfill on the project, or waste disposal of this material.

Payment for Solid Waste Disposal and Solid Hazardous Waste Disposal will be made at the appropriate contract unit price for the disposal of material determined to be either solid waste or solid hazardous waste. The contract unit prices will be full compensation for furnishing all materials, labor, equipment, tools, storage containers for transport, containerization of material for up to 60 days, and incidentals necessary to complete this work. This includes all handling of the material, loading for disposal, unloading for disposal, and borrow material required for replacement of excavated material disposed of offsite. It does not include stockpiling or containerization required for analysis which is included in the item Materials Handling (Stockpile & Containerization) paid for as described above. Payment for waste disposal fees and transport of hazardous waste will be made as shown below. Payment for this work will be in addition to any payment made under other bid items for excavation, embankment, backfill or material handling (stockpile & containerization) on the project.

1. **Solid Waste.** Transport costs to the disposal facility and disposal fees will be included in the contract unit price for this work.

2. **Solid Hazardous Waste.** Transport, Disposal and/or Treatment costs will be paid for by planned force account in accordance with subsection 109.04.

3. **Liquid Hazardous Waste.** Transport, Disposal and/or Treatment costs will be paid for by planned force account in accordance with subsection 109.04.

The cost of shoring required to limit the removal of contaminated materials to the specified limits shall be included in the bid unit prices for any excavation to be performed. Such shoring ordered by the Engineer in areas other than the specified areas of known or potential contamination, as shown in the plans, will be paid for in accordance with subsection 109.04.

Payment for Materials Sampling and Delivery will be made at the contract unit price for each material sample collected, containerized and transported to the laboratory testing facility as designated in the Contract. The Contract unit price will be full compensation for furnishing all materials, labor, equipment, tools and incidentals
necessary to complete this work including required sampling kits, containers, sample splits and quality control samples.

The Contractor shall be responsible for damage caused by Contractor negligence to the environment, persons, or property. Expenditures associated with actions of the Contractor shall be borne by the Contractor at no cost to the project.

Contaminated groundwater containerized, treated or disposed under the requirements of this specification will be paid for by planned force account in accordance with subsection 109.04.

The accepted quantities will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule.

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Health and Safety Management</td>
<td>Lump Sum</td>
</tr>
<tr>
<td>Health and Safety Officer</td>
<td>Hour</td>
</tr>
<tr>
<td>Monitoring Technician</td>
<td>Hour</td>
</tr>
<tr>
<td>Materials Sampling and Delivery</td>
<td>Each</td>
</tr>
<tr>
<td>Materials Handling (Stockpile)</td>
<td>Cubic Yard</td>
</tr>
<tr>
<td>Solid Waste Disposal</td>
<td>Cubic Yard</td>
</tr>
</tbody>
</table>
April 26, 2012

REVISION OF SECTION 401
COMPACTION OF HOT MIX ASPHALT

Section 401 of the Standard Specifications is hereby revised for this project as follows:

In subsection 401.17, delete the first paragraph and replace with the following:

401.17 Compaction. The hot mix asphalt shall be compacted by rolling. Both steel wheel and pneumatic tire rollers will be required. The number, weight, and type of rollers furnished shall be sufficient to obtain the required density while the mixture is in a workable condition. Compaction shall begin immediately after the mixture is placed and be continuous until the required density is obtained. When the mixture contains unmodified asphalt cement (PG 58-28 or PG 64-22) or modified (PG 58-34), and the surface temperature falls below 185 °F, further compaction effort shall not be applied unless approved, provided the Contractor can demonstrate that there is no damage to the finished mat. If the mixture contains modified asphalt cement (PG 76-28, PG 70-28 or PG 64-28) and the surface temperature falls below 230 °F, further compaction effort shall not be applied unless approved, provided the Contractor can demonstrate that there is no damage to the finished mat.

Warm Mix Asphalt compaction requirements shall conform to CP 59.

In subsection 401.17, delete the third paragraph and replace with the following:

SMA shall be compacted to a density of 93 to 97 percent of the daily theoretical maximum specific gravity, determined according to CP 51. All other HMA shall be compacted to a density of 92 to 96 percent of the daily theoretical maximum specific gravity, determined according to CP 51. If more than one theoretical maximum specific gravity test is taken in a day, the average of the theoretical maximum specific gravity results will be used to determine the percent compaction. Field density determinations will be made in accordance with CP 44 or 81.

In subsection 401.17, second to last paragraph, delete the first sentence and replace with the following:

After production paving work has begun, a new Roller Pattern shall be demonstrated when a change in the compaction process is implemented.
Section 401 of the Standard Specifications is hereby revised for this project as follows:

In subsection 401.17, delete the fifteenth paragraph and replace with the following:

Two sets of random cores shall be taken within the last 200 tons of the CTS. Each set shall consist of seven random cores. The Engineer will determine the coring locations using a stratified random sampling process. The locations of these cores will be such that one set can serve as a duplicate of the other. One set of these cores shall be immediately submitted to the Engineer. This set will be used for determining acceptance of the CTS and determining density correction factors for nuclear density equipment. Densities of the random samples will be determined by cores according to CP 44. Density correction factors for nuclear density equipment will be determined according to CP 81. Coring shall be performed under CDOT observation. Coring will not be measured and paid for separately but shall be included in the work. For SMA, a CTS is not used. The Contractor shall follow the requirements for the demonstration control strip in accordance with the Revision of Section 403, Stone Matrix Asphalt Pavement.
Section 401 of the Standard Specifications is hereby revised for this project as follows:

Subsection 401.02(b) shall include the following:

After the Form 43 is executed, and all ingredients are available on the project, the Contractor shall notify the Engineer a minimum of one working day in advance of beginning production of the hot mix asphalt. Any changes in the Form 43 will require the same notification unless otherwise approved by the Engineer.
Section 401 of the Standard Specifications is hereby revised for this project as follows:

In subsection 401.16 delete the twelfth (last) paragraph and replace it with the following:

The Engineer may evaluate the HMA for low density due to temperature segregation any time industry best practices, as detailed on Form 1346, are not being followed or the Engineer suspects temperature segregation is occurring. The Engineer will first meet with the Contractor to discuss the paving practices that are triggering the temperature investigation. Areas across the mat, excluding the outside 1 foot of both edges of the mat, that are more than 25 °F cooler than other material across the width may be marked for density testing. Material for temperature comparison will be evaluated in 3-foot intervals behind the paver across the width of the mat. The material shall be marked and tested in accordance with CP 58. If four or more areas within a lot of 500 tons have densities of less than 93 percent of the material’s maximum specific gravity for SMA mixes or less than 92 percent of the material’s maximum specific gravity for all other HMA mixes, a 5 percent price disincentive will be applied to the 500 ton lot. The 500 ton count begins when the Engineer starts looking for cold areas, not when the first cold area is detected. This price disincentive will be in addition to those described in Sections 105 and 106. Only one area per delivered truck will be counted toward the number of low density areas. Temperature segregation checks will be performed only in areas where continuous paving is possible.
Sections 401 and 412 of the Standard Specifications are hereby revised for this project as follows:

Subsection 401.10 shall include the following:

The paver shall include an approved longitudinal paver wedge system to create a sloped safety edge as shown on the plans. The wedge system shall be attached to the screed and shall compact the HMA to a density at least as dense as the compaction imparted to the rest of the HMA layer by the paving screed. The system shall provide a sloped Safety Edge equal to 32 degrees plus or minus 5 degrees measured from the pavement surface cross slope extended. The use of a single plate strike off is not permitted. The system shall be adjustable to accommodate varying paving thicknesses. The Engineer may allow the Contractor to use handwork for short sections or to saw cut the sloped Safety Edge after paving operations are completed in areas such as transitions at driveways, intersections, interchanges.

The Contractor shall submit the proposed system for approval at the Preconstruction Conference. The Engineer may require proof that the system has been used on previous projects with acceptable results or may require a test section constructed prior to the beginning of work to demonstrate that it creates an acceptable wedge shape and compaction. Paving shall not begin until the system is approved in writing by the Engineer. The Safety Edge may be constructed on each lift of HMA or on the full specified plan depth on the final lift. The finished shape of the Safety Edge shall extend for the full depth of the asphalt pavement or for the top 5 inches whichever is less.

Subsection 401.22 shall include the following:

All costs associated with the construction of the Safety Edge will not be paid for separately, but shall be included in the work.

Subsection 412.07 shall include the following:

The Contractor shall use an approved longitudinal paver wedge system to create a sloped Safety Edge. The Contractor shall modify the paver screed to create a Safety Edge that meets the final cross-section shown on the plans. The system shall provide a sloped Safety Edge equal to 32 degrees plus or minus 5 degrees measured from the pavement surface cross slope extended. There may be areas where it is not possible to place the Safety Edge in conjunction with mainline paving but where the Safety Edge is required, such as transitions at driveways, intersections, interchanges, etc. In these areas the Engineer may allow the Contractor to use handwork for short sections or to saw cut the sloped Safety Edge after paving operations are completed.

The Contractor shall submit the proposed system for approval at the Preconstruction Conference. The Engineer may require proof that the system has been used on previous projects with acceptable results or may require a test section constructed prior to the beginning of work to demonstrate that it creates an acceptable wedge shape. Paving shall not begin until the system is approved in writing by the Engineer. The finished shape of the Safety Edge shall extend for the full depth of the concrete pavement or for the top 5 inches whichever is less.
Subsection 412.23 shall include the following:

Concrete Safety Edge will be measured by the actual number of linear feet that are installed and accepted.

Subsection 412.24 shall include the following:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete Safety Edge</td>
<td>Linear Foot</td>
</tr>
</tbody>
</table>

Payment for concrete safety edge will be full compensation for all work and materials required to complete the item.
Sections 412, 601 and 711 of the Standard Specifications are hereby revised for this project as follows:

In subsection 412.14, first paragraph, delete the second sentence and replace with the following:

The impervious membrane curing compound shall meet the requirements of ASTM C 309, Type 2 and shall be volatile organic content (VOC) compliant.

In subsection 601.13 (b), first paragraph, delete the second sentence and replace with the following:

A volatile organic content (VOC) compliant curing compound conforming to ASTM C 309, Type 2 shall be used on surfaces where curing compound is allowed, except that Type 1 curing compound shall be used on exposed aggregate or colored concrete, or when directed by the Engineer.

In subsection 601.16 (a) 1., delete the first sentence and replace with the following:

1. Membrane Forming Curing Compound Method. A volatile organic content (VOC) compliant curing compound conforming to ASTM C 309, Type 2 shall be uniformly applied to the surface of the deck, curbs and sidewalks at the rate of 1 gallon per 100 square feet.

Delete subsection 711.01 and replace with the following:

711.01 Curing Materials. Curing materials shall conform to the following requirements:

<table>
<thead>
<tr>
<th>Burlap Cloth made from Jute or Kenaf</th>
<th>AASHTO M 182</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid Membrane-Forming Compounds for Curing Concrete</td>
<td>ASTM C 309</td>
</tr>
<tr>
<td>Sheet Materials for Curing Concrete</td>
<td>AASHTO M 171*</td>
</tr>
</tbody>
</table>

*Only the performance requirements of AASHTO M171 shall apply.

Straw used for curing shall consist of threshed straw of oats, barley, wheat, or rye. Clean field or marsh hay may be substituted for straw when approved by the Engineer. Old dry straw or hay which breaks readily in the spreading process will not be accepted.
Section 504 of the Standard Specifications is hereby revised for this project to include the following:

**DESCRIPTION**

504.06 This work consists of constructing a Concrete Panel Facing Mechanically Stabilized Earth (MSE) Retaining Wall System at the locations and to the lines and grades shown on the plans. Either metallic or geosynthetic reinforcement (woven fabrics or geogrids) as specified in this specification may be used as MSE reinforcement in the reinforced structure backfill zone. The retained structure backfill zone is the structure backfill retained by the reinforced structure backfill zone as shown on the plans.

**MATERIALS**

504.07 Shop Drawings. The Contractor shall submit six sets of shop drawings and certified material test reports for review prior to construction of the wall. See subsection 504.12, for a complete list of submittal requirements. Shop drawings shall be submitted in accordance with subsection 105.02.

The shop drawings shall provide the details necessary to demonstrate compliance with the Contract, including:

(a) **Wall Layouts.** Wall layouts shall conform to lines and grades on the plans including start, corner, and end stations, leveling pad step breaks, total number of panels and top and bottom of wall elevations. For walls with rail anchoring slabs, the top of panel elevations shall be within 8 inches of the elevation shown on the plans measured from the bottom of anchoring slab. The construction batter required to achieve the batter shown on the plans shall be shown on the shop drawings. If temporary walls are required for the construction of permanent wall, the permanent wall vendor shall provide the shop drawings and certified material test reports for temporary walls.

(b) **Panel and Reinforcement Locations.** Unless otherwise shown on the plans, each layer of soil reinforcement shall be connected to the back of each facial panel and the panel numbering and placement sequence shall be shown. The back of each panel shall be logically numbered with its location.

Panel to panel, panel to reinforcement connection detail, and limits of special panels at curved wall corner shall be shown.

(c) **Wall Elevations.** Except for the top of the leveling pad, wall elevations given on the plans are based on the desirable wall height. The actual panel and reinforcement elevations shall be marked on the shop drawings by taking into account the supplied panel as well as special panel heights for matching the front and top finished grade.

(d) **Soil Reinforcement Material.** The soil reinforcement type, Minimum Average Roll Value of the Ultimate tensile strength $T_{UL}\text{T}$ (MARV) for geosynthetic soil reinforcement or yield strength for metallic soil reinforcement, spacing, lengths, elevations, and the corresponding wall design height shall be shown on the shop drawings. The starting and ending stations for change in grade of reinforcement material shall be shown for walls with different grade of reinforcement material at the same elevation. Material grade shall be clearly identified on each roll of reinforcement to avoid errors in placement. Elevations of the reinforcement layers shall be as specified on the shop drawings.

(e) **Soil Reinforcement Length (RL).** The soil reinforcement length shall be measured from the back face of the concrete panel to end of the soil reinforcement as measured to the last cross member. Except for secondary reinforcements, soil reinforcement lengths shall not be less than the lengths specified on the plans.

For wall segments with a Design Height (DH) greater than or equal to 8 feet, the soil reinforcement shall be the same length from top to bottom of the wall.

For walls segments with a Design Height (DH) less than 8 feet, the length of the top layer of soil reinforcement shall be 8 feet and all other layers of soil reinforcement shall be the same length from top to bottom of the wall.
February 3, 2011

REVISION OF SECTION 504
CONCRETE PANEL FACING MSE WALL

Unless shown otherwise on the plans, the soil reinforcement lengths shall be as follows:

<table>
<thead>
<tr>
<th>Design Height (DH)</th>
<th>Reinforcement Length (RL)</th>
<th>Reinforcement Length Top Layer</th>
</tr>
</thead>
<tbody>
<tr>
<td>DH ≤ 6'-0&quot;</td>
<td>6'-0&quot;</td>
<td>8'-0&quot;</td>
</tr>
<tr>
<td>6'-0&quot; &lt; DH &lt; 8'-0&quot;</td>
<td>DH</td>
<td>8'-0&quot;</td>
</tr>
<tr>
<td>DH ≥ 8'-0&quot;</td>
<td>but not less than 8'-0&quot;</td>
<td>but not less than 8'-0&quot;</td>
</tr>
</tbody>
</table>

The Reinforcement Lengths shown on the shop drawings shall be the reinforcement length required for internal stability and pull-out only, but they shall not be less than those shown in the table above. External stability (bearing pressure, sliding and overturning) and global stability have already been considered and checked in the design.

(f) Panel Size and Soil Reinforcement Spacing.

1. Except for full height panels, the maximum panel size is 50 square feet and the minimum panel height shall be 30 inches.

2. For full height panels, the maximum panel width shall be 10 feet and the maximum panel height shall be 30 feet. Differential deflection between adjacent panels shall be limited to 1/500. The vendor shall supply design calculations regarding panel concrete crack size control during shipment and construction and estimated joint width and differential deflection limits. The use of full height panels with widths greater than 10 feet or heights greater than 30 feet shall be approved by the Engineer.

3. The maximum vertical spacing between layers of adjacent soil reinforcement shall not exceed 30 inches. Except the half height panel used at the top and bottom of wall, including all partial and extended height panels at the top of wall there shall be at least two layers of reinforcement per panel.

4. The first and bottom layers of reinforcement shall be within 15 inches measured from the top of panel and from the top of leveling pad accordingly.

5. Shiplap joints shall be required at horizontal and vertical joints for segmental panel walls and all vertical joints for full height panel walls. The gap between two adjacent panels shall be ½ to 1 inch. Shiplap joints are not required at the vertical joints of segmental and full height panel when a minimum of 12 inches depth of continuous crushed rock wrapped with Class 2 Geotextile is installed behind the joints as shown in the shop drawings. Geotextile (Class 2) and crushed rock will not be measured and paid for separately, but shall be included in the work. Neoprene cushions shall be provided at all horizontal joints as shown in the plans.

(g) Long Term Design Strength (LTDS) of Reinforcement.

1. The design charts on the plans define the strengths required for the zone of mechanical reinforcement of soil. Based on the total summed LTDS, the reinforcement proposed by the shop drawings for a specific wall height shall meet or exceed the total LTDS shown on the plans. This proposed reinforcement shall allow for a maximum of plus or minus 15 percent variation in each individual layer.

2. Metallic (Inextensible) Soil Reinforcement. The net section at the soil reinforcement to panel connection shall be used for the sacrificial thickness calculation. The following minimum sacrificial thickness for reinforcement shall be used for the 75 year LTDS calculations:

<table>
<thead>
<tr>
<th>Galvanization Loss</th>
<th>15 µm/year for first 2 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon steel loss</td>
<td>4 µm/year for subsequent years</td>
</tr>
<tr>
<td></td>
<td>12 µm/year after zinc depletion</td>
</tr>
</tbody>
</table>
3. Geosynthetic (Extensible) Soil Reinforcement. Geosynthetic soil reinforcement shall be a geogrid or woven geotextile. For polyester (PET), polypropylene (PP) and high-density polyethylene (HDPE) reinforcement, the LTDS of material shall be determined using the following factors of safety to ensure the required design life. Unless otherwise specified, LTDS shall not exceed the following K percent of its ultimate tensile strength, $T_{ULT}$ (MARV), i.e.

$$LTDS = K \cdot T_{ULT} \text{ (MARV)},$$

1. Geogrid reinforcement (HDPE, PET):

<table>
<thead>
<tr>
<th>Products</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensar</td>
<td>20%</td>
</tr>
<tr>
<td>Fortrac, Miragrid, Strata, Synteen and Raugrid</td>
<td>24%</td>
</tr>
</tbody>
</table>

2. All products not listed above:

<table>
<thead>
<tr>
<th>Products</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>All geogrid or woven geotextile products meet AASHTO Standard Specifications for Highway Bridges, 16th Edition</td>
<td>10%</td>
</tr>
<tr>
<td>Products not meet AASHTO Standard Specifications for Highway Bridges, 16th Edition including Non-woven geotextile products</td>
<td>5%</td>
</tr>
</tbody>
</table>

(h) *Design Heights and Supplied Reinforcing Material.* Unless otherwise defined on the plans, the wall design height shall be measured vertically from the top of the leveling pad to the top of the concrete rail anchoring slab for walls with railing, or to the top of the cast-in-place concrete coping for walls without railing. For walls that are in front of a bridge abutment that is founded on a deep foundation, the design height used to determine the soil reinforcement length shall be measured vertically from the top of the leveling pad to the top of the roadway carried by the bridge and the wall. Bridge approach slabs shall not be considered in the design of the MSE wall.

For both geosynthetic and metallic reinforcement, the required reinforcement LTDS and the supplied LTDS (determined in accordance with the K factors or depletion of material as defined above) with corresponding brand and grade of material shall be marked clearly on the elevation view or in a tabulation summary. The LTDS of the supplied reinforcement grade must meet or exceed the required LTDS corresponding to the reinforcement spacing provided.

(i) *Tiered Walls.* For the reinforcement layouts of tiered walls, the overall geometry, the reinforcement length and the sum of the LTDS provided from all layers in all tiers shall be in close conformity with the retaining wall system shown on the plans in order to ensure that local, global, and internal stability requirements have been met.

(j) *Obstructions.* Details for the placement of soil reinforcement around obstructions (i.e. steel piles, concrete piers, concrete boxes, pipes, etc.) shall be shown on the shop drawings. Design calculations shall be provided showing that the internal stability of the wall meets the required safety factors in the area of the obstruction.

(k) *Table of Quantities.* A table comparing the Structural Backfill (Class 1), Mechanical Reinforcement of Soil, Geomembrane, and Panel Facing quantities shown on the plans to the quantities shown in the shop drawings and percent difference (positive percent indicates an increase in shop drawing quantities from the plans) shall be shown on the shop drawings. Structure Backfill (Class 1), Mechanical Reinforcement of Soil, Geomembrane, and Panel Facing quantities shall be calculated in accordance with the Contract. The Contractor shall notify the Engineer of the difference in plan and shop drawing quantities before wall construction begins.
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(l) Placement Schedule. Geomembrane placement schedule and clearances to soil reinforcements shall be shown.

(m) Vertical Slip Joints. Locations of vertical slip joints for differential settlement relief shall be as specified in subsection 504.16.

504.08 Backfill. Unless otherwise specified on the plans, wall backfill material in the reinforced structure backfill zone and the associated trapezoidal retained structure backfill zone shall conform to the requirements for Structure Backfill (Class 1) of Section 206. For reinforcement tensile stress and associated pullout, a friction angle of 34 degrees shall be assumed for Structure Backfill (Class 1). Structure Backfill (Class 1) shall be considered to be non-aggressive soil for corrosion and durability computations. All reinforcing elements shall be designed to ensure a minimum design life of 75 years for permanent structures.

504.09 Leveling Pad. Concrete for the leveling pad shall be Concrete (Class D) conforming to the requirements of Section 601. Unless specified on the plans, the maximum vertical step shall be no greater than 36 inches. The leveling pad shall be reinforced only at the steps. When the toe of wall is founded on slope steeper than 1.5 (H) to 1 (V), the leveling pad shall be constructed with reinforced concrete with same reinforcing schedule as at its steps. Leveling pad concrete shall be cured for at least 12 hours before placement of the concrete panels. To avoid panel cracking from high contact points, a ¼ inch thick expansion joint material with the same thickness as the panels may be installed between the first layer of panels and the leveling pad.

504.10 Geomembrane and Joint. A Geomembrane shall be installed on all walls at the top of the reinforced structure backfill zone and retained structure backfill zone to intercept surface runoff and prevent salt penetration into the backfill of the wall as shown on the plans. The Geomembrane shall meet the requirements of subsection 712.08 for geomembrane, and shall have a minimum thickness of 30 mils. It shall be spliced with a dual track field seamed joint in accordance with ASTM D4437 or ASTM D7717. For small local coverage areas, less than 30 square feet, the membrane may be spliced using a 6 inch minimum overlap and an adhesive or a single seam portable thermal welding tool, as suggested by the membrane manufacturer and approved by the Engineer. Unless otherwise shown on the plans, the membrane shall have a minimum coverage length measured perpendicular to the wall face of at least the wall Design Height (DH) plus Soil Reinforcement Length (RL) plus 1.5 feet. The membrane shall be installed with a slope between 20:1 (minimum) and 10:1 (maximum), as shown in the plans, from the panel facing to a drainage system located at the cut or pre-filled slope as shown on the plans.

The drainage system shall consist of a 12 inch wide Geo-Composite strip drain inserted into a slot in the Geomembrane, at 10 foot maximum spacing, that collects the water from the membrane and conveys it to a water collector system at the toe of the 1:1 slope as shown on the plans. The water collector system shall consist of a 4 inch diameter perforated collector pipe surrounded by Filter Material Class B and wrapped with Class 3 Geotextile. A 4 inch diameter non-perforated drain pipe, at 100 foot maximum spacing, shall be used to discharge the water in the water collector system out the face of the wall.

Alternatives for the drainage system shown on the plans may be used by the Contractor. A detailed layout of this equivalent water collection system shall be provided by the Contractor and approved by the Engineer.

For tiered walls, a Geomembrane shall be installed between the top of the bottom wall and the toe of the top wall as shown on the plans.

504.11 Pre-Cast Concrete Panel Facing Unit and Panel Joint Material. The pre-cast concrete panels shall conform to the requirements shown on the plans and these specifications including the color, texture, dimensions and pattern. These facing units shall be factory made with Class B Concrete with the following additional requirements:

(1) Minimum Cementitious Content: 610 lb./cu. yd.
(2) No more than 50 percent fine aggregate (AASHTO M6) by volume of total aggregate.
(3) Ambient temperature: shall be a minimum of 40°F and rising when casting panels.
(4) Pre-cast panels shall be cured in accordance with AASHTO M170.

Reinforcing steel shall conform to the requirements of Section 602 of the specifications. The concrete in the pre-cast units shall be compacted using a vibrating table, grid vibrator, or screed vibrator. All panels shall be cast face down on flat level surface.

Panel dimensions and facing treatment shall conform to the architectural requirements shown on the plans. Width of panel from center to center of joint shall be an even whole increment of the pattern dimensions selected to match the architectural treatment. Thickness shall be a minimum of 6 inches plus the depth of rustication. Panel shall be cast to the dimension that accommodates the architectural treatment.

Panels may be longer than 5 feet provided their section strength can be shown to accommodate handling and erection without cracking. Soil reinforcement attachment devices shall be within 1 inch of shop drawing locations. All unit dimensions shall be within ¼ inch of plan. Concrete surface for the front face of the wall shall match the architectural treatment requirements and structural concrete color shown on the plans. Squareness determined by the difference between two diagonals, shall not exceed ½ inch Surface defects on the front face textured surface, shall not exceed 3/16 inch when measured with a 5 foot straight edge, except when intentionally roughened.

The Engineer shall be allowed access to the manufacturer's facilities to inspect and sample units from lots prior to delivery with a minimum of 2 working days advance notice. The Engineer will reject any concrete panels, which do not meet the requirements of this specification. Panels shall not be shipped until the concrete strength, at the time of shipping, is greater than 0.9 times \( f_c \). The Contractor shall notify the Engineer in writing at least 3 working days before shipment of panels begins.

Cover on the back face of the wall for horizontal and vertical joints is required between panels and shall be a drainage geotextile conforming to Subsection 712.08, a minimum of 12 inches wide, nailed or glued in place prior to placing backfill.

At horizontal joints, a cellular type or molded expansion joint material shall be placed and shall be a size suggested by the supplier and approved by the Engineer.

504.12 Certifications, Calculations and Testing Reports. The Contractor shall provide the following reports, certifications, calculations and checklists as needed to accompany the shop drawing submittal. All engineering calculations, as stated in subsections 504.07(f), 504.07(g), 504.07(j), 504.07(k), 504.12(e), 504.12(f), 504.12(g), and 504.12(i) shall be certified and stamped by a Professional Engineer licensed in the State of Colorado.

(a) Certification of \( T_{UL} \) (MARV). For geo-synthetic reinforced system only, the Contractor shall submit a certification letter from the manufacturer which provides the \( T_{UL} \) (MARV) and certifies the \( T_{UL} \) (MARV) of the supplied materials have been determined in accordance with ASTM D4595 or ASTM D6637 as appropriate.

(b) Mill Report for Metallic Reinforcements and Connectors. This includes, but is not limited to mill certifications on weldability, ultimate tensile and yield strength.

(c) Report of The Panel-Reinforcement Connection Test. The test report shall be prepared and certified by an independent laboratory. The panel to reinforcement connection test method shall conform to the industrial standards. The report shall provide data on the ultimate as well as service limit state.

(d) Report for Soil to Reinforcement Interface Pullout Test. The test report shall be prepared and certified by an independent laboratory. The soil to reinforcement interface pullout test method shall conform to the requirements of ASTM D6706. Tests shall include the full range of overburden pressures defined by wall design heights.
(e) Certification of Facial Panel to Reinforcement Long-Term Connection Strength. Certification shall include calculations to demonstrate that the facial panel to reinforcement connection meets or exceeds current AASHTO 75 years design life requirements.

(f) Certification of Reinforcement Pullout. Certification shall be provided with detail calculations to demonstrate that reinforcement pullouts meet or exceed current AASHTO requirements. For metal reinforcement breakage and pullout, calculations shall include a combination of 75 years material depletion of carbon steel and galvanization loss.

(g) Report and Certification for the Initial Concrete Compression Strength, Shipping and Handling Stress. Cylinder compressive test is acceptable to verify the initial concrete strength of panel at time of shipping. Concrete tensile stress shall not exceed the modulus of rupture. Report shall include calculations of panel cracking stress according to the proposed method of lifting and shipping. Before panel shipping from precast yard to wall site, the Engineer will approve the time of shipping, method of lifting and supporting condition during shipping as well as storage condition at the site before panel installation.

(h) Calculations. Calculation of the LTDS of reinforcement shall conform to the 17th edition of the AASHTO Standard Specifications for Highway Bridges.

(i) Efflorescence and Air Content Test. Panel shall be visually efflorescence free. Efflorescence control agent shall be used in concrete mix design. When fly ash is used as the efflorescence control agent, the fly ash shall be ASTM C618 Class F fly ash and shall be a minimum of 20 percent by weight of the total cementitious material content. Air Content shall be determined in accordance with AASHTO T152. Concrete shall be tested a minimum of the first three batches each day and then once per five batches for the rest of the day to assure specified air entrainment.

(j) Submittal Checklist. The Contractor shall submit the Panel Faced MSE Wall Submittal Checklist, Form 1402 with the Certifications, Calculations and Testing Report submittal package included with the shop drawing submittal.

504.13 Hybrid MSE Wall Systems.

A hybrid system is one which combines elements of both externally and internally stabilized systems.

An externally stabilized system uses a physical structure to hold the retained soil. The stabilizing forces of this system are mobilized either through the weight of a shape stable structure or through the restraints provided by the embedment of wall into the soil, if needed, plus the tieback forces of anchorages.

An internally stabilized system involves reinforced soils to retain fills and sustain loads. Reinforcement may be added to either the selected fills as earth walls or to the retained earth directly to form a more coherent stable slope. These reinforcements can either be layered reinforcements installed during the bottom-to-top construction of selected fills, or be driven piles or drilled caissons built into the retained soil. All this reinforcement must be oriented properly and extend beyond the potential failure mass.

Hybrid MSE wall systems may be used unless otherwise noted on the plans. Hybrid MSE wall systems are subject to the same design requirements for MSE walls and this specification. The shop drawings for the Hybrid MSE wall system shall include a combination of design calculations and appropriate test results to demonstrate that it meets or exceeds the regular system. Hybrid MSE wall systems shall have a facing area of 3.5 square feet and be stabilized by a counterfort. The Certifications, Calculations and Testing Reports in subsection 504.12(e) is not required for Hybrid MSE wall systems. The facing to soil reinforcement connection test, subsection 504.12(c) under MATERIALS, may be waived only if the soil reinforcing spacing is less than or equal to 8 inches or the facing is secured and stabilized by hybrid components with primary reinforcement spacing less than 24 inches.

The Contractor shall provide the following additional reports, certifications and calculations to accompany the shop drawing submittal for Hybrid MSE wall systems:
(1) The facing to counterfort long-term connection test.

The Contractor shall submit the Block Faced MSE Wall Submittal Checklist, Form 1401 and the Panel Faced MSE Wall Submittal Checklist, Form 1402, with the Certifications, Calculations and Testing Report submittal package included with the shop drawing submittal.

CONSTRUCTION REQUIREMENTS

504.14 Approval and Qualifications of MSE Wall Installer. The job site wall foreman shall have experience in construction of at least five transportation related MSE walls within the last three years. Transportation related MSE walls are walls that carry or are adjacent to vehicular traffic and are constructed with MSE reinforcement in the reinforced structure backfill zone. The foreman must have prior experience or adequate training on the products that the Contractor elects to use in the project. The resume and credentials of the foreman shall be submitted to the Engineer for approval prior to the pre-construction meeting. The foreman shall be on the site for 100 percent of time during which the work is being done.

504.15 Wall Test Segment. The wall test segment shall be the first segment of the wall constructed. The wall test segment shall be constructed in the presence of the Technical Representative and the Engineer and shall include construction of each of the 5 elements listed in 504.15 below. The minimum length of the wall test segment shall be 40 feet or the full length of the wall if less than 40 feet. A wall test segment shall be constructed for the first wall constructed from each wall product used on the project.

504.16 Technical Representative of Wall Product Supplier. The Contractor shall arrange for a technical representative (Tech Rep) of the manufacturer of the selected wall products to be present during the construction of each wall test segment. If the selected wall products are supplied from different manufacturers, a Tech Rep from each wall product shall be present. The Tech Rep shall be present for construction of the wall test segment and each of the following elements:

(1) Placement of a minimum of the first four layers of primary soil reinforcement and backfill,

(2) If obstructions (i.e. steel piles, concrete piers/abutments, concrete boxes, pipes, etc.) exist, placement of primary soil reinforcement and backfill at obstructions,

(3) Placement of a minimum of the first two rows of panels or a minimum of a four foot wall height,

(4) If a vertical slip joint is required, construction of the vertical slip joint in a minimum of a two row portion of panels or a minimum of a four foot wall height, and

(5) If corners are required, construction of a corner representative of the corners in the wall in the project in a minimum of a two row portion of panels or a minimum of a four foot wall height.

Before construction of the wall test segment the Tech Rep shall provide the Contractor and the Engineer the following:

(1) Technical instructions as required in the construction of the earth retaining wall system.

(2) Product specific specifications in the placement of the soil reinforcement and backfill in accordance with the wall system.

(3) Guidelines in placing the facing units and attaching them to the soil reinforcement in accordance with the system requirements.

(4) Provide technical assistance to the facing unit fabricator.

At the completion of the wall test segment the Tech Rep shall provide the following:
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(1) Documentation that the wall test segment was constructed in accordance with the product specific specifications. This documentation shall include a location description (starting and ending stations and elevations) of the wall test segment.

(2) Documentation that the job site wall foreman is familiar with the wall products used to construct the walls on the project.

After completion of the wall test segment the Tech Rep shall be available whenever there is any special field condition such as change of geological condition, when there are equipment or personnel changes, or when requested by the Engineer.

504.17 Facial Panel Quality Control, Placing Plan and Daily Placement Logs. Before the start of wall construction, the Contractor shall provide a panel-placing plan and shall supply daily placement logs to the Engineer weekly and at the completion of the wall. The daily placement log shall consist of an elevation view of the wall showing the dates, number of panels placed, and the serial numbers of the panels placed. The panel quality control shall contain multiple submittals if required by subsections 504.12(g) and (h). Panels shall be labeled with serial number for each panel and corresponding certification with one set of random samples tested for each 220 panels or 5500 square foot of wall face. At least one certification with supporting test results is required for each wall. Test results will be reviewed and pre-approved by the Engineer before shipment. The Contractor shall coordinate and mark the panel and backfill placing sequence on the daily placement logs. The log serves as means for the Engineer to identify where each panel was placed.

504.18 Wall With Curved Alignments, Tight Curved Corners, and Sections Adjacent To Bridge Abutment. The Contractor shall provide a placement plan that shows curved layouts, special corner panel, sequence of panel placement, and construction off-sets as recommended by the manufacture. For tight curved corners, 8 foot radius or less, and dissimilar foundations such as bridge abutment, to avoid panels with random cracks, the Contractor shall install vertical slip joints as shown on the shop drawings.

504.19 Excavation and Backfill. The base of leveling pad shall receive the same compaction as cut area required by subsection 203.07. The Contractor shall report to the Engineer in writing density test results for any unsatisfactory bearing material that does not meet the minimum 90 percent compaction for walls less than 16 feet high and 95 percent of T-180 for walls higher than 16 feet. If the excavation for the placement of the leveling pad exposes an unsatisfactory bearing material, the Engineer may require removal and replacement of that material. The removed material shall be replaced with Structure Backfill (Class 1) compacted in conformance with subsection 206.03. The Engineer with the assistance of the geotechnical engineer of record will provide the limits including the depth of removal. As directed by the Engineer, and if required, Structure Backfill (Class 1) shall be reinforced with soil reinforcements in conjunction with wick drains and outlet pipes

The Contractor shall grade the foundation for the bottom of the wall for a width equal to or exceeding the limits of the Reinforcement Length (RL) plus 18 inches as shown on the plans. This graded area shall be compacted with an appropriate vibratory roller weighing a minimum of 8 tons for at least five passes or as directed by the Engineer. For cut wall with continuous seepage, phasing of foundation construction or a different drainage and foundation improvement plan may be necessary.

The reinforced structure backfill zone and the retained structure backfill zone portion immediately behind the wall as defined on the plans shall be Structure Backfill (Class 1). Recycled asphalt, recycled concrete and flow-fill material shall not be substituted for Structure Backfill (Class 1). Each compacted layer of backfill within a distance equal to the reinforcement spacing away from the back of the panels shall not exceed 4 inches. The triangular or trapezoidal portion behind the concrete panels and above the spill of backfill, as shown on the plans, shall be filled with ¾ inch crushed rock, filter aggregates with filter fabric, or wall system specific fill as approved by the Engineer. Density tests behind and parallel to the wall in the triangular or trapezoidal portion above the backfill spill zone are not required. Each compacted layer of backfill shall be in even increments up to 8 inches thick. The fill and compaction operation shall start 3 feet from the wall back face and progress toward the end of the reinforcement. All Structure Backfill (Class 1) including fill material under the wall and on-site material as allowed by subsection 504.08 shall be compacted to a density of at least 95 percent of the maximum density according to AASHTO T 180. For on-site foundation material containing more than 30 percent retained on the ¾
inch sieve, a method of compaction consisting of a conventional heavy vibratory roller starting with minimum 5 passes shall be used to establish the number of passes required to exceed the 95 percent T180.

At least 6 inches of material shall be in place prior to operation of tracked vehicles over soil with reinforcement. Only power operated roller or plate compaction equipment weighing less than 1,000 pounds is allowed within 3 feet of the front of the wall face. The reinforcement shall not be connected to the wall until the compacted fill is at or slightly higher than the location of the connector.

Backfill containing frost or frozen lumps shall not be used. Backfill that has been placed and becomes frozen shall be removed and replaced at the Contractor's expense. If cold weather conditions prevent the placement of Structure Backfill (Class 1), the Contractor may use Filter Material Class B as backfill without compaction at the Contractor's expense and approved by the Engineer. The Contractor shall provide a test report, prepared and certified by an independent laboratory, that the internal friction angle of soil for the Filter Material Class B meets or exceeds that shown on the plans.

The Contractor shall place additional panels including partial height panels and properly compacted fill material to return the finished grade to the plan elevations if settlement, as determined by the Engineer, has occurred. A final inspection before the installation of rail anchoring slab will be made after construction settlement, if any, has occurred or 30 days after the completion of the wall. The Contractor shall provide immediate temporary storm water protection and wind erosion control at the end of each day during construction. If settlement occurs as the result of loss of backfill due to wind or water erosion, non-conforming backfill such as frozen fill or over-saturated fill, or if the backfill does not meet compaction requirements, the Contractor shall remove the backfill, wash the soil reinforcement, and bring the elevation to the finished grade at the Contractor's expense. Before final project acceptance, the Contractor shall repair any backfill losses due to wind and water erosion.

To avoid the foundation of the leveling pad being washed out by rain, the area in front of the wall and around the leveling pad shall be backfilled as soon as practicable.

504.20 Reinforcement. Steel reinforcement shall be slack free and geosynthetic reinforcement shall be slightly pre-tensioned. The minimum coverage ratio for geogrid reinforcement shall be 67 percent and the spaces between rolls shall be staggered between layers of soil reinforcement. The minimum coverage ratio for woven fabric reinforcement shall be 100 percent and an overlap between rolls is not required. Soil reinforcement shall not be cut to avoid obstruction unless shown on the shop drawings.

504.21 Leveling Pad. The foundation of the leveling pads shall meet the requirement of subsection 504.16 immediately above. The leveling pad shall be level within the tolerance of ⅛ inch for any two points along the length of a panel, and within ¼ inch for any two points 10 feet apart. If the wall is not level, the panels will bind against each other causing spall of the edges and corners.

Cushion or shimming material (Expansion Joint Material, Concrete Mortar Grout, Roofing Felt or Geosynthetic Reinforcement) shall be used to support panels directly founded on the leveling pad. Before starting a new course of panels, the Contractor shall take steps to ensure that the wall elevations are matched at the neighboring panels. Cushion or shimming material shall be used to obtain necessary panel elevations at next leveling pad step. No more than 2 shims (each 3/16 inch thick) should be required to level the panels on the leveling pad.

504.22 Wooden Wedges. Wooden wedges are used to help to hold the panels at the correct batter during the backfill operation. The wooden wedges shall be made from hard wood (such as oak, maple or ash). Wooden wedges shall be removed as soon as the precast panels above the wedged panels are completely erected and backfilled. There shall not be more than three rows of wooden wedges in place at one time. Panels that crack or spall due to failure to remove the wooden wedges shall be repaired or replaced.

504.23 Panel Facing. For walls that support a roadway, the wall layout line at the leveling pad shall be setback and pre-measured with appropriate batter (5 to 8 percent) from the top of the panels according to the offset with respect to the centerline of the road. For walls adjacent to a roadway, the wall layout line at the leveling pad shall be directly offset from the centerline of the road. An overall negative batter (wall face leaning outward) between
the bottom and the top of the wall is not allowed. Unless otherwise noted on the plans for battered walls, the final wall face shall be vertical, or have a positive batter of not greater than 5 percent for construction control purpose. The surface of the wall face shall be tested with a 10 foot straightedge laid along the surface in horizontal and vertical directions. Except as necessary for horizontal alignment of the wall, convex deviation of the wall face from the straightedge (belly wall) shall not be allowed, and concave deviation from the straightedge shall be less than ½ inch.

Walls without a rail-anchoring slab, cast-in-place reinforced concrete coping with uniform exposed height is required to match the required finished elevations as well as to retain the panels’ lateral deformation.

For walls with rail anchoring slabs, the top of panel elevations shall be within 8 inches of the bottom of the anchoring slab. Cast-in-place concrete or saw-cut partial height panels may be used to accomplish this.

Where the Geomembrane for drainage interferes with the continuation of reinforcement, the panels beyond the termination shall be reinforced with the same grade of additional soil reinforcing material to maintain the total amount of reinforcement per panel. To avoid leaking or soil erosion through the joint, a filter fabric at least 12 inches wide shall be glued to the panels behind all vertical joints.

As shown on the plans, facing panels directly exposed to spray from deiced pavements and indirect windborne spray shall have three coats of water resistant or repellant concrete sealer applied to the front face of the wall before the wall is opening to traffic.

For completed wall or parts of completed wall, before final payment any damages including blemish and discoloring of panel shall be replaced or repaired. Sand blasting may be used if accepted by the Engineer.

504.24 Fill under Leveling Pad. For walls requiring fill under the planned elevation of the leveling pad, the Contractor may lower the elevation of the leveling pad as approved by the Engineer, except that the finished elevation at the top of the wall shall not be altered. As requested by the Contractor, and with the Engineer’s approval, the higher wall shall be redesigned with longer reinforcement length and revised reinforcement schedule.

METHOD OF MEASUREMENT

504.25 MSE retaining walls will not be measured for payment in the field, but will be paid for by the calculated quantities shown on the plans for the five major components of the wall: structure excavation, structure backfill, concrete panel facing, mechanical reinforcement of soil, and geomembrane. The Contractor's construction of a system that requires increased or decreased quantities of any of the components to complete the wall to the dimensions shown will not result in a change in pay quantities. Exceptions will be made when field changes are ordered or when it is determined that there are discrepancies on the plans in an amount of at least plus or minus five percent of the plan quantity.

(1) The panel facing quantity was calculated for the square foot of wall front face area from the top of the leveling pad (or average pad elevations) as shown on the plans to the top of the anchoring slab for walls with railing, or to the top of the cast in place coping for walls without railing.

(2) The structure excavation quantity was calculated for the total volume of earth to be removed before the installation of the reinforced zone as shown on the plans.

(3) The structure backfill quantity was calculated for the total volume behind the wall (the retained structure backfill zone) including the material in the reinforced zone as shown on the plans.

(4) The mechanical reinforcement of soil quantity was calculated for the total volume of the reinforced zone as shown on the plans.

(5) Geomembrane was calculated as the design height (DH) plus soil reinforcement length (RL) plus 1.5 feet, disregarding the slope of the membrane.
The square foot and cubic yard quantities computed for payment are the wall plan quantities based on the height measured at 20 foot maximum intervals along the wall layout line.

**BASIS OF PAYMENT**

**504.26** The accepted quantity will be paid for at the contract unit price per unit of measurement for the pay items listed below:

Payment will be made under:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel Facing</td>
<td>Square Foot</td>
</tr>
</tbody>
</table>

Structure excavation will be paid for under the Section 206 Pay Item Structure Excavation. Structure backfill will be paid for under the Section 206 Pay Item Structure Backfill (Class 1). Soil reinforcement will be paid for under the Section 206 Pay Item Mechanical Reinforcement of Soil. Geomembrane will be paid for under the Section 420 Pay Item Geomembrane.

Rail anchoring systems (slabs) at the tops of walls and leveling pads at the bottom of wall will be measured and paid for separately under the Section 601 Pay Item Concrete and the Section 602 Pay Item Reinforcing Steel.

Payment will be full compensation for all work and materials required to construct the concrete panel facing MSE wall. Miscellaneous items such as dual track welding of Geomembrane, drainage ditches, rundowns, filter material, filter fabric, grout, pins, shimming material, ¼ inch thick expansion joint material, concrete coating and providing a technical representative will not be measured and paid for separately but shall be included in the work.

**504.27** Panel Facing Payment Reductions. In this subsection, a “panel” refers to either a concrete panel or a hybrid unit. Each of the following shall be considered a defect:

1. **Dislocated Panel.** A dislocated panel is an individual panel or its corner located outward more than ¼ inch from the adjacent panels.
2. **Cracked Panel.** A cracked panel is an individual panel with any visible crack when viewed from a distance equal to the wall height in natural light.
3. **Corner Knock Off.** A corner knock-off is a panel with any missing facial corners or architectural edges.
4. **Substandard panel.** Substandard panels are concrete panels installed in any wall segments that do not meet the certified values for compressive strength. Each substandard panel counts as one defect.
5. **Oversize Joints.** Panels with oversize joints are two adjacent panels that do not meet the required values in subsection 504.07(f).
6. **Panels Failing the 10 Foot Straightedge Test.** Straightedge test failures are joints that that deviate from even by more than ¼ inch when measured by placing a 10 foot straightedge across the joint.

Defects shared by two adjacent panels such as oversized joint, dislocated panel and panels not passing 10 foot straight edge test will be count as one defect.

In the completed wall, or completed portion of the wall the number of defects, as described above, in each 40 foot section (horizontal or arc length) will be counted. If there are defects, the number of defects in the 40 foot section will be considered for price reduction according to the table below. For panels subjected to price reduction, if the defects are repairable or the overall quality of wall can be improved, with the consent from the Engineer, the Contractor may elect to repair and reduce the percent of price reduction. A walkthrough inspection shall be made as requested by the Contractor before final payment.

<table>
<thead>
<tr>
<th>No. of Defects in 40 Foot Section</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>&gt; 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Of Price Reduction for that section</td>
<td>3</td>
<td>9</td>
<td>15</td>
<td>21</td>
<td>Rejection</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>---</td>
<td>---</td>
<td>----</td>
<td>----</td>
<td>-----------</td>
</tr>
</tbody>
</table>

When the number of defects exceeds 5, the Engineer will reject the entire wall or portions thereof. The Contractor shall replace the rejected wall at his own expense.
Section 507 of the Standard Specifications is hereby revised for this project as follows:

In subsection 507.05 delete the first paragraph and replace with the following:

507.05 Grouted Riprap Slope and Ditch Paving. Concrete mortar for grouted riprap slope and ditch paving shall meet the requirements of Section 601 and the following:

<table>
<thead>
<tr>
<th>Field Compressive Strength (28 days) (Not a specification requirement)</th>
<th>2000 psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Cement Content</td>
<td>560 lbs./cu. yd.</td>
</tr>
<tr>
<td>Air Content</td>
<td>6-9%</td>
</tr>
<tr>
<td>Slump, AASHTO Designation T-119</td>
<td>5-9 inches</td>
</tr>
<tr>
<td>Fine Aggregate, AASHTO M-6</td>
<td>65-75%</td>
</tr>
<tr>
<td>Coarse Aggregate, AASHTO M-43</td>
<td>3/8&quot; nominal maximum size</td>
</tr>
<tr>
<td>Polypropylene Fibers (1&quot; fiber length or equivalent)</td>
<td>1.5 lbs./cu. yd.</td>
</tr>
</tbody>
</table>
Section 512 of the Standard Specifications is hereby revised for this project as follows:

Delete the first paragraph of subsection 512.09 and replace with the following:

512.09 Testing and Acceptance. The materials for elastomeric bearings and finished bearings shall be subjected to the tests described in this section. Material tests shall be in accordance with Table 705-1 or 705-2 and as described herein. The manufacturer shall furnish facilities for the testing and inspection of the completed bearings in the plant or at an independent test facility. At the Engineer’s discretion, testing may be performed in the presence of the Engineer or a designated representative. The Engineer or the Engineer’s representative shall be allowed free access to the necessary parts of the manufacturer's plant and test facility, as arranged by the Contractor. The Contractor shall inform the Engineer a minimum of two weeks in advance of a date and time when a visit to the plant and test facility would be permitted.
Section 601 of the Standard Specifications is hereby revised for this project as follows:

Subsection 601.02 shall include the following:

Deviations from the Standard Class B, Class BZ, Class D, DT and P concrete may be made under the following conditions:

1. The minimum cement content may be reduced from that specified in Table 601-1 if lab test results show that the permeability of the mix does not exceed 2,500 Coulombs at an age of not more than 56 days as determined by ASTM C1202.

2. The maximum cement content may be increased from that specified in Table 601-1 if lab test results show that the unrestrained shrinkage is less than 0.050 percent when tested by CP-L 4103.

3. The maximum amount of fly ash substituted for ASTM C150 cement or the maximum pozzolan content when ASTM C595 or C1157 cement is used may exceed the limits in subsection 601.05 if lab test results show that the permeability of the mix does not exceed 2,500 Coulombs at an age of not more than 56 days as determined by ASTM C1202 and the salt scaling resistance is less than 3 as determined by ASTM C672.

4. Except for Class DT, the concrete mix may use an Optimized Gradation (OG). When an OG is used aggregate proportions must be a result of an optimized combined aggregate gradation (CAG) developed by an approved mix design technique such as Shilstone or KU Mix. The amount of aggregate in the CAG passing the 19 mm (¾ inch) sieve and retained on the 12.5 mm (½ inch) sieve shall be a minimum of 8 percent for the trial mix design. The coarseness factor (CF) and workability factor (WF) must plot within the workability box (ABCD) depicted graphically by the following 4 coordinate points:
   a. Point A> (CF,WF) 72, 31
   b. Point B> (CF,WF) 44.5, 35
   c. Point C> (CF,WF) 44.5, 43.5
   d. Point D> (CF,WF) 72, 40

5. Aggregate gradings not obtained through an OG may be used if lab test results show that the unrestrained shrinkage is less than 0.050 percent when tested by CP-L 4103.

\[
CF = \frac{S}{T} \times 100
\]

Where:
S = Percent Cumulative Retained on 9.5 mm (3/8 inch) Sieve
T = Percent Cumulative retained on 2.36 mm (No. 8) Sieve

WF is the percent passing the 2.36 mm (No. 8) sieve. Increase workability factor by 2.5 percentage points for every 94 pounds per cubic yard of cementitious material used in excess of 564 pounds per cubic yard in the mix design. Decrease workability factor by 2.5 percentage points for every 94 pounds per cubic yard of cementitious material used below 564 pounds per cubic yard in the mix design. The Contractor shall not adjust the workability factor if the amount of cementitious material is 564 pounds per cubic yard.
Concrete with any of the above deviations shall be known as Class (_-) Non Standard concrete (Class _-NS concrete). For example Class B-NS. Non Standard concrete may be substituted for the equivalent standard concrete. Non Standard concrete shall be tested, accepted, measured and paid for as standard concrete or the pay item specifying standard concrete.

Subsection 601.05 shall include the following in the second paragraph:

(8) Concrete with an OG shall indicate the gradation proportions that results in a combined aggregate gradation corresponding to compliance within the specified CF and WF box and shall include the following charts used to perform aggregate gradation analysis:
   (i) Coarseness Factor
   (ii) Workability Factor
   (iii) 0.45 power
   (iv) Combined gradation

Delete Subsection 601.06 (10) and (11) and replace with the following:

(10) Weights of fine and coarse aggregates or combined weight when an OG is pre-blended
(11) Moisture of fine and coarse aggregates or combined moisture when an OG is pre-blended

Subsection 601.17 shall include the following:

(g) Water to cementitious material content (w/cm) ratio. When a Non Standard concrete is used the maximum w/cm ratio is the w/cm ratio that was used in the in the laboratory trial mix for the Concrete Mix Design. The w/cm ratio shall be determined for each batch of Non Standard concrete by the Contractor and provided to the Engineer for approval prior to placement. If an adjustment to the mix is made after the Engineer's approval, the w/cm shall be determined and submitted to the Engineer prior to the continuation of placement. Any Non Standard concrete that is placed without the Engineer’s approval shall be removed and replaced at the Contractor’s expense.
REVISION OF SECTION 601
CONCRETE BATCHING

Section 601 of the Standard Specifications is hereby revised for this project as follows:

In subsection 601.06, delete (13) and (17) and replace with the following:

(13) Gallons of water added by truck operator, the time the water was added and the quantity of concrete in the truck each time water is added.

(17) Water to cementitious material ratio.
Section 601 of the Standard Specifications are hereby revised for this project as follows:

In subsection 601.12 (a) delete the fifth paragraph and replace it with the following:

Water shall not be added to the surface of the concrete to assist in finishing operations.

Hand finishing should be minimized wherever possible. The hand finishing methods shall be addressed in the Quality Control Plan for concrete finishing. Hand finished concrete shall be struck off and screeded with a portable screed that is at least 2 feet longer than the maximum width of the surface to be struck off. It shall be sufficiently rigid to retain its shape. Concrete shall be thoroughly consolidated by hand vibrators. Hand finishing shall not be allowed after concrete has been in-place for more than 30 minutes or when initial set has begun. Finishing tools made of aluminum shall not be used.

The Contractor shall provide a Quality Control Plan (QCP) to ensure that proper hand finishing is accomplished in accordance with current Industry standards. It shall identify the Contractor’s method for ensuring that the provisions of the QCP are met. The QCP shall be submitted to the Engineer at the Preconstruction Conference. Concrete placement shall not begin until the Engineer has approved the QCP. The QCP shall identify and address issues affecting the quality finished concrete including but not limited to:

(1) Timing of hand finishing operations
(2) Methodology to place and transport concrete
(3) Equipment and tools to be utilized
(4) Qualifications and training of finishers and supervisors

When the Engineer determines that any element of the approved QCP is not being implemented or that hand finished concrete is unacceptable, work shall be suspended. The Contractor shall supply a written plan to address improperly placed material and how to remedy future hand finishing failures and bring the work into compliance with the QCP. The Engineer will review the plan for acceptability prior to authorizing the resumption of operations.

In subsection 601.14(a) delete the fourth paragraph.
Section 601 of the Standard Specifications is hereby revised for this project as follows:

Delete the fifth paragraph of Subsection 601.05 and replace with the following:

Except for Class BZ concrete, the slump of the delivered concrete shall be the slump of the approved concrete mix design plus or minus 2.0 inch. The laboratory trial mix must produce an average compressive strength at least 115 percent of the required field compressive strength specified in Table 601-1. When entrained air is specified in the Contract for Class BZ concrete, the trial mix shall be run with the required air content.

Delete Subsection 601.17 (b), 601.17 (d) and Table 601-3 and replace with the following:

(b) Slump. Slump acceptance, but not rejection, may be visually determined by the Engineer. Any batch that exceeds the slump of the approved concrete mix design by 2.0 inches will be retested. If the slump is exceeded a second time, that load is rejected. If the slump is greater than 2 inches lower than the approved concrete mix design, the load can be adjusted with a water reducer, or by adding water (if the w/cm allows) and retested.

Portions of loads incorporated into structures prior to determining test results which indicate rejection as the correct course of action shall be subject to reduced payment or removal as determined by the Engineer.

(d) Pay Factors. The pay factor for concrete which is allowed to remain in place at a reduced price shall be according to Table 601-3 and shall be applied to the unit price bid for Item 601, Structural Concrete.

If deviations occur in air content and strength within the same batch, the pay factor for the batch shall be the product of the individual pay factors.

<table>
<thead>
<tr>
<th>Deviations From Specified Air (Percent)</th>
<th>Percent Total Air</th>
<th>Below Specified Strength (psi) [&lt; 4500 psi Concrete]</th>
<th>Pay Factor (Percent)</th>
<th>Below Specified Strength (psi) [≥ 4500 psi Concrete]</th>
<th>Pay Factor (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0-0.2</td>
<td>98</td>
<td>1-100</td>
<td>98</td>
<td>1-100</td>
<td></td>
</tr>
<tr>
<td>0.3-0.4</td>
<td>96</td>
<td>101-200</td>
<td>96</td>
<td>101-200</td>
<td></td>
</tr>
<tr>
<td>0.5-0.6</td>
<td>92</td>
<td>201-300</td>
<td>92</td>
<td>201-300</td>
<td></td>
</tr>
<tr>
<td>0.7-0.8</td>
<td>84</td>
<td>301-400</td>
<td>84</td>
<td>301-400</td>
<td></td>
</tr>
<tr>
<td>0.9-1.0</td>
<td>75</td>
<td>401-500</td>
<td>75</td>
<td>401-500</td>
<td></td>
</tr>
<tr>
<td>Over 1.0</td>
<td>Reject</td>
<td>Over 500</td>
<td>Reject</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>65</td>
<td>501-600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>54</td>
<td>601-700</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>701-800</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>29</td>
<td>801-900</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>901-1000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reject</td>
<td>Over 1000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
REVISION OF SECTION 601
DEPOSITING CONCRETE UNDER WATER

Section 601 of the Standard Specifications is hereby revised for this project as follows:

In subsection 601.12, delete (f) and replace with the following:

(f) Deposit Concrete Under Water. Concrete, except for cofferdam seals, shall not be deposited under water, unless approved by the Engineer. If approved, care shall be exercised to prevent the formation of laitance. Concrete shall not be deposited until all laitance, which may have formed on concrete previously placed, has been removed. Pumping shall be discontinued while depositing foundation concrete if it results in a flow of water inside the forms. Concrete deposited under water shall be carefully placed in a compact mass in its final position by means of a concrete pump and tremie. The discharge or bottom end of the tremie shall be lowered to contact the foundation at the start of the concrete placement and shall be raised during the placement at a rate which will insure that the bottom or discharge end of the tremie is continuously embedded or buried in fresh concrete a minimum of 12 inches. Air and water shall be excluded from the tremie pipe by keeping the pipe continuously filled. The continuity of the placement operation shall be maintained without breaking the seal between the concrete mass and the discharge end of the tremie until the lift is completed. The concrete placement shall not be disturbed after it has been deposited.
REVISION OF SECTION 601
QC TESTING REQUIREMENTS FOR STRUCTURAL CONCRETE

May 8, 2014

Section 601 of the Standard Specifications is hereby revised for this project as follows:

Delete the first paragraph of subsection 601.17 and subsection 601.17(a) and replace with the following:

601.17 Acceptance and Pay Factors. These provisions apply to all concrete. The Contractor shall sample 601 pay items for both QC and QA in accordance with CP 61. The Engineer will witness the sampling and take possession of the QA samples at a mutually agreed upon location. The Contractor shall be responsible for Quality Control (QC) testing for 601 pay items. QC testing shall be performed at least once per day and then once per 50 cubic yards for concrete slump, unit weight and concrete temperature for each 601 pay item.

(a) Air Content. The first three batches at the beginning of each day’s production for each 601 pay item shall be tested by the Contractor’s QC and CDOT’s QA for air content. When the QC and QA air content measurements differ by more than 0.5 percent, both the QC and QA air meters shall be checked in accordance with ASTM C 231. When air content is below the specified limit, it may be adjusted in accordance with subsection 601.08. Successive batches shall be tested by the Contractor’s QC and witnessed by the Engineer until three consecutive batches are within specified limits. After the first three batches, CDOT will follow the random minimum testing schedule. After the first three batches the Contractor shall perform QC testing at a frequency of one random sample per 50 cubic yards. Air content shall not be adjusted after a CDOT QA test.

Subsection 601.19 shall include the following:

The Contractor’s QC testing will not be measured and paid separately, but shall be included in the work.
Section 601 of the Standard Specifications is hereby revised for this project as follows:

In subsection 601.17 (c), delete the first paragraph and replace with the following:

(c) *Strength (When Specified)*. The concrete will be considered acceptable when the running average of three consecutive strength tests per mix design for an individual structure is equal to or greater than the specified strength and no single test falls below the specified strength by more than 500 psi. A test is defined as the average strength of three test cylinders cast in plastic molds from a single sample of concrete and cured under standard laboratory conditions prior to testing. If the compressive strength of any one test cylinder differs from the average by more than 10 percent that compressive strength will be deleted and the average strength will be determined using the compressive strength of the remaining two test cylinders.
Sections 601 and 701 of the Standard Specifications are hereby revised for this project as follows:

In subsection 601.03, first paragraph, the following shall be added to the table:

High-Reactivity Pozzolans  701.04

Subsection 601.03 shall include the following:

Pozzolans shall consist of Fly Ash, Silica Fume and High-Reactivity Pozzolan.

In subsection 601.04, delete the third and fourth paragraphs and replace with the following:

Cementitious material requirements are as follows:

Class 0 requirements for sulfate resistance shall be one of the following:

(1) ASTM C 150 Type I, II or V
(2) ASTM C 595 Type IL, IP, IP(MS), IP(HS) or IT
(3) ASTM C 1157 Type GU, MS or HS
(4) ASTM C 150 Type III cement if it is allowed, as in Class E concrete

Class 1 requirements for sulfate resistance shall be one of the following:

(1) ASTM C 150 Type II or V; Class C fly ash shall not be substituted for cement.
(2) ASTM C 595 Type IP(MS) or IP(HS).
(3) ASTM C 1157 Type MS or HS; Class C fly ash shall not be substituted for cement.
(4) When ASTM C 150 Type III cement is allowed, as in Class E concrete, it shall have no more than 8 percent C₃A. Class C fly ash shall not be substituted for cement.
(5) ASTM C 595 Type IL; having less than 0.10 percent expansion at 6 months when tested according to ASTM C 1012. Class C fly ash shall not be substituted for cement.
(6) ASTM C 595 Type IT; having less than 0.10 percent expansion at 6 months when tested according to ASTM C 1012.

Class 2 requirements for sulfate resistance shall be one of the following:

(1) ASTM C 150 Type V with a minimum of a 20 percent substitution of Class F fly ash by weight
(2) ASTM C 150 Type II or III with a minimum of a 20 percent substitution of Class F fly ash by weight. The Type II or III cement shall have no more than 0.040 percent expansion at 14 days when tested according ASTM C 452
(3) ASTM C 1157 Type HS; Class C fly ash shall not be substituted for cement.
(4) ASTM C 150 Type II, III, or V plus High-Reactivity Pozzolan where the blend has less than 0.05 percent expansion at 6 months or 0.10 percent expansion at 12 months when tested according to ASTM C 1012
(5) ASTM C 1157 Type MS plus Class F fly ash or High-Reactivity Pozzolan where the blend has less than 0.05 percent expansion at 6 months or 0.10 percent expansion at 12 months when tested according to ASTM C 1012.

(6) A blend of portland cement meeting ASTM C 150 Type II or III with a minimum of 20 percent Class F fly ash by weight, where the blend has less than 0.05 percent expansion at 6 months or 0.10 percent expansion at 12 months when tested according to ASTM C 1012.

(7) ASTM C 595 Type IP(HS).

(8) ASTM C 595 Type IL plus Class F fly ash or High-Reactivity Pozzolan where the blend has less than 0.05 percent expansion at 6 months or 0.10 percent expansion at 12 months when tested according to ASTM C 1012.

(9) ASTM C 595 Type IT; having less than 0.05 percent expansion at 6 months or 0.10 percent expansion at 12 months when tested according to ASTM C 1012.

Class 3 requirements for sulfate resistance shall be one of the following:

A blend of portland cement meeting ASTM C 150 Type II, III, or V with a minimum of a 20 percent substitution of Class F fly ash by weight, where the blend has less than 0.10 percent expansion at 18 months when tested according to ASTM C 1012.

(1) ASTM C 1157 Type HS having less than 0.10 percent expansion at 18 months when tested according to ASTM C 1012. Class C fly ash shall not be substituted for cement.

(2) ASTM C 1157 Type MS or HS plus Class F fly ash or High-Reactivity Pozzolan where the blend has less than 0.10 percent expansion at 18 months when tested according to ASTM C 1012.

(3) ASTM C 150 Type II, III, or V plus High-Reactivity Pozzolan where the blend has less than 0.10 percent expansion at 18 months when tested according to ASTM C 1012.

(4) ASTM C 595 Type 1L plus High-Reactivity Pozzolan where the blend has less than 0.10 percent expansion at 18 months when tested according to ASTM C 1012.

(5) ASTM C 595 Type IP(HS) or IT having less than 0.10 percent expansion at 18 months when tested according to ASTM C 1012.

(6) ASTM C 595 Type IL with a minimum of a 20 percent substitution of Class F fly ash by weight, where the blend has less than 0.10 percent expansion at 18 months when tested according to ASTM C 1012.

When fly ash or High-Reactivity Pozzolan is used to enhance sulfate resistance, it shall be used in a proportion greater than or equal to the proportion tested in accordance to ASTM C1012, shall be the same source and it shall have a calcium oxide content no more than 2.0 percent greater than the fly ash or High-Reactivity Pozzolan tested according to ASTM C 1012.

In subsection 601.05 delete the first paragraph and replace with the following:

601.05 Proportioning. The Contractor shall submit a Concrete Mix Design for each class of concrete being placed on the project. Concrete shall not be placed on the project before the Concrete Mix Design Report has been reviewed and approved by the Engineer. The Concrete Mix Design will be reviewed and approved following the procedures of CP 62. The Concrete Mix Design will not be approved when the laboratory trial mix data are the results from tests performed more than two years in the past or aggregate data are the results from tests performed more than two years in the past. The concrete mix design shall show the weights and sources of all ingredients including cement, pozzolan, aggregates, water, additives and the water to cementitious material ratio.
(w/cm). When determining the w/cm, the weight of cementitious material (cm) shall be the sum of the weights of the cement, fly ash, silica fume and High-Reactivity Pozzolan.

In subsection 601.05, delete the 12\textsuperscript{th}, 13\textsuperscript{th}, 14\textsuperscript{th}, 15\textsuperscript{th}, and 16\textsuperscript{th} paragraphs and replace with the following:

The Concrete Mix Design Report shall include Certified Test Reports showing that the cement, fly ash, High-Reactivity Pozzolan and silica fume meet the specification requirements and supporting this statement with actual test results. The certification for silica fume shall state the solids content if the silica fume admixture is furnished as slurry.

For all concrete mix designs with ASTM C150 cements, up to a maximum of 20 percent Class C, 30 percent Class F or 30 percent High-Reactivity Pozzolan by weight of total cementitious material may be substituted for cement.

For all concrete mix designs with ASTM C595 Type IL cements, up to a maximum of 20 percent Class C, 30 percent Class F or 30 percent High-Reactivity Pozzolan by weight of total cementitious material may be substituted for cement.

For all concrete mix designs with ASTM C595 Type IP, IP(MS), IP(HS) or IT cements; fly ash or High-Reactivity Pozzolan shall not be substituted for cement.

For all concrete mix designs with ASTM C1157 cements, the total pozzolan content including pozzolan in cement shall not exceed 30 percent by weight of the cementitious material content.

When the Contractor’s use of fly ash or High-Reactivity Pozzolan results in delays to the project, when it is necessary to make changes in admixture quantities, the source, or the Contractor performs , the cost of such delays and corrective actions shall be borne by the Contractor.

The Contractor shall submit a new Concrete Mix Design Report meeting the above requirements when a change occurs in the source, type, or proportions of cement, fly ash, High-Reactivity Pozzolan, silica fume or aggregate. When a change occurs in the source of approved admixtures, the Contractor shall submit a letter stamped by the Concrete Mix Design Engineer approving the changes to the existing mix design. The change will need to be approved by the Engineer prior to use.

In subsection 601.06, second paragraph, delete (9) and replace with the following:

(9) Type, brand, and amount of cement, fly ash and High-Reactivity Pozzolan

In subsection 601.06, delete (a) and replace with the following:

(a) \textit{Portland Cement, Fly Ash, High-Reactivity Pozzolan and Silica Fume}. These materials may be sacked or bulk. No fraction of a sack shall be used in a batch of concrete unless the material is weighed.

All bulk cement shall be weighed on an approved weighing device. The bulk cement weighing hopper shall be sealed and vented to preclude dusting during operation. The discharge chute shall be so arranged that cement will not lodge in it or leak from it.

Separate storage and handling equipment shall be provided for the fly ash, silica fume and High-Reactivity Pozzolan. The fly ash, silica fume, and High-Reactivity Pozzolan may be weighed in the cement hopper and discharged with the cement.
In subsection 701.01 delete and replace the second paragraph with the following:

All concrete, including precast, prestressed and pipe shall be constructed with one of the following hydraulic cements, unless permitted otherwise.

- ASTM C 150 Type I
- ASTM C 150 Type II
- ASTM C 150 Type V
- ASTM C 595 Type II
- ASTM C 595 Type IP
- ASTM C 595 Type IP(MS)
- ASTM C 595 Type IP(HS)
- ASTM C 1157 Type GU, consisting of no more than 15 percent limestone
- ASTM C 1157 Type MS, consisting of no more than 15 percent limestone
- ASTM C 1157 Type HS, consisting of no more than 15 percent limestone

In subsection 701.02 add the following after the first paragraph:

Blending of pozzolans according to ASTM D5370 is permitted to meet the requirements of ASTM C 618.

Add subsection 701.04 immediately following subsection 701.03 as follows:

**701.04 High-Reactivity Pozzolans.** High-Reactivity Pozzolans (HRP) shall conform to the requirements of AASHTO M321. HRPs are but not limited to metakaolin, rice hull ash, zirconium fume, ultra-fine fly ash, and fume from the production of 50 percent ferrosilicon (with SiO2 less than 85 percent).

HRPs shall meet the following optional requirement of AASHTO M321: The sulfate expansion at 14 days shall not exceed 0.045 percent.

HRP shall be from a preapproved source listed on the Department’s Approved Products List. The HRP intended for use on the project shall have been tested and accepted prior to its use. Certified Test Reports showing that the HRP meets the specification requirements and supporting this statement with actual test results shall be submitted to the Engineer.

The HRP shall be subject to sampling and testing by the Department. Test results that do not meet the physical and chemical requirements may result in the suspension of the use of HRP until the corrections necessary have been taken to ensure that the material conforms to the specifications.
Section 603 of the Standard Specifications is hereby revised for this project as follows:

Delete the first paragraph of subsection 603.09 and replace with the following:

603.09  Backfilling. After the conduit or section of conduit is placed, it shall be inspected before any backfill is placed. Reinforced concrete pipe (RCP) shall be visually inspected in accordance with AASHTO LRFD Bridge Construction Specifications, Section 27.6. Conduit found to be damaged shall be replaced, and conduit found to be out of alignment or unduly settled shall be taken up and relaid. The trench shall then be backfilled with material in accordance with Section 206.

In subsection 603.09, delete the fifth paragraph.

Add subsection 603.091 immediately following subsection 603.09 as follows:

603.091  Deflection Testing of Metal and Plastic Pipe. After a metal or plastic pipe is backfilled and earthwork over the pipe is complete to the top of the subgrade, the pipe deflection shall be measured in the presence of the Engineer. The maximum allowable deflection shall be 5 percent. Deflection is a reduction in the nominal diameter of the pipe measured in any direction. Measurement shall be made using a mandrel, laser profile, or other method approved by the Engineer. Measurement shall be made 30 days or more following the pipe installation. Pipe having any deflections in excess of 5 percent at any location within the pipe shall be removed and reinstalled at the Contractor's expense. Pipe that is permanently deformed or damaged in any way shall be replaced at the Contractor's expense. Replaced pipe shall be retested 30 days or more after the installation in accordance with the method described above.
Sections 603, 624, 705, 707 and 712 of the Standard Specifications are hereby revised for this project as follows:

Subsection 603.07 shall include the following:

Joint systems for siphons, irrigation systems, and storm drains shall be watertight.

Subsection 603.07(c) shall include the following:

Watertight joint systems for plastic pipe shall conform to subsection 705.03.

Subsection 624.02 shall include the following material type and requirement:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
<th>Subsection</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALT2 CSP</td>
<td>Aluminized Corrugated Steel Pipe Type 2</td>
<td>707.11</td>
</tr>
<tr>
<td>Plastic</td>
<td>Polyvinyl Chloride (PVC), Polyethylene (PE), Steel Reinforced Polyethylene (SRPE), and Polypropylene (PP)</td>
<td>712.13</td>
</tr>
</tbody>
</table>

In subsection 624.02 delete the third paragraph and replace it with the following:

Connecting bands shall receive the same corrosion protection as the pipe with which they are used. Coatings conforming to the requirements of Sections 706 and 707 will be permitted as applicable. Connecting bands and pipe extensions shall be of similar metal, or of non-metallic material, to avoid galvanic corrosion.

End sections for concrete or metal pipe shall be the same material as the pipe and meet the requirements for the same class as that specified for the pipe in accordance with Table 624-1.

Plastic end sections shall not be used. When plastic pipe is to be installed with end sections, steel or concrete end sections meeting the same class as that specified for the pipe in accordance with Table 624-1 shall be used.

In subsection 624.02 delete the fourth paragraph and replace it with the following:

The Contractor may furnish any pipe material allowed in Table 624-1 for the class of pipe specified in the Contract except for storm drains. The Contractor may furnish RCP, PVC, SRPE or PP allowed in Table 624-1 for the class of pipe specified in the Contract for storm drains. The Contractor shall state at the preconstruction conference the pipe materials intended to be furnished.

In subsection 624.02 delete Table 624-1 and replace it with the following:
### TABLE 624-1
Materials Allowed for Class of Pipe

<table>
<thead>
<tr>
<th>Material Allowed**</th>
<th>Class of Pipe*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>CSP</td>
<td>Y</td>
</tr>
<tr>
<td>ALT2 CSP</td>
<td>Y</td>
</tr>
<tr>
<td>Bit. Co. CSP</td>
<td>Y</td>
</tr>
<tr>
<td>A.F. Bo. CSP</td>
<td>Y</td>
</tr>
<tr>
<td>CAP</td>
<td>Y</td>
</tr>
<tr>
<td>PCSP - both sides</td>
<td></td>
</tr>
<tr>
<td>PVC</td>
<td></td>
</tr>
<tr>
<td>PE</td>
<td></td>
</tr>
<tr>
<td>PP</td>
<td></td>
</tr>
<tr>
<td>SRPE</td>
<td></td>
</tr>
<tr>
<td>RCP (SP0)</td>
<td></td>
</tr>
<tr>
<td>RCP (SP1)</td>
<td></td>
</tr>
<tr>
<td>RCP (SP2)</td>
<td></td>
</tr>
<tr>
<td>RCP (SP3)</td>
<td></td>
</tr>
</tbody>
</table>

* As determined by the Department in accordance with the CDOT Pipe Selection Guide. Determination is based on abrasion and corrosion resistance.

** Y=Yes; N=No.

1. Coated Steel Structural Plate Pipe of equal or greater diameter, conforming to Section 510, may be substituted for Bit. Co. CSP at no additional cost to the project.
2. Aluminum Alloy Structural Plate Pipe of equal or greater diameter, conforming to Section 510, may be substituted for CAP at no additional cost to the project.
3. SP= Class of Sulfate Protection required in accordance with subsection 601.04 as revised for this project. RCP shall be manufactured using the cementitious material required to meet the SP class specified.
4. For pipe classes 6 and 10, the RCP shall be coated in accordance with subsection 706.07 when the pH of either the soil or water is less than 5. The Contract will specify when RCP is to be coated.
5. Concrete shall have a compressive strength of 4500 psi or greater.

Subsection 624.03 shall include the following:

Joint systems for siphons, irrigation systems, and storm drains shall be watertight. Watertight joint systems for plastic pipe shall conform to subsection 705.03.

Installation for Aluminized Corrugated Steel Pipe Type 2 shall conform to all requirements for Corrugated Steel Pipe (CSP) including the fill height tables and requirements in Standard Plan M-603-1.

Subsection 705.03 shall include the following:

Watertight joint systems for plastic pipe shall be in accordance with ASTM D3212.
Add subsection 707.11 as follows:

707.11 Aluminized Corrugated Steel Pipe Type 2. Aluminized Corrugated Steel Pipe Type 2 shall conform to the requirements of AASHTO M 274.

In subsection 712.13 (b), delete (1) and (2) and replace with the following:

(1) AASHTO M 304 (Profile) for nominal pipe sizes of 4 to 36 inches.
(2) ASTM F794 (Profile) for nominal pipe sizes 4 to 36 inches with 46 psi minimum pipe stiffness

Add subsection 712.13 and (c) and (d) as follows:

(c) Polypropylene (PP) Pipe.

AASHTO M330 for nominal pipe sizes of 12 to 60 inches with the following exceptions: Type S and Type SP are acceptable (Type C, Type CP and Type D will not be accepted).

The Contractor shall provide a polypropylene (PP) pipe product that is prequalified under the AASHTO National Transportation Product Evaluation Program (NTPEP). Only products from suppliers whose manufacturing plant and PP pipe products comply with this specification shall be placed by the Contractor. The current list of plants and PP pipe products that meet these requirements is located at: www.ntpep.org. The Contractor shall use plants listed as compliant and a size listed in the NTPEP reports on PP Thermoplastic Pipe. Every Certificate of Compliance (COC) on each diameter PP pipe product delivered to the project shall include a statement that the product has been manufactured at a NTPEP inspected plant, has been tested by NTPEP, has a NTPEP product number, and is currently on the NTPEP website. The COC shall confirm that the supplied pipe meets the applicable specification limits in subsection 712.13. Manufacturers shall remain acceptable to CDOT as long as the results of verification samples and performance in the field are satisfactory. Any changes in the PP pipe formulation will require re-submittal for prequalification testing by NTPEP.

(d) Steel Reinforced Polyethylene (SRPE). SRPE pipe shall be AASHTO MP 20 ribbed pipe for nominal pipe sizes 12 to 60 inches with the following exceptions:

(1) Nominal pipe sizes 30 to 60 inches are acceptable; nominal pipe sizes 12 to 27 inches will not be accepted.
REVISION OF SECTION 612
DELINEATORS

Section 612 of the Standard Specifications is hereby revised for this project as follows:

In subsection 612.02(a) 1, delete the last sentence, and replace with the following:

Posts shall conform to the requirements shown on the plans, and reflectors shall conform to the requirements in subsections 713.07 and 713.10.

In subsection 612.02(a) 2.B, delete the first paragraph, and replace with the following:

B. Base Anchoring. The posts shall be designed to facilitate a permanent installation that resists overturning, twisting, and displacement from wind and impact forces. It shall have an anchoring depth of 18 to 24 inches. Actual depth shall be as recommended by the manufacturer. If soil conditions prohibit anchoring depth to less than 18 inches, installation shall be in accordance with manufacturer’s recommendations.
Sections 614 and 713 of the Standard Specifications are hereby revised for the project as following:

Delete subsection 614.04 and replace with the following:

**614.04 Sign Panels.** Sign panel materials shall conform to Section 713 and to the details shown on the plans. Sign panels shall be produced in accordance with the retroreflective sheeting manufacturer’s recommendations. Layout and font design shall conform to the “Standard Highway Signs” published by FHWA. Font selection for guide sign legends shall conform to the most recent version of the “CDOT Sign Design Manual”. Sign layouts for special signs shall be in accordance with the detailed sign layouts proved in the plans or by the Engineer.

Silk screen and digital process figures shall be in accordance with the plans and series figures described in the current editions of “Standard Highway Signs”, published by the FHWA, and the “Colorado Supplement to Standard Highway Signs”.

All exposed lockbolt fastener heads on the faces of the sign panels shall be covered with material matching the background of the panel.

All sign panels shall be identified with the month and year that the sign was manufactured. The date shall be located on the lower right side of the back of the sign panel and shall be approximately ¼ inch high. The date shall be stamped or adhered onto the sign panel material for a permanent record. This work will be paid for as part of the Item.

In subsection 713.01, delete Table 713-1 and replace with the following:

<table>
<thead>
<tr>
<th>Application</th>
<th>Aluminum</th>
<th></th>
<th>Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sign panels</td>
<td>B 449¹</td>
<td>6061-T6</td>
<td>A 653²</td>
</tr>
<tr>
<td></td>
<td>B 921¹</td>
<td>5052-H36 5052-H38</td>
<td></td>
</tr>
<tr>
<td>Traffic controller cabinets</td>
<td>B 209</td>
<td>6061-T6</td>
<td>A 709 Grade 36</td>
</tr>
<tr>
<td>Clip bolts</td>
<td>B 211</td>
<td>2024-T4</td>
<td></td>
</tr>
<tr>
<td>Locknuts or steel nuts and bolts</td>
<td>B 211</td>
<td>2014-T4</td>
<td>A 307</td>
</tr>
<tr>
<td>Clips and backing angles</td>
<td>B 221</td>
<td>6061-T6</td>
<td></td>
</tr>
</tbody>
</table>

¹In lieu of ASTM treatment, aluminum sign blanks shall receive a Class 2 anodized coating prior to the placement of retroreflective sheeting.

² Steel sheets shall have a Z600 zinc coating in accordance with ASTM A 653 and a light phosphate coating. Phosphate coating of 3.5 oz./sq. ft. will be required for application with reflective sheeting. Nuts and bolts shall be galvanized or cadmium plated.

Delete subsection 713.04 and replace with the following:

**713.04 Sign Message Materials.** The legend, border, and overlay shall be used in accordance with the sheeting manufacturer’s recommendation. Retroreflective sheeting background material shall be approved in the Department’s Approved Product List; and the retroreflective sheeting background material shall be the type as specified on the plans. At a minimum, ASTM 4956 Type IV shall be used for ground mount signs. ASTM D4956 Type XI shall be used for Class III overhead signs.
For Class III overhead signs, the legend and borders shall be ASTM D4956 Type XI sheeting.

All reflective sheeting shall be sealed at the seams and edges as recommended by the manufacturer.

Delete subsection 713.06 and replace with the following:

713.06 (unused)
Section 618 of the Standard Specifications is hereby deleted for this project and replaced with the following:

**DESCRIPTION**

618.01 This work consists of fabricating, furnishing and installing prestressed concrete members in accordance with the requirements of the Contract.

This work includes the furnishing and installation of all appurtenant items necessary for the particular prestressing systems to be used, including but not limited to ducts, anchorage assemblies and grout used for pressure grouting ducts.

For cast-in-place prestressed concrete, the term "member" as used herein shall be considered to mean the concrete which is to be prestressed.

The term "tendon" as referenced herein shall be considered to mean the prestressing steel within a duct.

Both temporary and permanent post-tensioning shall comply with the requirements of this Section.

The term temporary post-tensioning is referring to the post-tensioning required to control stresses during handling and erection of precast elements.

**MATERIALS**

618.02 Materials shall conform to the following:

Anchorage devices shall meet the requirements of subsection 714.02. Prestressing steel shall meet the requirements of subsection 714.01.

Elastomeric bearing pads shall meet the requirements of subsection 512.

All reinforcing and embedment item supports, bolsters, chairs, and spacers shall be CDOT approved. These items shall be plastic, rubber, or epoxy coated at all areas that will contact external concrete surfaces, unless otherwise shown on the plans.

(a) **Prepackaged Grout for Post-tensioned Ducts.**

1. Water. The water used in the grout shall conform to subsection 712.01.

2. Shall meet the requirements of subsection 618.09(b). Grout.

(b) **Steel and Metal for Prestress Members.** All steel and metal products incorporated into the work shall meet the requirements of Section 106. The Contractor shall keep Certified Mill Test Reports (CMTR's) on file for all steel and metal products used, and shall furnish copies of CMTR's when requested.

Galvanizing and metallizing of steel products shall be done in accordance with the product applicable ASTM method. The product shall be galvanized after welding and fabrication is complete. Minor repair of galvanizing shall be brush coated with an approved zinc-rich compound that is acceptable to the QA Representative.

Materials and fabrication procedures shall conform to ASTM or ANSI / AWS requirements. The materials and work shall conform to the following requirements and specifications, unless otherwise indicated in the Contract.

1. Reinforcing Bars. All reinforcing bar material shall be Grade 60 minimum and shall conform to ASTM A 615, or ASTM A 706; epoxy coated bars shall also meet ASTM D 3963. Reinforcing bars that require welding shall conform to ASTM A 706. Welding of A 706 bars shall be done in accordance with ANSI /AWS D.1.4.

2. Welded Wire Reinforcement. Steel welded wire reinforcement for concrete reinforcement shall conform to ASTM A497.

3. Plate Steel. All plate steel shall conform to ASTM A 709 Grade 36 specifications. Fabrication and welding of plate steel products shall be done according to ANSI / AWS D.1.1.
4. Steel and metal products shall be free of loose rust and foreign substances before incorporation into the cast product.

The presence of rust on strand shall not necessarily be cause for rejection. Light rust and rust that does not result in visible pitting of the prestressing steel with the unaided eye shall be acceptable. Prior to evaluation rust shall be removed from representative lengths of prestressing strand by heavy duty scouring pads or wire brush. After rust removal, visual comparisons shall be made to picture sets in the article “Evaluation of Degree of Rusting on Prestressed Concrete Strand” published in the 1992 May-June edition of the PCI Journal. Surface conditions comparable to picture sets 1 through 3 shall be acceptable, while conditions comparable to picture sets 4 and greater shall be cause for rejection of the prestressing strand.

(c) Concrete for Pretensioned and Combination Tensioned Products. Materials for Concrete class PS shall meet the requirements specified in the following subsections:

<table>
<thead>
<tr>
<th>Material</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic Cement</td>
<td>701.01</td>
</tr>
<tr>
<td>Fly Ash</td>
<td>701.02</td>
</tr>
<tr>
<td>Fine Aggregate</td>
<td>703.01</td>
</tr>
<tr>
<td>Coarse Aggregate</td>
<td>703.02</td>
</tr>
<tr>
<td>Curing Materials</td>
<td>711.01</td>
</tr>
<tr>
<td>Air Entraining Admixtures</td>
<td>711.02</td>
</tr>
<tr>
<td>Chemical Admixtures</td>
<td>711.03</td>
</tr>
<tr>
<td>Water</td>
<td>712.01</td>
</tr>
</tbody>
</table>

(d) Concrete and Steel for Other Members. Concrete for other members shall conform to the requirements of Section 601 and the plans. Reinforcing steel for other members shall conform to the requirements of Section 602.

CONSTRUCTION REQUIREMENTS

618.03 Prestressed Members. Members may be pretensioned, post-tensioned, or a combination of pretensioned and post-tensioned. Members shall be fabricated and finished as shown in the Contract.

Minimum cover for prestressing steel shall be 1½ inches, unless otherwise shown in the Contract. Minimum clearance for reinforcing steel shall be 1 inch unless otherwise shown in the Contract.

If the plans show only pretensioning details, use of a post-tensioning system will be allowed only if complete details of all necessary modifications are approved by the Engineer of Record.

Cast-in-place members shall be post-tensioned unless otherwise shown on the plans. All falsework for cast-in-place members shall remain in place until all post-tensioning and grouting has been completed and accepted by the Engineer.

618.04 Shop Drawings.

(a) General. The Contractor shall furnish shop drawings in conformity with subsection 105.02 for all prestressed components. When the Contractor's Engineer completes or revises design details or engineering drawings, then those engineering drawings and details that are submitted to the Engineer shall contain the endorsement seal of a Professional Engineer registered in the State of Colorado. CDOT review of the shop drawings does not relieve the Contractor of the responsibility for the adequacy of the prestressed members. Minor changes to design details or engineering drawings that do not represent a significant change to the original design will not require a Professional Engineer seal. The Contractor shall submit supporting calculations for these changes along with the shop drawings.
(b) "Pretensioned Members." The shop drawings shall include the following:

1. Superstructure Framing Plan.
2. All unit dimensions.
3. Location and arrangement of prestressing strands.
4. Initial and final jacking forces.
5. Location, description, and detail of structural reinforcing items, excluding minor items used for field erection.
6. Location of all hold-down devices.
7. Location and description of all plates.
9. Blockout and keyway dimensions, if any.
10. Location and detail of debonded strands.
11. Strand de-tensioning sequence.

(c) "Post-tensioned Members." The shop drawings for post-tensioned members shall show the following:

1. Strand and bar properties, including material type, modulus of elasticity, ultimate strength, diameter, and cross-sectional area assumed in the design.
2. Duct properties, including material type, and minimum inside and maximum outside diameters, and friction coefficients of the duct-strand system if different from shown on the plans.
3. The position and profile of the ducts and tendons along the length of the member. Each duct position shall be defined at tenth points along the length of the member. The minimum clearance from the edge of concrete to the edge of a duct shall be shown.
4. Location of closure pours and associated duct splices and details of duct splice, including the details and specifications of the shrink sleeve material.
5. The maximum offset between the center of the duct and the center of force in the duct for each unique strand and bar and duct combination. The resultant force of all permanent tendons in the member shall match the profile indicated on the plans.
6. The initial and final force at each anchorage. The initial force is defined as the largest force at each anchorage before anchor set and after friction losses. The final force is defined as the residual force remaining after anchor set and long term losses.
7. Complete dimensions and properties necessary to fabricate and install each unique anchorage device, including the type of materials, yield strengths, distribution plates, wedges, trumpets, anchorage blocks, and other appurtenant items. Adjacent reinforcement shall be detailed showing how it will coordinate with the anchorage device and its reinforcement.
8. The dimensions and properties necessary to fabricate and install the bursting, splitting, and other reinforcement required by the prestressing system, as shown on the plans or as proposed by the Contractor. Included shall be cross-sectional areas, yield strength, the location of the reinforcement, and the diameter and pitch of the spirals. If no additional bursting steel is required, it shall be so stated on the shop drawings.
9. The minimum length of strand or bar projection at the live ends and accessible dead ends.
10. The preload force for each unique tendon. The preload force is defined as 20 percent of the jacking force.
11. The required total jacking force for each unique tendon.
12. The total final elongation, after dead and live end anchor sets, and the measurable elongation for each tendon. The measurable elongation is defined as the total elongation at the live end after preload while the stressing equipment is tensioning the tendon to the total jacking force. The tendon length used for calculations shall include the full length of strand that is being stressed.
13. The sequence of stressing, including temporary and permanent post-tensioning.
14. Blockout or buildout concrete dimensions and reinforcement details.
(15) If the Contractor elects to submit an alternative system, as defined in subsection 618.07(c), the Contractor shall also provide the following, as appropriate.

If the anchorage device will differ from what is shown on the plans, the Contractor shall submit calculations or manufacturer test certification consistent with the Contract. The calculations shall show the complete design of the anchorage device, including splitting steel, bursting reinforcement, the distribution plate, and the bearing stresses transmitted to the concrete by the anchorage device. The manufacturer's test certification shall certify the adequacy of the anchorage device. The shop drawings shall reflect the anchorage device design.

If the flare of the tendons is different from what is shown on the plans, the Contractor shall submit design and details of appropriate reinforcement and concrete dimensions to accommodate the flare.

Along with the shop drawing details, six copies of computations for friction losses, calculated measurable elongations, the maximum offset between the center of force and center of duct for each unique tendon, and the stressing sequence shall be submitted for review. The friction losses shall be determined in accordance with the plans and as provided for in the current "AASHTO LRFD Bridge Design Specifications."

(d.) For Combination Tensioned Members refer to 618.04 (b) and (c).

618.05 Notification of Fabrication for Pretensioned and Combination Tensioned Members.

(a) Start of Work. Prior to beginning the work, the Contractor shall provide notice to the Engineer and the Quality Assurance (QA) Representative, as defined in subsection 618.06(a), so that QA services may be provided. The notice shall be at least seven days before fabrication begins.

The anticipated production schedule, including the start of work, phase work and shipment dates shall be submitted in writing to the QA Representative before any work begins. Fabrication shall not be started until the shop drawings have been returned with the Engineer's review stamp, indicating Reviewed, no exception taken; or Reviewed, revise as noted; or Resubmit, revise as noted in accordance with subsection 105.02, and delivered to the Contractor's site of fabrication.

(b) Production Schedule Changes. Accelerated changes to the proposed production schedule, including start of work, phase work, and shipment dates, shall require advance written notification be provided to the Engineer and the QA Representative. The written notice of change shall be received at least 48 hours before fabrication begins, unless otherwise approved in writing by the Engineer or the QA Representative.

(c) Notice of Shipment. The QA Representative shall be notified in writing, at least 72 hours before shipment of prestressed members to the job site.

(d) Notification. Failure to notify the Engineer or the designated QA Representative as described in this section may be cause for rejection.

618.06 Inspection of Pretensioned, Post-tensioned and Combination Tensioned Members.

(a) Quality Control and Quality Assurance. Quality Control (QC) of prestressed concrete fabrication is the responsibility of the Contractor. The Contractor shall designate a QC Manager who shall be responsible for product quality requirements as defined in the specifications and the Contractor's approved QC plan (QCP). The QC Manager shall possess and maintain certification at Level II minimum, from the Prestressed Concrete Institute (PCI), or be a licensed Professional Engineer in the State of Colorado, and shall have one year minimum of construction related experience. The QC Manager shall not be supervised by the Contractor's production section. If grouting for post-tensioning ducts of combination tensioned members is done by the precast girder fabricator, the QC Manager shall possess and maintain an American Segmental Bridge Institute (ASBI) Certified Grouting Technician Certificate. If prestressing, duct and anchorage installation, inspection of duct and anchorage stressing of tendons, air testing of ducts, or grouting of ducts of multi-strand bonded tendons of the post-tensioning system for combination tensioned members is done by the precast girder fabricator the QC Manager shall possess a PTI Level I – Bonded Tendon Training Certificate.
Quality Assurance (QA) and product acceptance are the prerogatives of the Engineer. The QA Representative acts for and in behalf of the Engineer on all matters within the scope of the contract documents, as delegated by the Engineer. QA administration will be performed to the extent necessary to assure contract compliance. The QA Representative shall possess the American Segmental Bridge Institute Grouting Certification Training.

Repeated out of tolerance work, including dimensional non-conformance, shall be considered as recurring deficiencies. Recurring deficiencies shall be considered as evidence that required QC is not being provided. When the QA Representative determines that fabrication operations are producing recurring defects that do not conform to the Contract and the QCP requirements, the Contractor will be notified that the present work is unacceptable. Work shall not continue until the QC Manager has submitted a written proposal addressing corrective procedures that the Contractor will take to prevent recurrence of the non-conforming work. Fabrication shall not resume until the proposal has been reviewed and accepted in writing by the QA Representative.

(b) **Quality Control Plan (QCP).** The Contractor shall submit a written QCP to the QA Representative prior to the beginning of fabrication. The QCP shall be reviewed and approved in writing by the Contractor’s QC Manager. The QCP shall list all methods utilized by the Contractor to ensure that the work conforms to contract requirements. The QC section is responsible for establishing the QCP, as well as conformance to the QCP. Fabrication shall not begin until the QCP has been reviewed and accepted in writing by the QA Representative.

If work methods for a specific project or product are not listed in the original QCP, the Contractor shall submit written addenda addressing the proposed methods that are necessary to meet contract requirements. Fabrication shall not begin until the addenda have been reviewed and accepted in writing by the QA Representative.

The QCP shall address the following:

1. Names and qualifications of the QC Manager and personnel conducting inspection and testing. This list shall be updated when changes in personnel occur.
2. List of material suppliers, post-tensioning system supplier, post-tensioning grout supplier and certified testing agencies used; the list shall be updated when vendors change.
3. Materials sampling and testing schedule, showing testing methods and frequencies.
4. QC inspection methods and procedures for all stages of fabrication operations.
5. Methods for curing products and test specimens.
6. Method and sequence for tensioning strands, including methods used for verifying equal distribution of jacking forces.
7. Method and sequence of de-tensioning strands and procedure.
8. Post-tensioning system. The responsible representative meeting the requirements of subsection 618.06(b)(8) shall possess an “American Segmental Bridge Institute (ASBI) Certified Grouting Technician” certificate and a PTI Level 1 – Bonded Tendon Training certificate. Duct and anchorage inspection schedule, duct splices at closure pour inspection schedule, and onsite duct air pressure testing schedule, including name(s) of the responsible representatives who will conduct inspections and testing.
9. Written report format for materials sampling, testing, and inspection for all phases of the work.
10. Copies of all concrete mix designs to be used, including mix design computations and test data.
11. Provisions for fabrication operations during cold, windy, or hot weather conditions.
12. Procedures for patching small production holes and holes left by strand hold-down devices.
13. Procedures for identifying, evaluating and reporting defects, including dimensional non-conformance, discovered during QC/QA inspections and testing.
14. Procedures for notifying the QA Representative of structural defects, and submittal of written proposal for repairs.
(15) Provisions for contingency operation when concrete delivery is interrupted due to malfunction of equipment during fabrication.

(c) **Frequency.** QC inspection and testing at all intervals of duct and anchorage placement, duct splices at closure pours, onsite duct air pressure tests and forming, tensioning, steel and concrete placement, curing, and storage operations shall be performed in accordance with the accepted QCP. The QCP shall contain provisions for increased frequencies of inspection and testing when operations or products do not conform to the Contract.

(d) **Written Records and Reports.** The QC Manager shall review and submit the following completed records and reports to the QA Representative before the product receives acceptance by the QC section:

1. Prestressing Steel - Tensioning reports for each setup, showing the jacking force calculations; initial and final jacking force used; calculated and final net measured elongation; applicable stressing corrections for seating, slippage, shortening, rotation movement, and temperature; Certified Mill Test Reports for prestressing steel used; jack identification number, date and time of stressing.

2. Concrete - A daily report of each mix design used, showing the fresh concrete slump, temperature, unit weight, and air content (if specified). The daily report shall also include the following data:
   1. date and time of casting
   2. bed and setup location
   3. ambient conditions
   4. total cubic yards placed
   5. girder mark and unique sub-mark identifications
   6. actual product curing temperature charts or graphs
   7. actual curing enclosure humidity charts or graphs
   8. average release strength in psi
   9. date and time of release strength
   10. copies of individual batch tickets when requested by the QA Representative

3. Pre-pour Inspection Records shall include the items to be checked as listed in the QCP.

4. Post-pour Inspection Records shall include the items to be checked as listed in the QCP. These records shall include all discovered variances from product dimensional tolerances.

5. Report of minor repairs made to each individual product.

6. The following written records shall be submitted to the QA Representative before product shipment:
   1. Elastomeric Bearing Pads - Product manufacturer's certification and supplier's letter of compliance.
   2. Length measurement of beams within three days prior to shipping.
   3. Product camber measurement within seven days prior to shipping.

7. Steel and Metal. For reinforcing bars, welded wire reinforcement, plate steel, and miscellaneous steel and metal products incorporated into the work, QC Manager shall review and maintain all certified mill test reports (CMTRs). QC Manager shall certify in writing that all steel and metal products comply with the Contract. When requested, QC Manager shall furnish copies of CMTRs to the QA Representative.

8. Post-tensioning Ducts. The responsible representative meeting the requirements of subsection 618.06 (b)(8) shall submit to the QA Representative a letter certifying that the ducts, duct splices, and anchorages are installed according to the Contract and that they have been inspected by the responsible representative of the post-tensioning system supplier and adequately held an air pressure after stressing and before grouting.

After stressing and before grouting, install all grout caps, inlets and outlets and test the duct with compressed air to determine if duct connections require repair. In the presence of the Engineer,
pressurize the duct to 30 psi and lock-off the outside air source. Record pressure loss for one minute. A pressure loss of 15 psi is acceptable for ducts having a length equal to or less than 150 feet and a pressure loss of 9 psi is acceptable for ducts longer than 150 feet. If the pressure loss exceeds the allowable, repair leaking locations using methods approved by the Engineer and retest.

618.07 Fabrication.

(a) Pretensioning - General. Prestressing shall be done with calibrated jacking equipment that conforms to the requirements of subsection 618.10. Strands shall be tensioned in accordance with the approved sequence as indicated in the QCP. All indicating dials shall be at least 6 inches in diameter; calibrated digital display equipment is also acceptable.

The stressing sheet shall show the measurements, factors and computations for tension and elongation, including all stressing corrections; if these factors are not shown on the stressing sheet, they must be submitted with the shop drawing and calculation index. The applicable stressing corrections shall be applied at the time of final stressing. Before using any stressing correction for friction, the need for corrections shall be proven by load cell or dynamometer checks at both ends of the setup. Temporary overstressing shall not exceed 80 percent of the minimum ultimate tensile strength of the prestressing steel. Tensioned strands shall not be seated during temporary overstressing.

Tensioned strands shall maintain vertical and horizontal position, within allowable tolerances, as specified in subsection 618.14(b), throughout the entire length of the member; intermediate strand supports shall be used if the tolerances cannot be maintained. Tensioned strands shall not be entangled or intertwined with other strands, except for draped strands in the bundled area between hold down devices.

A QC employee shall witness and verify final tensioning operations and record the jacking forces and the net measured elongations. Jacking force shall be recorded to the nearest 100 pound increment used. Net elongation shall be measured to the nearest ⅛ inch. Tensioning operations shall also meet the following requirements:

1. Initial tensioning shall not exceed 20 percent of the jacking force.

2. Tension load readings shall be taken from pressure gages, dynamometers or load cells. If pressure gages or dynamometers are used, the applied load shall register between 20 and 80 percent of the total reading capacity of the system. If load cells are used, the applied load shall register between 10 and 90 percent of the total load cell capacity. If a master gage system is used, a current certified calibrated graph or table correlating actual loads with the master gage readings, shall be given to the QA Representative.

3. The jacking force applied shall be within plus or minus 5 percent of the design jacking force. The net measured elongation shall be within plus or minus 5 percent of the calculated elongation; if net measured elongation is not within tolerance, the strand shall be stressed from both ends. The algebraic comparison of the variation between the jacking force and the net measured elongation shall agree within plus or minus 7 percent. If these three tolerances are not achieved, tensioning operations shall cease; all stressing deficiencies shall be corrected before regular tensioning operations resume.

4. If any wire or wires in a 7-wire strand breaks, whether or not that strand shall be removed and replaced shall be determined based on whether forces are within tolerances as specified in subsection 618.07(a)(3) and by referring to PCI MNL 116 5.2.6.

5. Strand or spliced strand that exhibits unraveling after stressing, shall be removed and replaced with a sound strand. Strand splices shall not fall within the member to be cast.

6. Strands that have received final tension shall be protected from temperature fluctuations greater than 40 °F until the time of concrete placement. The Contractor may apply stress corrections at the rate of 1 percent per 11 °F, for temperature variation between final tensioning and concrete placement. This requirement does not apply to self-stressing bed setups. The total stressing force applied shall not exceed 80 percent of the minimum ultimate tensile strength of the prestressing steel.

7. Tensioned prestressing steel shall be free from dirt, mud, ice, snow build up, oil, grease, paint, loose rust, and all other bond inhibiting substances prior to concrete placement. Visibly pitted strand shall not be used.
8. Draped Strand - Final stressing shall be accomplished by any of the methods described below:

A. Jacking in Draped Position. Final stressing shall begin at one end of the bed. Strands that do not meet the tension vs. elongation tolerances shall be jacked from the other end so that all tolerances are achieved. If all draped strands conform to tolerances after jacking at one end, the jacking force shall be verified on at least two strands at the opposite end.

B. Partial Stressing and Subsequent Strain. Initial and partial stress may be induced from either end of the bed. Final stress shall be attained by lifting or depressing the strands to the design location. Final stress and strain shall be applied in such a manner that uniform distribution of jacking force is attained throughout the bed setup and, all tension vs. elongation tolerances have been achieved. The distribution of force shall be verified on at least two strands at the opposite end.

C. Stage Tensioning. Initial tensioning shall be done from one end. Partial tensioning may then be performed from either end. When final stressing is completed, the sum of the partial elongations shall be used to verify that all tension vs. elongation tolerances have been achieved. This method may also be used for tensioning of straight strands.

9. Hold-down devices shall be placed within a 20 inch horizontal tolerance from the locations shown on the contract drawings if placement is moved toward the center of girder and within a 40 inch horizontal tolerance from the locations shown on the contract drawings if placement is moved toward the girder ends; if minimum or maximum placement locations are shown on the contract drawings, the placement tolerances shall not encroach beyond those locations.

The hold-down device shall not encumber or displace adjacent straight strands out of tolerance; and shall not produce nicking of any drape or bundled strands. The device shall secure the draped or bundled strands in the positions shown on the shop drawings, within all tolerances required by subsection 618.14(b).

(b) Combination Tensioned Members. Pretensioning of combination members shall be performed in accordance with subsection 618.07(a). All post-tensioning operations shall conform to subsection 618.07(c)

(c) Post-tensioning Method.

1. Bonded Post-tensioning and Grouting Systems Review. Upon review of the shop drawings, the Engineer will schedule a meeting with the Contractor to review the post-tensioning and grouting procedures to be used on the project. The following individuals shall be in attendance at this meeting:

   (1) The Engineer and QA Representative.
   (2) The Contractor’s Superintendent.
   (3) The post-tensioning system supplier. This individual shall have the following qualifications:
      (i) A Professional Engineer registered in the State of Colorado.
      (ii) Knowledgeable in the analysis of post-tensioned structures, the design required for shop drawing development, field calculations for revising tendon elongations from the assumed parameters to the actual strand area and modulus used on the project as determined by tests conducted on the strand by CDOT, and stressing of tendons.
      (iii) A holder of a current Certified Grout Technician Certificate from the American Segmental Bridge Institute (ASBI).
      (iv) Able to be present during all tendon stressing and grouting to keep written records of these operations for submittal to the Engineer for review.
   (4) A grout manufacturer’s field representative who is a full-time employee of the grout manufacturer, will provide technical product assistance to the grouting crew, and shall be present during start-up of grouting operations and shall be able to be present at the request of the Engineer should problems with the grout occur.
   (5) The Contractor’s designee who will be in direct charge of the post-tensioning and grouting crews. This individual shall have the following qualifications:
      (i) Be skilled in the use of the post-tensioning and grouting equipment.
(ii) Have at least three years experience on previous projects supervising the post-tensioning and grouting of structures of similar type and magnitude.

(iii) Present on the project during the installation of the post-tensioning system, stressing operations, and grouting operations.

(6) Contractor’s QC Manager.

(7) Other individuals as deemed necessary by the Contractor or Engineer.

Ten days prior to the Post-Tensioning and Grouting System Review meeting, the Contractor shall submit a written plan for grouting the ducts. Grouting shall not begin until the Engineer has provided written approval of the grouting plan. The grouting plan shall provide at least the following information:

(1) The name, training, and experience records of the person supervising the grouting operations.

(2) Other individuals as deemed necessary by the Contractor or Engineer.

(3) Name of the grout material and the required certifications and test results.

(4) Manufacturer and type of grout mixer and pump to be used, including provisions for back-up equipment and spare parts.

(5) Grouting procedure and the role of each person on the crew.

(6) Theoretical grout volume calculations.

(7) Method for closing all duct orifices as grouting progresses.

(8) Air testing of ducts.

(9) Grout mixing and pumping procedures.

(10) Location of grout inlet and direction of pumping.

(11) Procedures for handling blockages, procedures and equipment required for flushing ducts of grout if necessary, and how and when it will be decided whether or not to flush ducts.

(12) Methods to inspect behind anchorages, grout inlets and outlets, and vents for voids.

(13) List of production testing along with acceptable values according to Table 618-1.

(14) Acceptable specific gravities for mud balance test provided by the grout manufacturer.

(15) Procedures for post grouting repair of all grout voids detected.

(16) Procedure for installing corrosion inhibitor inside tendons if necessary.

2. Alternative Post-tensioning Systems. The Contractor may choose to supply the design and details of the prestressing system shown on the plans or submit an alternative for approval. The following alternatives may be presented to the Engineer for his review and approval:

(1) Alternative anchorage systems. Alternative anchorage systems, including all associated anchor zone reinforcing steel associated with the alternative anchorage system, and all details of the alternative anchorage system shall be shown on approved shop drawings and stamped by a Professional Engineer registered in the State of Colorado and who is an employee of the post-tensioning system supplier or anchorage supplier.

(2) Alternative number or sizes of ducts. The duct pattern must conform to an acceptable pattern as indicated on the plans.

(3) Alternative jacking ends.

(4) Alternative number of strands, provided the minimum area of steel and the center of force matches that indicated on the plans.

(5) Alternative duct type, friction coefficients, or anchor set.

The stressing sequence, details, or procedures shall not differ from what is called for on the plans, such that it would cause a change in the jacking force times initial stress ratios at the critical points identified on the plans, beyond an acceptable tolerance of 0 to +5 percent.

If the Contractor elects to submit alternative details, the alternative details shall conform to the following:
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(1) The final center of force shall match that as indicated on the plans.

(2) If the plans call for a tendon to be composed of a certain number of strands, the Contractor's alternative shall have that same tendon composed of the same number of strands.

(3) If the plans call for a tendon to be composed of bars, the Contractor's alternative shall have that same tendon composed of bars.

(4) If the plans call for ducts and tendons internal to the member, the Contractor's alternative shall also have internal ducts. Similarly, if the plans call for ducts and tendons external to the member, then the Contractor's alternative shall also have external ducts.

(5) The alternative shall include details or calculations supporting the adequacy of the Contractor's alternative as specified in the shop drawing and calculation requirements of this specification.

(6) Bridge cross-sectional geometries, dimensions, and clearances shall match those indicated on the plans, with the exception of girder flares near anchorages.

3. Duct Fabrication and Placement. Duct enclosures for prestressing steel shall be either rigid corrugated plastic or galvanized, corrugated, rigid ferrous metal.

Metal ducts shall be fabricated with either welded or interlocked seams. Galvanizing of the welded seams for metal ducts will not be required.

The ducts shall be mortar tight and accurately placed within ½ inch of the positions shown on the approved shop drawings. Ducts shall be securely fastened to maintain their correct alignment during placing of concrete. Joints between sections of duct shall be positive rigid connections which do not result in angle changes at the joints. Waterproof tape shall be used at the connections. Ducts shall be bent without crimping or flattening. Transition couplings connecting ducts to anchoring devices need not be galvanized. Ducts shall be free of kinks. All changes of direction shall have a radius of 20 feet, unless otherwise shown on the plans. Shrink sleeves at duct splices at closure pours shall be used.

The duct area shall be at least twice the net area of the prestressing steel for tendons composed of multiple wires, bars, or strands.

The duct diameter shall be at least ¼ inch larger than the nominal diameter of the wire, bar, or strand for tendons made up of a single wire, bar, or strand.

All ducts shall have grout openings at each end. Grout vents shall be provided at all high points and low points of draped tendons. In addition, at draped tendon high points, secondary high point gout vents shall be located three feet beyond all high points in the direction that the grout will be pumped.

Grout openings and vents shall be securely fastened to the ducts and forms or reinforcing steel to prevent displacement while placing concrete. The vents shall be mortar tight, taped as necessary and shall provide means for injection of grout. Ends of grout vents shall be removed to 1 inch inside the face of concrete surface after the grouting has been completed and the holes filled with an approved epoxy or non-shrink grout and finished smooth.

Prior to installation of the prestressing steel, the Contractor shall show that the ducts are free from debris and water. For ducts which are internal to the member, the Contractor shall show that the ducts are free from any blockage or damage from the concrete placing operations. The Contractor shall do this immediately after the concrete encasing the duct has achieved initial set. The precast fabricator shall be responsible for the condition of the ducts during fabrication if the member is precast.

The precast fabricator shall demonstrate to the QA Representative that the ducts are free and clear of any obstructions or damage and are able to accept the intended post-tensioning tendons by passing a torpedo through the ducts. A torpedo of the same cross-sectional shape as the duct that is 1/8 inch smaller all around than the clear, nominal inside dimension of the duct. No deductions shall be made to the torpedo section dimensions allowed in the manufacture or fixing of the ducts. For curved ducts the length shall be determined so that when both ends of the torpedo touch the outermost wall of the duct, the torpedo is 1/8 inch clear of the innermost wall. Acceptance shall be based on the torpedo passing through the duct easily. Nonconformance is when the torpedo does not pass through the ducts easily.
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and shall be addressed per 618.13.
Once installed, the ducts (including the ends of the ducts at the anchorages, grout ports, and duct vents) shall be sealed immediately to prevent the entry of water or other debris until the tendons are grouted.
The use of water soluble oil in the ducts and flushing the ducts with water will not be allowed.

Installing Tendons. Excess water in ducts shall be removed by blowing oil-free compressed air through the ducts.
Post-tensioning strands to make up tendon shall be pushed or pulled through the ducts using methods which will not snag on any lips or joints in the ducts.
The ends of strands which are pushed through the duct shall be rounded off or fitted with a smooth protective cap. Strand that is pushed shall not be intentionally rotated by any mechanical device during the installation of the post-tensioning into the duct.
The ends of strands which are pulled through the duct shall be assembled to form the tendon and pulled using a special steel wire sock (“Chinese finger”) or other device attached to the end. The ends of the strands may be electric arc welded together for this purpose as long as at least 1 foot to 5 ft of the strands from the welded end, depending on size of tendon, is removed after installation. The ends of strands of the pre-assembled tendon shall be rounded to facilitate smooth passage through the duct.
Cut strands using an abrasive saw or equal. Flame cutting or plasma cutting of strands is allowed only with permission from the Engineer.
The responsible representative shall be present at all times during stressing of bonded post-tensioned members.

Tensioning shall be done with approved jacking equipment. Hydraulic jacks shall be equipped with accurate pressure gauges at least 6 inches in diameter. The combination of jack and gauge shall have been calibrated within the last 12 months, in accordance with subsection 618.10(a). A certified calibration chart, graph, or table showing this calibration of the jack and gauge combination shall be furnished to the Engineer. The range of calibrations shall encompass the range of required forces indicated on the shop plans. The jacking equipment shall be capable of simultaneously stressing all wires, strands, or bars for each individual tendon.
Tendons shall be stressed in accordance with the sequence as indicated on the approved shop drawings. If the Contractor chooses to deviate from the sequence, the Contractor shall resubmit the shop drawings for approval. The sequence shall not cause stresses in excess of the maximum allowable stresses shown on the plans.
Tendons shall be preloaded to 20 percent of their total jacking force, before measuring elongations.
Measured elongations shall be within ± 7 percent of the calculated values, unless otherwise approved by the Engineer.
A broken or damaged strand is cause for rejection of the tendon. If a strand is rejected, the remaining strands in the tendon will be evaluated by the Engineer for reuse.
Where dead end anchorages and tendons are accessible, the anchorage system and length of projecting prestressing steel shall permit jacking with the same jacking equipment that was used on the live end.
Tendon projections at the live end and accessible dead ends shall not be cut off until all post-tensioning is completed and accepted.
The representative of the post-tensioning system supplier shall keep a record of the following items for each tendon installed and provide a copy to the Engineer the day stressing is completed:
(1) Project name and number.
(2) Contractor and subcontractor.
(3) Tendon location, strand diameter, and number of strands.
(4) Date strand was first installed in the ducts.
(5) Heat number of the strands.
(6) Assumed and actual strand cross-sectional area and modulus of elasticity.
(7) Date stressed.
(8) Date of calibration of the jack and pressure gauge combination with their identification numbers.
(9) Required initial and final jacking force and the gauge pressure.
(10) Anticipated and actual elongations and anchor set.
(11) All deviations from the plans, specifications, and approved shop drawings shall be brought to the attention of the Engineer for immediate resolution.

618.08 Post-Tensioning Anchorages and Distribution. Prestressing steel shall be secured at the ends by means of approved permanent type anchoring devices.

Anchorages and couplers shall develop at least 95 percent of the minimum specified ultimate strength of the prestressing steel. The coupling of tendons shall not reduce the elongation at rupture below the requirements of the tendon itself. Couplers and coupler components shall be enclosed in housings long enough to permit necessary movements. Couplers for tendons shall be used only at locations specifically indicated or approved by the Engineer.

Couplers shall not be used at points of sharp tendon curvature.

Permanent anchorage grout caps are required and shall be installed before grouting begins.

Anchorages shall have a minimum clear concrete or grout coverage of 2 inches in every direction. Alternative corrosion protection methods for anchorages shall be shown on the shop drawings submitted by the Contractor.

The prestressing force shall be effectively distributed to the concrete by means of an approved anchoring device. Such devices shall conform to the following requirements:

(1) The average concrete bearing stresses on the concrete-created anchorage distribution plates shall not exceed the values allowed by the following equations:

During jacking:

$$f_{cp} = 0.8 f_{ci}' \left( \frac{A'_b}{A_b} - 0.2 \right) \leq 1.25 f_{ci}'$$

After jacking:

$$f_{cp} = 0.6 f_{ci}' \left( \frac{A'_b}{A_b} - 0.2 \right) \leq 1.25 f_{c}'$$

Where:

- $f_{cp}$ = permissible compressive concrete stress
- $f_{ci}'$ = compressive strength of concrete at time of jacking
- $f_{c}'$ = compressive strength of concrete
- $A'_b$ = maximum area of the portion of the concrete anchorage surface that is geometrically similar to and concentric with the area of the anchorage
- $A_b$ = bearing of the anchorage

If bursting steel is not used, the peak bearing pressure on the concrete at the time of jacking from the distribution plate shall not exceed $0.90 f_{ci}'$. If the distribution plate or anchorage device is within 4 inches of any concrete edge or corner or another distribution plate or anchorage device, the pressure on the concrete shall not exceed $0.70 f_{ci}'$. Construction joints shall not pass under distribution plates or anchors.

(2) Bending moments in the plates or assemblies induced by the pull of the prestressing steel shall not exceed
the plastic strength of the material or cause visible distortion of the distribution plate when 100 percent of the ultimate prestress load is applied as determined by the Engineer.

(3) Distribution plates may be omitted if the anchorage device distributes the stresses in the concrete consistent with these specifications, and provided that this anchorage device is used in conjunction with embedded bursting and splitting reinforcement.

618.09 Bonding and Grouting.

(a) General. Post-tensioned prestressing steel shall be bonded by completely filling the void space within a duct with grout. Prestressing steel to be bonded shall be free of dirt, loose rust, or other deleterious substances. The ducts shall be kept free of water, dirt, or other deleterious foreign materials that will inhibit bond until the tendons are grouted. Time from installing the prestressing steel in the ducts in an unstressed condition to grouting after stressing shall not exceed thirty days. If a corrosion inhibitor, as specified below, is used on the strands in the ducts, the time limit shall not exceed sixty days. Grouting shall proceed as soon as possible after stressing of the prestressing steel in the ducts. If a corrosion inhibitor is used on the strands in the ducts, it shall be applied after post-tensioning is completed and accepted and grouting accessories are installed so that tendons are sealed. The post-tensioning system installer shall submit an installation log. A copy of the log that documents the day the strands were installed within the duct and the corrosion inhibitor applied to the strands in the duct, with the duct given an identification easily referenced to the plans, shall be provided to the Engineer. All pertinent product numbers, the brand and the corrosion inhibitor type shall be documented in the log. Verification shall be made weekly that the tendons remain sealed and grout vents, drains and caps have not been damaged.

(b) Grout. Grout shall be prepackaged in bags.

The following information shall be printed on the grout bags: product name, name of the producer, date of packaging, lot number, and mixing instructions.

Grout shall not contain any lumps or other evidence of hydration.

The grout shall not contain aluminum powder or compounds, which will produce hydrogen gas, carbon dioxide, or oxygen. In addition, the grout shall not contain fluorides, sulphites, nitrates, or acid-soluble chloride ions which exceed 0.08 percent by weight of the cementitious materials. The Contractor shall provide the Engineer with written certification from the grout manufacturer that the grout does not contain or produce these elements or compounds with the grouting plan.

The grout shall conform to the following Standard and Modified ASTM Tests in Table 618-1 when mixed in accordance with the manufacturer's instructions:
### Table 618-1

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Value</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Chloride Ions</td>
<td>Max. 0.08% by weight of Cementitious material</td>
<td>ASTM C 1152</td>
</tr>
<tr>
<td>Fine Aggregate (If utilized)</td>
<td>Max. Size: 300 µm (No. 50 Sieve)</td>
<td>ASTM C 33</td>
</tr>
<tr>
<td>Volume Change at 24 hours and 28 days</td>
<td>0.0% to + 0.3%</td>
<td>ASTM C 1090 1</td>
</tr>
<tr>
<td>Expansion</td>
<td>0.0%(minimum) 2%(maximum) for up to 3 hours</td>
<td>ASTM C 940</td>
</tr>
<tr>
<td>Compressive Strength at 28 days (Average of 3 cubes)</td>
<td>7,000 psi minimum</td>
<td>ASTM C 942</td>
</tr>
<tr>
<td>Initial set of the grout</td>
<td>3 hours minimum 12 hours maximum</td>
<td>ASTM C 953</td>
</tr>
<tr>
<td>Bleeding at 3 hours</td>
<td>Maximum 0.0 % Maximum 2500 coulombs At 30 Volts for 6 hours</td>
<td>ASTM C 940 4</td>
</tr>
<tr>
<td>Permeability at 28 days</td>
<td></td>
<td>ASTM C 1202</td>
</tr>
</tbody>
</table>

**FLUIDITY TEST** 2

<table>
<thead>
<tr>
<th>Efflux Time from Flow Cone</th>
<th>ASTM Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Immediately after mixing</td>
<td>11 Seconds Minimum 30 Seconds Maximum OR 5 Seconds Minimum 30 Seconds Maximum</td>
</tr>
<tr>
<td>(b) 30 minutes after mixing with remixing for 30 seconds</td>
<td>30 Seconds Maximum OR 30 Seconds Maximum</td>
</tr>
</tbody>
</table>

Table 618-1 and footnotes continued on next page.
Footnotes for Table 618-1

1 ASTM C 1090 shall be modified to include verification at both 24 hours and 28 days.

2 Adjustments to flow rates shall be achieved by strict compliance with the manufacturer’s recommendations.

3 Grout fluidity shall meet either the Standard ASTM C 939 flow cone test or the Modified Test described herein. Modify the ASTM C 939 Test by filling the cone to the top instead of to the standard level. The efflux time is the time to fill a one liter container placed directly under the flow cone.

4 ASTM C 940 shall be modified to conform with the wick induced bleed test as follows:
   
   (i) Use a wick made of a 20 inch length of ASTM A 416 seven wire 0.5 inch diameter strand. Wrap the strand with two inch wide duct or electrical tape at each end prior to cutting to avoid splaying to the wires when it is cut. Degrease (with acetone or hexane solvent) and wire brush to remove any surface rust on the strand before temperature conditioning.
   
   (ii) Condition the dry ingredients, mixing water, prestressing strand and test apparatus overnight to 65 to 75 °F.
   
   (iii) Mix the conditioned dry ingredients with the conditioned mixing water and place 800 ml of the resulting grout into the 1,000 ml cylinder. Measure and record the level of the top of the grout.
   
   (iv) Completely insert the strand into the graduated cylinder. Center and fasten the strand so it remains essentially parallel to the vertical axis of the cylinder. Measure and record the level of the top of the grout.
   
   (v) Store the mixed grout at the temperature range listed in (ii).
   
   (vi) Measure the level of the bleed water every 15 minutes for the first hour and hourly for two successive readings thereafter.
   
   (vii) Calculate the bleed water, if any, at the end of the three hour test period and the resulting expansion in accordance with the procedures outlined in ASTM C 940, with the quantity of bleed water expressed as a percent of the initial grout volume. Note if the bleed water remains above or below the top of the original grout height. Note if any bleed water is absorbed into the specimen during the test.

Grout used on the project shall have been sampled and tested within the last twelve months in accordance with the above referenced test procedures. The Contractor shall provide certified test reports for the grout used on the project from an independent AASHTO Accredited Laboratory and a sample of the grout for evaluation by the Department with the plan for grouting the ducts. The grout sample submitted to the Project shall be at least 2,000 grams in a sealed container. Grout which does not meet the above requirements shall not be used.

(c) **Mixing of Grout.** All grout shall be mixed with a high speed shear (colloidal) mixer.

(d) **Grouting.** All grouting operations shall be performed under the immediate control of the Contractor’s designee. An individual of the post-tensioning system supplier, who possesses an ASBI Certified Grouting Technician Certificate and the grout supplier’s field representative shall be available to provide technical expertise to the Contractor’s designee as required during grouting.

The Contractor shall either perform or contract a commercial testing entity experienced with the following tests, in the presence of the Inspector/Engineer and report the results to the Engineer:
(1) One pressure bleed test per day in accordance with the “Schupack Pressure Bleed Test” using a Gelman Filter in accordance with the requirements in Appendix C of the “Specification for Grouting of Post-Tensioned Structures” by the Post-Tensioning Institute. The Gelman filtration funnel shall be secured vertically plumb in a stand. The maximum percent bleed shall be zero when the funnel is pressurized to 50 psi for evaluating installed ducts having a vertical rise greater than 6 feet; the maximum percent bleed shall be 2 percent when the funnel is pressurized to 30 psi for evaluating installed ducts having a vertical rise greater than 2 feet but less than 6 feet; and the maximum percent bleed shall be 4 percent when the funnel is pressurized to 20 psi for evaluating installed ducts having a vertical rise that is less than 2 feet.

(2) Two mud balance tests, one at grout mixer and one at duct outlet, per day or when there is a visual or apparent change in the characteristics of the grout in accordance with the API Recommended Practice 13B-1 “Standard Procedure for Field Testing Water-Based Drilling Fluids”. Acceptable specific gravity values for the grout shall be provided by the grout manufacturer and included with the grouting plan.

(3) Minimum of one strength test per day in accordance with ASTM C942 and the minimum 28 day compressive strength shall be 7000 psi.

(4) Minimum of two fluidity tests (flow cone) – one at the mixer and one at the duct outlet in accordance with ASTM C939, “Standard Tests Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)”. The efflux time shall be as shown in Table 618-1.

Grout shall be injected from the lowest end of a tendon to the highest end in an uphill direction. A continuous, one-way flow of grout shall be maintained for each duct.

All grout vent openings shall be open when grouting starts. Grout shall be allowed to flow to the first vent from the inlet pipe until residual slugs of water or entrapped air have been eliminated and the grout has the same consistency as that of the grout being injected. The vent shall then be capped or otherwise closed. Remaining vents shall be capped or closed in sequence in the same manner except that at draped tendon high points, the secondary vents placed a short distance downstream from the high point vent shall be closed before the highpoint vent.

The Contractor shall inspect the interiors of box girders during grouting operations for grout leakage. Leaks shall be sealed before grouting is continued.

Grout shall be pumped through the duct and continuously wasted at the outlet pipe until all visible slugs of water or air are ejected. To insure that the tendon remains filled with grout, the outlet shall be closed and the pumping pressure allowed to build to a minimum of 75 psi and held for one minute before the inlet vent is closed.

For all vertical tendons that are 20 feet and taller, a standpipe shall be provided at the upper end of the tendon to collect bleed water and allow it to be removed from the grout. This device shall be designed with commercial steel plumbing fittings so that the grout level will not drop below the elevation at the highest point in the upper anchorage device due to bleeding. If the level of the grout drops below the highest point in the upper anchorage device, additional grout shall immediately be added to the standpipe. After the grout has hardened, the standpipe shall be removed.

For vertical internal tendons, if the grouting pressure exceeds the maximum recommended pumping pressure, the grout shall be injected at increasingly higher outlets (which become inlets) that have been or are ready to be closed as long as one-way flow of grout is maintained. Grout shall be allowed to flow from each outlet until all slugs of air and water have been purged prior to using that outlet for injection.

Plugs, caps, and valves thus required shall not be removed or opened until the grout has set.

The Contractor shall monitor all anchorages, grout ports and vents periodically until the grout sets. The Engineer shall be notified if bleed water is dripping from these locations. Bleed water may be an indication of voids and will require investigation by the Contractor after the grout sets.

After the grout has set, the grout port and vent plugs shall be removed. The Contractor shall inspect the tendon anchorages, grout ports and vents for voids or other evidence of incomplete grouting. If evidence is found of voids in these areas, the Contractor shall submit a plan for regrouting the voids to the Engineer for
approval. All costs for remedial grouting will not be measured and-paid for separately but shall be included in the work.

(e) Temperature Considerations.

The temperature of the concrete adjacent to the ducts shall be 40 °F or higher from the time of grouting until site cured 2-inch grout cubes, tested in accordance with AASHTO T 106, reach a minimum compressive strength of 800 psi.

Grout shall be between 40 and 90 °F during mixing and pumping. If necessary, the mixing water shall be heated or cooled.

618.10 Equipment. Equipment used for fabrication of pretensioned and combination tensioned members shall conform to the following requirements:

(a) Jacking Equipment and Load Cells. All equipment shall be calibrated as a system that represents actual use. Jacks, gage and pump systems, and load cells shall be calibrated at intervals no longer than 12 months, or whenever the tensioning system yields erratic results. Master gage systems shall be calibrated at intervals no longer than six months, or whenever the tensioning system yields erratic results. If load, sensor or indicator components are replaced or repaired, the system shall be recalibrated before resuming jacking operations. System error shall not exceed plus or minus 1 percent of the applied loads.

Calibration shall be performed by an agency or service that uses equipment certified by the National Institute for Standards and Technology (NIST). Accuracy of the calibration equipment shall be traceable to the NIST records. The calibration procedures used shall conform to ASTM Standard Practices E 4 and E 74. Each time that calibration verification is performed, a copy of the certified test report shall be furnished to the QA representative or the Engineer.

(b) Concrete Batching Equipment. The weighing system shall be calibrated at intervals no longer than 12 months. If disassembly, replacement, damage or repair of scales or balance indicators should occur, the weighing system shall be recalibrated before resumption of mix operations. Scale calibrations shall be performed in conformance with the State of Colorado - Department of Agriculture requirements. Current calibration labels shall be visibly displayed on the equipment.

The batching system shall record the weights of all concrete mix ingredients for each batch. Ingredient weights shall meet the requirements of ASTM C 94, Section 8, Measuring Materials.

The batching system shall be equipped with a flow meter which measures the weight or volume of the added mixing water within plus or minus 1 percent of the total water added to each batch.

(c) Concrete Load Testing Machine. The test machine shall meet the requirements of ASTM C 39.

(d) Concrete Cylinder Molds. Shall meet the requirements of ASTM C470.

(e) Forms. Forms shall be sufficiently mortar tight to minimize fresh mortar paste leakage, and sufficiently rigid to prevent product distortion due to concrete pressure or consolidation operations. Form joints shall be kept clean, smooth and adjusted to minimize form finish irregularities.

Forms shall be constructed and erected to produce units that conform to the product dimensional tolerances required by subsection 618.14(b); the forms shall also meet smoothness tolerances required by this subsection.

Forms shall be treated with a form release agent that does not adhere to or significantly discolor the final concrete product.

Forms that have known deviations from the typical sections shown on the plans shall be approved by the Engineer before use. The deviations shall be submitted on working or shop drawings.

(f) Miscellaneous Test Equipment. All miscellaneous test equipment used during fabrication shall be kept in a condition such that accurate test results are obtained. Proper equipment maintenance and calibration shall be the responsibility of the Contractor's QC section.

618.11 Concrete for Pretensioned and Combination Tensioned Products. The Contractor shall furnish and place concrete according to this subsection.
(a) **Classification.** Concrete shall be designated as class PS. The Contractor shall be responsible for the actual mix proportions and adjustments necessary to produce the specified strength. The specified strengths and air content shall be as stated on the plans. Fly ash may be substituted for hydraulic cement up to a maximum of 25 percent by weight. If fly ash is used in the mix, the weight of the total cementitious material content shall be the sum of the weights of the hydraulic cement and fly ash.

When voluntary use of fly ash by the Contractor results in delays, changes in mix quantities or materials sources, or unsatisfactory work, the costs of such delays, changes or corrective actions shall be borne by the Contractor.

(b) **Concrete Mix Components.** Materials sources shall be listed in the Contractor's QCP. The QC Manager must notify the QA representative in writing before changing the sources as listed in the QCP. For new sources, the Contractor must submit certified data for review and acceptance by the Engineer, at least 30 days before the sources can be used for production. Materials shall conform to the requirements of subsection 618.02(c).

(c) **Proportioning.** The minimum total cementitious material content shall be 610 pounds per cubic yard of concrete. Fine aggregates shall not exceed 55 percent of the total aggregate volume. Aggregates from different sources and of different gradings shall not be stockpiled together.

(d) **Batching and Mixing.** Concrete shall be batched and mixed according to ASTM C 94.

(e) **Placing Concrete.** Forms shall be free of dirt, mortar, debris, and foreign substances before depositing the fresh concrete. Rust areas shall be cleaned to prevent rust staining of the finished products. The concrete shall be consolidated with suitable mechanical vibrating equipment. Vibration time shall be of sufficient duration to accomplish adequate consolidation throughout the entire product, but shall not be prolonged to the point that segregation of the fresh concrete occurs.

The Contractor shall use the procedures listed in the QCP, to protect the freshly deposited concrete from rapid drying and surface moisture loss due to extreme ambient or climatic conditions. Temperature limitations are as follows:

1. The temperature of the plastic concrete during placement operations shall not be lower than 50 °F.
2. Mixed concrete that has a temperature in excess of 90 °F shall not be placed.
3. Unless a suitable retarder is used the concrete shall be deposited in place within 90 minutes after batching; any load or portion of a load shall not be placed after the 90 minute limit.
4. Inner form temperature shall be within 40 °F of the fresh concrete temperature at time of concrete placement.
5. Minimum inner form temperature shall be 40 °F at the time of concrete placement.
6. Maximum inner form temperature shall be 130 °F at the time of concrete placement.

(f) **Finishing Fresh Concrete.** Open surfaces of fresh concrete shall be worked as little as possible to obtain the finish shown on the plans. Water shall not be added to the surfaces to ease finishing. Excessive water or laitance brought to the surface through vibration shall be removed before the surface is final finished. All hand finishing, required for precast members that have surfaces that become part of the final bridge deck surface, shall be performed in conformance with subsection 601.12(a).

Monomolecular film coatings or fogging systems, as approved by the QA Representative, may be used to retard evaporation during extreme ambient conditions. Application methods shall deposit a fine mist spray over the concrete surface. Streaming, puddling, or droplet application of coatings shall not be permitted. The concrete surfaces shall not be reworked after application of mist.

(g) **Concrete Testing.** The Contractor's QC section shall make representative cylinder test specimens for QC/QA testing. The Contractor shall forward test cylinders to the QA representative, for 28-day strength tests, and for shipping strength tests as required by subsection 618.15. Concrete tests shall be performed in accordance with the following requirements:

1. Test cylinder specimens shall be made in accordance with ASTM C 31. Vibration consolidation shall not
be allowed unless the slump is less than 1 inch. Specimens shall be cured as listed in the accepted QCP.

2. Cylinders shall be tested in accordance with ASTM C 39. The average strength of at least two test cylinders shall be greater than the minimum required strength. No individual strength test shall be more than 7 percent below the minimum required strength.

3. Cylinder test specimens shall be made to verify stress transfer strength and to verify 28-day design strength. If the products will be shipped prior to 28-day testing, additional test specimens shall be available to verify product strength prior to shipment.

4. Representative cylinders shall be molded for each 50 cubic yards or portion thereof, for each different concrete mix design used per day per product line.

5. Air Content, when specified, shall be determined in accordance with either ASTM C 173 or ASTM C 231. Air entrained mixes shall be tested a minimum of once per day to assure specified air entrainment.

7. Slump of fresh concrete shall be determined in accordance with ASTM C 143. The slump shall be tested whenever test cylinder sets are made.

8. Unit Weight of fresh concrete shall be determined in accordance with ASTM C 138. Unit weight shall be tested a minimum of once per day for each different concrete mix design used.

9. Temperature of fresh concrete shall be taken as needed, to assure compliance with the temperature requirements.

618.12 Curing.

(a) Pretensioned and Combination Tensioned Members. Members shall be uniformly cured from the time of concrete placement until at least two representative product test specimens achieve an average strength that meets or exceeds 0.7 \( f'_{ci} \), or the specified release strength, \( f'_{ci} \), whichever is higher.

Where:

\[
\begin{align*}
& f'_{c} = \text{28 Day Compressive Strength of Concrete} \\
& f'_{ci} = \text{Required Concrete Strength at Release of Prestress Force}
\end{align*}
\]

Additional curing requirements shall be maintained until the above strength requirements are achieved, and are as follows:

1. Exposed concrete surfaces shall be kept moist from the time of concrete placement until the freshly finished concrete is covered with an enclosure that retains heat and moisture. After enclosure, moist curing shall be maintained at a minimum 70 percent relative humidity.

   The Contractor shall monitor the temperature and humidity conditions from the initial curing period through the end of the accelerated curing stage.

2. Temperature of the concrete shall be maintained above 50 °F.

3. The internal and surface temperature of the concrete shall not exceed 160 °F.

4. Concrete shall attain initial set prior to application of the accelerated curing cycle. If initial set was not determined in accordance with ASTM C 403, accelerated curing shall not be induced for 4 hours, or 6 hours if retarding admixtures are used.

   While waiting for the initial set period, low cycle heat may be applied to maintain the curing chamber temperature; however, the temperature rise shall not exceed 10 °F per hour during the waiting period.

5. The rise in temperature in the curing chamber during accelerated curing cycle shall not exceed 40 °F per hour.

(b) Cast-in-Place Members. The curing of cast-in-place members shall conform to the requirements of subsection 601.13. The concrete shall not be exposed to temperatures below freezing for six days after casting, or until it has reached the strength required for applying the prestressing force. The minimum strength of the concrete shall be at least, 3500 psi for post-tensioned members, or as given on the plans whichever is greater, before prestressing.
(c) Other Precast Members. Precast members that do not contain pretensioned steel shall meet curing requirements as follows:

1. Exposed surfaces of freshly finished concrete shall be covered with moisture retaining material, or shall be treated with a concrete curing compound approved by the QA representative.
2. Temperature of the concrete shall be maintained above 50 °F from the time of concrete placement until the curing is complete.
3. Uniform curing shall continue until at least two representative product test specimens achieve an average strength that meets or exceeds 0.7 $f_{c}$ or the specified release strength $f_{r}$, whichever is higher.
4. The internal and surface temperature of the concrete shall not exceed 150 °F.

618.13 Repairs of Prestressed and Combination Tensioned Members. Repairable product defects discovered during QC or QA inspection, shall be corrected at the Contractor's expense prior to shipping. Damage incurred during handling, storage, shipment and erection shall be repaired or replaced at the Contractor's expense.

Defects shall be categorized as minor, structural, or rejectable. The QC section shall examine and record all defects. The QC section shall submit a written proposal for minor repairs to the QA Representative for review and acceptance prior to correcting the minor defects. The proposal shall also address the measures the Contractor will take to prevent recurring defects in future members. The QA Representative will approve, or reject, the finished repair work in writing.

Small production holes that are less than ½ inch in depth and less than 1 square inch in surface area, shall not be considered defects. Larger production holes shall be repaired according to the procedures listed in the QCP.

Structural and rejectable defects shall be examined by the Contractor's Engineer. A written proposal for repair of structural or rejectable defects shall be submitted to the QA Representative for review and acceptance prior to correcting any defects. The proposal shall include a detailed description and sketch of the defects, detailed repair procedures, description of repair materials, and the methods the Contractor will use to evaluate the finished repair work. The proposal shall also include the measures the Contractor will take to prevent recurring defects in future members.

Completed repairs shall be cured as needed to ensure soundness of the reworked area.

The defect categories and repair requirements are defined as follows:

(a) Minor Defects. Minor defects are those which do not affect the ability of the product to withstand service or construction loads. Minor defects include superficial discontinuities such as cracks; small spalls, voids and honeycombed areas; and defects that do not extend beyond the centerline of any reinforcing steel or into any elements of the tensioning system. Minor defects of other types may also be designated by the QA Representative.

Repair methods shall not affect the structural integrity of the product. The finished repair work shall meet the approval of the QA Representative and the Engineer.

(b) Structural Defects. Structural defects, as determined by the QA Representative or the Engineer, include defects which may impair the ability of the product to adequately withstand construction or service loads. Defects that extend beyond the centerline of any reinforcing steel or into any element of the tensioning system are classified as structural defects. Such defects also include cracks, spalls, honeycombed areas, voided areas, significant concrete breakage areas, cold joints, and segregated concrete areas. Structural defects of other types may also be designated by the QA Representative or the Engineer.

Repair methods shall adequately restore structural integrity of the product. When repairs have been completed, the Contractor's Engineer shall examine and analyze the product for construction and service load ability, and certify in writing that the repair work is structurally adequate. Evaluation and test data shall be submitted along with the written certification. The finished repair work, including aesthetic acceptability, shall meet the approval of the Engineer.

(c) Rejectable Defects. Rejectable defects or damages, as determined by the QA Representative or the Engineer, are those which impair the ability of the product to adequately withstand construction or service...
loads, and which cannot be successfully repaired to structural and architectural acceptability. Structurally defective or rejected products shall not be incorporated into the work but shall be replaced with acceptable products supplied at the Contractor's expense.

Damaged and defective products will also be rejected by the QA Representative for the following reasons:

1. Failure by the Contractor's Engineer to approve and submit proposed repair procedures in writing before repair work begins.
2. Failure by the Contractor to execute the repair work according to QA approved procedures.
3. Failure by the Contractor to provide written certification of acceptable structural repair, along with submittal of evaluation and test data, if applicable.
4. Failure by the Contractor to correct recurring defects.
5. Determination by the QA Representative that the work, or materials used in the work, does not meet all contract requirements.

618.14 Other Fabrication Requirements for Pretensioned and Combination Tensioned Members.

(a) *Finishing Hardened Concrete Products.* Finished and repaired areas shall reasonably match the coloration and profile characteristics of the adjacent concrete. Loose concrete laitance shall be removed from the product before storage.

Each finished product shall clearly display legible identification markings that show the cast date, piece mark and unique sub-mark. The marking shall also identify the setup location where the product was cast.

Finishing operations shall also conform to the following requirements:

1. Excessive laitance and unsound rubble shall be removed from surfaces to be bonded.
2. Fins and irregular projections shall be removed from the formed surfaces.
3. Bulges or offsets on the formed surfaces greater than ¼ inch shall be smoothed by stoning, sawing, or grinding.
4. Dented and inset surfaces greater than 4 square inches in area and deeper than ½ inch shall require a written repair proposal before repair or finish work begins.
5. Patches in areas of exposed steel or prestressing strand shall be bonded with an approved bonding agent and patched with an approved non-shrink grout.
6. If liquid membrane curing compounds are used on the concrete surfaces which are to be bonded, they shall be removed by sandblasting, prior to shipping the product.

(b) *Product Dimensional Tolerances.* Tolerances for prestressed concrete products shall meet the unit tabulations listed in the PCI Manual MNL-116, unless otherwise stated in the Contract. The PCI tolerance figures and tabulations shall be specification requirements. Out-of-dimensional-tolerance variations shall be considered defects and shall be examined and evaluated by the Contractor's Engineer. The evaluation shall be submitted to the QA Representative in writing and shall contain written opinion of structural adequacy as determined by the Contractor's Engineer. The submittal shall meet the approval of the Engineer. Failure to submit the written evaluation and opinion will be cause for rejection.

The following work or products shall meet the specific PCI tolerance requirements described as follows, unless otherwise specified in the plans:

1. Bulb-Tee Sections shall conform to Division VI, I-Beams.
2. G-Series Sections shall conform to Division VI, I-Beams.
3. Box Girders and U-Girders shall conform to Division VI, Box Beams.
4. Deck Panels shall conform to the dimensional tolerances as listed in the PCI Special Report JR-343-88, Chapter 4, or the updated published edition thereof.

(c) *Handling, Storage, Shipment and Erection.* The Contractor shall handle the product in such a manner as to
prevent cracking or damage. Cracked or damaged products shall be inspected by the QC section and repaired in accordance with subsection 618.13, or replaced at the Contractor's expense.

Braces, trusses, chains, cables, or other metal devices used for handling, storing, shipping, or erecting shall be adequately padded at points in contact with the concrete, to prevent chipping of the finished product.

Beam sections shall be handled, stored, shipped and erected with supports and devices that maintain the product in an upright position. Deck panels shall be lifted as directed in the Contract unless alternative lifting methods are allowed by the Engineer. Lifting of more than one panel at a time shall not cause panel cracking. Methods for multiple lifting of panels shall be shown on the working or shop drawings. Panel products shall be stacked in such a manner that damage does not occur.

Pre-cast concrete members shall be erected to prevent damage to all elements of the structure and in a safe manner. Pre-cast concrete members to which the erection specification applies are those members that bear on the substructure of a bridge. The primary members such as beams and girders shall be temporarily anchored and braced as they are erected to preclude detrimental movement in any direction, and to prevent overturning and buckling. Struts, bracing, tie cables, and other devices used for temporary restraint shall be considered falsework and shall be designed to resist all loads imposed during each stage of construction until the deck concrete has attained the Field Compressive Strength shown in Table 601-1.

At least one week prior to the Pre-Erection Conference, the Contractor shall approve, sign and submit an Erection Plan to the Engineer for record purposes only. The Erection Plan shall be stamped “Approved for Construction” and signed by the Contractor. The Erection Plan will not be approved by the Engineer. If falsework is required, falsework drawings shall conform to and be submitted in accordance with subsection 601.11.

The Erection Plan and procedure shall provide complete details of the erection process with dimension tolerances including:

1. Falsework, struts, bracing, tie cables and other devices, material properties and specifications for temporary works, bolt torque requirements prior to releasing girders from the cranes (if required), connection details and attachments to other structure components or objects;

2. Procedure and sequence of operations, including a detailed schedule with completion times for work items that complies with the working hour limitations;

3. Minimum load chart lift capacity, outrigger size and reactions for each crane;

4. Assumed loads and girder weights, lift points, lifting devices, spreaders, and angle of lifting cables.

5. Girder stresses at critical points along the girder length during progressive stages of erection shall be investigated to assure that the structural integrity and stability of the girders is maintained. Stresses at lift points induced as a result of lifting shall be investigated and adequate bracing provided as indicated by the analysis.

6. Locations of cranes, trucks delivering girders, and the location of cranes and outriggers relative to other structures, including retaining walls, wingwalls and utilities.

7. Drawings, notes, catalog data showing the manufacturer’s recommendations or performance tests, and calculations clearly showing the above listed details, assumptions, and dimensions.

8. Contingency plans detailing what measures the Contractor will take in case of inclement weather (forecast or actual), equipment failure, delivery interruption, and slower than planned production.

A Pre-Erection Conference will be held at least one week prior to the beginning of erection. The Engineer, Contractor, erection subcontractor, and the Contractor’s Engineer shall attend the meeting. The erection subcontractor shall demonstrate his knowledge and familiarity of where the piece marks are located on the components to be erected, their orientation in the erected structure, and the shop drawing piece mark convention used by the girder fabricator at the Pre-Erection Conference. The girder fabricator shall either attend the meeting or participate in the conference, by way of speaker telephone. Participation is required during that portion in which the piece marks are discussed. The girder fabricator shall state whether the
erection subcontractor has demonstrated a correct understanding of the piece marks, and if not, correct any misunderstanding.

Additional Pre-Erection conferences may be required for subsequent phases of construction, or for phases that differ from the original construction plan, as directed by the Engineer. Additional conferences may also be requested by the Contractor, and approved by the Engineer.

The Contractor shall submit a final Erection Plan to the Engineer prior to girder erection for record purposes only. The Contractor’s Engineer shall sign and seal (1), (5), and (7) listed above in the final Erection Plan. The final Erection Plan shall be stamped “Approved for Construction” and signed by the Contractor. The final Erection Plan will not be approved by the Engineer.

When a bridge spans traffic of any kind, except for construction traffic and the Contractor’s employees, the Contractor’s Engineer shall inspect and provide written approval of the erected girders prior to opening the area beneath the girders to traffic. For this specification, traffic is defined as the vehicles, railroad, pedestrians and watercraft moving along a route. The Contractor shall perform daily inspections of the erected girders and other permanent and temporary bridge elements until the deck concrete has attained the Field Compressive Strength. The Contractor’s Engineer shall provide an inspection form to the Engineer and the Contractor that lists the items the Contractor will document during the daily inspection of the erected girders. The inspection form shall include inspection items specific to each bridge being constructed. The Contractor shall provide the Engineer and the Contractor’s Engineer with written documentation of these inspections within 24 hours of each inspection.

All temporary struts, bracing, tie cables, other devices and extra material required shall be removed upon completion of the structure.

Falsework shall conform to subsection 601.11.

618.15 Product Shipping Strength for Pretensioned and Combination Tensioned Members. Products shall not be shipped before concrete strength meets or exceeds 0.95 f'c, unless otherwise indicated on the plans. The average of at least two representative test specimens shall meet or exceed 0.95 f'c. No individual specimen strength shall be more than 7 percent below 0.95 f'c. The shipping strength test specimens shall be cured in the same environment as the actual product until the time of testing. The QC section shall test the specimens for actual shipping strength. The QA Representative may independently verify any shipping strength tests.

The Contractor may elect to take concrete cores from the actual product in lieu of curing cylinder test specimens with the product. If the Contractor chooses this test option, the QC Manager shall submit written request to the QA Representative. Core extraction shall not begin until the request has been accepted in writing by the QA Representative. The written request shall include the proposed location and time schedule for core extraction and testing.

The cores shall be delivered in a wrapped and moist condition to the certified test laboratory as listed in the QCP. The QA Representative may witness any or all stages of the core testing operations. The test laboratory shall provide a copy of the formal test report to the QA Representative.

The Contractor shall bear all expenses associated with the optional core testing requirements. Sampling and testing of the concrete core specimens shall conform to ASTM C 42 with the following addenda:

(1) Samples may be removed at any age at the Contractor's sole risk of damage.

(2) Test cores shall not contain embedded reinforcement.

(3) A minimum of three core samples shall be taken from the product casting in question. Three specimens shall be tested for compressive strength. The average compressive strength of the three tests shall meet or exceed product f’c. If the compressive test result of any specimen differs from the average strength by more than 15 percent, those results shall be disregarded, and the compressive strength shall be determined from at least two remaining valid test results.

(4) If end capping of test specimens is necessary, the capping shall be done with sulfur mortar in accordance with ASTM C 617. Specimens shall be kept moist until end capping preparation begins.
Ends shall be trimmed or prepped as required, wiped with absorbent cloth and air-dried or fan-dried to prepare for end capping. The drying period shall not exceed 20 minutes before capping is completed.

Specimens shall be air-dried for 10 to 20 minutes after capping, then wrapped with a double layer of wet, thick cloth or burlap. Compressive testing shall not be started for at least one hour after wet-wrapping. The wrapped specimens shall be kept moist until compressive testing begins.

The Contractor shall submit a written repair proposal to the QA Representative for patching the core holes. Repair work shall not begin until the proposal is accepted in writing by the Engineer.

**METHOD OF MEASUREMENT**

618.16 Prestressed units will be measured by one of the following methods as indicated in the Contract.

1. Prestressed girders will be measured by the linear foot from end to end or by the square foot, based on the plan length multiplied by the plan width, whichever is specified on the plans.

2. Prestressed concrete box girders and prestressed concrete slabs will be measured by the square foot based on the plan length multiplied by the plan width.

3. When measured by component materials, concrete and reinforcing steel will be measured and paid for in accordance with Sections 601 and 602 respectively.

   The quantities of prestressing steel will not be measured but shall be the quantities shown on the plans, completed and accepted. MKFT equals the jacking force, in thousands of KIPS, times the length in feet.

Precast panel deck forms that are required by the plans will be measured by the square foot. The quantity will not be remeasured, but will be the quantity shown on the plans, except when a plan change is ordered or when it is determined that there are discrepancies in an amount of plus or minus two percent of the plan quantity.

**BASIS OF PAYMENT**

618.17 The accepted quantities of prestressed units and prestressing steel will be paid for at the contract unit price per unit of measurement for each of the pay items listed below that is included in the bid schedule. Precast panel deck forms required by the plans will be paid for at the contract unit price for the area shown on the plans.

Payment will be made under:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prestressing Steel Bar</td>
<td>Pound or MKFT</td>
</tr>
<tr>
<td>Prestressing Steel Strand</td>
<td>Pound or MKFT</td>
</tr>
<tr>
<td>Prestressed Concrete ___ (___)</td>
<td>Linear Foot or Square Foot</td>
</tr>
<tr>
<td>Prestressed Concrete Box (___)</td>
<td>Square Foot</td>
</tr>
<tr>
<td>Prestressed Concrete Slab (Depth _____)</td>
<td>Square Foot</td>
</tr>
</tbody>
</table>

Payment will be full compensation for all work necessary to complete the designated pay item.

Prestressing steel bar and prestressing steel strand shall include but not be limited to all anchorage devices, prestressing steel, ducts, grout, and miscellaneous hardware. Elastomeric leveling pads, and galvanized steel diaphragms and connectors will not be paid for separately, but shall be included in the work. Concrete and reinforcing steel not shown on the plans but required by the Contractor's alternative will not be paid for separately but shall be included in the work. All required testing will not be paid separately but shall be included in the work.

Concrete quantities will not be reduced for the volume occupied by the ducts, prestressing steel, anchorages, blockouts for tensioning, etc., and will not include web flares, projections, warts, etc., required to accommodate the prestressing system used.

All costs associated with the preparation and implementation of the Erection Plan will not be paid for separately, but shall be included in the work.

Concrete, reinforcing steel, and prestressing steel for permanent steel bridge deck forms will not be measured and paid for separately, but shall be included in the work.
May 8, 2014

REVISION OF SECTION 630  
RETROREFLECTIVE SIGN SHEETING

Section 630 of the Standard Specifications is hereby revised for this project as follows:

In subsection 630.02, delete the sixth and seventh paragraphs, including Table 630-1, and replace them with the following:

Retroreflective sheeting for all signs requiring an orange background shall be Type VI or Type Fluorescent.

Retroreflective sheeting for all signs requiring a yellow background shall be Type Fluorescent.

Table 630-1  
RETROREFLECTIVE SHEETING TYPES

<table>
<thead>
<tr>
<th>Sheeting</th>
<th>Type IV</th>
<th>Type VI (Roll-up sign material)</th>
<th>Type Fluorescent&lt;sup&gt;1&lt;/sup&gt;</th>
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<tbody>
<tr>
<td></td>
<td>Application</td>
<td>Work Zone</td>
<td>Work Zone</td>
</tr>
<tr>
<td>All Orange Construction Signs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orange Construction Signs that are used only during daytime hours for short term or mobile operations</td>
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<td>X&lt;sup&gt;4&lt;/sup&gt;</td>
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</tr>
<tr>
<td>Barricades (Temporary)</td>
<td>X</td>
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<tr>
<td>Vertical Panels</td>
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</tr>
<tr>
<td>Flaggers Stop/Slow Paddle</td>
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<tr>
<td>Drums&lt;sup&gt;2&lt;/sup&gt;</td>
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<tr>
<td>Non-orange Fixed Support signs with prefix &quot;W&quot;</td>
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</tr>
<tr>
<td>Special Warning Signs</td>
<td></td>
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</tr>
<tr>
<td>STOP sign (R1-1)</td>
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</tr>
<tr>
<td>YIELD sign (R1-2)</td>
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</tr>
<tr>
<td>WRONG WAY sign (R5-1a)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO NOT ENTER sign (R5-1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXIT sign (E5-1a)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DETOUR sign (M4-9) or (M4-10)</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>All other fixed support signs&lt;sup&gt;3&lt;/sup&gt;</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>All other signs used only during working hours</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>All other signs that are used only during daytime hours for short term or mobile operations</td>
<td>X</td>
<td>X&lt;sup&gt;5&lt;/sup&gt;</td>
<td>X</td>
</tr>
</tbody>
</table>

1 Fluorescent Sheeting shall be of a brand that is on the CDOT Approved Products List.
2 Drum Sheeting shall be manufactured for flexible devices.
3 Fixed support signs are defined as all signs that must remain in use outside of working hours. They shall be mounted in accordance with Standard Plan S-630-1.
4 RS 24 only.
5 White only.
Section 702 of the Standard Specifications is hereby deleted for this project and replaced with the following:

702.01 Asphalt Cements.

(a) **Superpave Performance Graded Binders.** Superpave Performance Graded Binders shall conform to the requirements listed in Table 702-1. (Taken from AASHTO M 320)

Asphalt cement shall not be acid modified or alkaline modified.

Asphalt cement shall not contain any used oils that have not been re-refined. Modifiers that do not comply with environmental rules and regulations including 40 CFR Part 261.6(a) (3) (IV), and part 266/Subpart C shall not be added. Modifiers shall not be carcinogenic.

The supplier of the PG binder shall be certified in accordance with CP 11.
Table 702-1
SUPERPAVE PERFORMANCE GRADED BINDERS

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement for PG Binder</th>
<th>AASHTO Test No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>58-28</td>
<td>58-28</td>
</tr>
<tr>
<td></td>
<td>58-34</td>
<td>64-22</td>
</tr>
<tr>
<td></td>
<td>64-28</td>
<td>70-28</td>
</tr>
<tr>
<td></td>
<td>76-28</td>
<td></td>
</tr>
<tr>
<td>Flash Point Temp., °C, minimum</td>
<td>230</td>
<td>230</td>
</tr>
<tr>
<td>Viscosity at 135 °C, Pas•s, maximum</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Dynamic Shear, Temp. °C, where G*/Sin δ @ 10 rad/s ≥ 1.00 kPa</td>
<td>58</td>
<td>64</td>
</tr>
<tr>
<td>Ductility, 4 °C (5 cm/min.), cm minimum</td>
<td>-</td>
<td>50</td>
</tr>
<tr>
<td>Toughness, joules (inch-lbs)</td>
<td>-</td>
<td>12.4 (110)</td>
</tr>
<tr>
<td>Tenacity, joules (inch-lbs)</td>
<td>-</td>
<td>8.5 (75)</td>
</tr>
<tr>
<td>Acid or Alkali Modification (pass-fail)</td>
<td>Pass</td>
<td>Pass</td>
</tr>
<tr>
<td></td>
<td>Pass</td>
<td>Pass</td>
</tr>
<tr>
<td></td>
<td>Pass</td>
<td>Pass</td>
</tr>
<tr>
<td></td>
<td>Pass</td>
<td>Pass</td>
</tr>
<tr>
<td></td>
<td>Pass</td>
<td>CP-L 2210</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CP-L 2210</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CP-L 2214</td>
</tr>
<tr>
<td>RTFO Residue Properties</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass Loss, percent maximum</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Dynamic Shear, Temp. °C, where G*/Sin δ @ 10 rad/s ≥ 2.20 kPa</td>
<td>58</td>
<td>64</td>
</tr>
<tr>
<td>Elastic Recovery, 25 °C, percent min.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ductility, 4 °C (5 cm/min.), cm minimum</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td>PAV Residue Properties, Aging Temperature 100 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamic Shear, Temp. °C, where G•Sin δ @ 10 rad/s ≤ 5000 kPa</td>
<td>19</td>
<td>25</td>
</tr>
<tr>
<td>Creep Stiffness, @ 60 s, Test Temperature in °C</td>
<td>-18</td>
<td>-12</td>
</tr>
<tr>
<td>S, maximum, MPa</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>m-value, minimum</td>
<td>0.300</td>
<td>0.300</td>
</tr>
</tbody>
</table>
Acceptance Samples of the PG binder will be taken on the project in accordance with the Schedule in the Field Materials Manual.

The Department will test for acid modification and alkaline modification during the binder certification process. Thereafter, the Department will randomly test for acid modification and alkaline modification.

(b) Damp proofing. Asphalt for damp proofing shall conform to the requirements of ASTM D 449, and the asphaltic primer shall conform to the requirements of ASTM D 41.

702.02 Emulsified Asphalts. Emulsified asphalts shall conform to AASHTO M 140 or M 208 for the designated types and grades. Emulsified asphalt and aggregate used for surface seals shall be sampled and will be tested for information only in accordance with CP-L 2213.

Emulsified asphalt (HFMS-2S) with a residual penetration greater than 300 dmm shall conform to all properties listed in AASHTO M 140, Table 1 except that ductility shall be reported for information only.

(a) Emulsion for Tack and Fog Coats. Emulsions for tack and fog coats shall conform to the requirements listed in Table 702-2 or 702-3, prior to dilution.
Table 702-2
TACK AND FOG COAT EMULSIONS

<table>
<thead>
<tr>
<th>Property</th>
<th>CSS-1h</th>
<th>SS-1h</th>
<th>AASHTO Test No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity, at 25 ºC, Saybolt-Furol, s (min)</td>
<td>20</td>
<td>20</td>
<td>T 59</td>
</tr>
<tr>
<td></td>
<td>max</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Storage stability, 24 hr, % max(^1)</td>
<td>1.0</td>
<td>1.0</td>
<td>T 59</td>
</tr>
<tr>
<td>Particle charge test</td>
<td>Positive</td>
<td></td>
<td>T 59</td>
</tr>
<tr>
<td>Sieve test, % max</td>
<td>0.10</td>
<td>0.10</td>
<td>T 59</td>
</tr>
<tr>
<td>Oil Distillate by volume, % max</td>
<td>3.0</td>
<td>3.0</td>
<td>T-59</td>
</tr>
<tr>
<td>Residue by distillation/ evaporation, % min(^3)</td>
<td>57(^3)</td>
<td>57(^3)</td>
<td>T 59/CP-L 2212(^2)</td>
</tr>
</tbody>
</table>

Tests on residue:
- Penetration, 25 ºC, 100g, 5s, min, dmm: 40
- Penetration, 25 ºC, 100g, 5s, max, dmm: 120
- Ductility, 25 ºC, 5 cm/min, cm, min: 40
- Solubility, in trichloroethylene% min: 97.5

\(^1\) If successful application is achieved in the field, the Engineer may waive this requirement.

\(^2\) CP-L 2212 is a rapid evaporation test for determining percent residue of an emulsion and providing material for tests on residue. CP-L 2212 is for acceptance only. If the percent residue or any test on the residue fails to meet specifications, the tests will be repeated using the distillation test in conformance with AASHTO T-59 to determine acceptability.

\(^3\) For polymerized emulsions the distillation and evaporation tests will in be in conformance with AASHTO T-59 or CP-L 2212 respectively with modifications to include 205 ± 5 ºC (400 ± 10 ºF) maximum temperature to be held for 15 minutes.

(b) Emulsion for Chip Seals  Polymerized emulsions for chip seals shall conform to the requirements listed in Table 702-3. Emulsion for chip seals shall be an emulsified blend of polymerized asphalt, water, and emulsifiers. The asphalt cement shall be polymerized prior to emulsification and shall contain at least 3 percent polymer by weight of asphalt cement. The emulsion standing undisturbed for a minimum of 24 hours shall show no white, milky separation but shall be smooth and homogeneous throughout. The emulsion shall be pumpable and suitable for application through a distributor.
Table 702-3
POLYMERIZED EMULSIONS FOR CHIP SEALS

<table>
<thead>
<tr>
<th>Property</th>
<th>CRS-2</th>
<th>CRS-2P</th>
<th>CRS-2R</th>
<th>HFMS-2P</th>
<th>AASHTO Test No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tests on Emulsion:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viscosity, at 50 ºC, Saybolt-Furol, s min</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>T 59</td>
</tr>
<tr>
<td></td>
<td>max</td>
<td>450</td>
<td>450</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>Storage stability, 24 hr, % max</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>T 59</td>
</tr>
<tr>
<td>Particle charge test</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td></td>
<td>T 59</td>
</tr>
<tr>
<td>Sieve test, % max</td>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
<td>T 59</td>
</tr>
<tr>
<td>Demulsibility1, % min</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td></td>
<td>T 59</td>
</tr>
<tr>
<td>Oil Distillate by volume, % max or range</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>T-59</td>
</tr>
<tr>
<td>Residue by distillation/ evaporation, % min³</td>
<td>65³</td>
<td>65³</td>
<td>65³</td>
<td>65³</td>
<td>T 59/CP-L 2212²</td>
</tr>
<tr>
<td>Tests on residue:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penetration, 25 ºC, 100g, 5s, min, dmm</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>T 49</td>
</tr>
<tr>
<td>Penetration, 25 ºC, 100g, 5s, max, dmm</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Ductility, 25 ºC, 5 cm/min, cm, min</td>
<td>40</td>
<td></td>
<td>75</td>
<td></td>
<td>T 51</td>
</tr>
<tr>
<td>Ductility, 4 ºC, 5 cm/min, cm, min</td>
<td></td>
<td>40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solubility, in trichloroethylene% min⁴</td>
<td>97.5⁴</td>
<td>97.5⁴</td>
<td>97.5⁴</td>
<td>97.5⁴</td>
<td>T 44</td>
</tr>
<tr>
<td>Elastic Recovery, 25 ºC min</td>
<td>58</td>
<td></td>
<td></td>
<td></td>
<td>T 301</td>
</tr>
<tr>
<td>Float Test, 60 ºC, s min</td>
<td>1200</td>
<td></td>
<td></td>
<td></td>
<td>T 50</td>
</tr>
<tr>
<td>Toughness, in-lbs, min</td>
<td>70</td>
<td>90</td>
<td></td>
<td></td>
<td>CP-L 2210</td>
</tr>
<tr>
<td>Tenacity, in-lbs, min</td>
<td>45</td>
<td>45</td>
<td></td>
<td></td>
<td>CP-L 2210</td>
</tr>
</tbody>
</table>

¹If successful application is achieved in the field, the Engineer may waive this requirement.

²CP-L 2212 is a rapid evaporation test for determining percent residue of an emulsion and providing material for tests on residue. CP-L 2212 is for acceptance only. If the percent residue or any test on the residue fails to meet specifications, the tests will be repeated using the distillation test in conformance with AASHTO T-59 to determine acceptability.

³For polymerized emulsions the distillation and evaporation tests will in be in conformance with AASHTO T-59 or CP-L 2212 respectively with modifications to include 205 ± 5 ºC (400 ± 10 ºF) maximum temperature to be held for 15 minutes.

⁴Solubility may be determined on the base asphalt cement prior to polymer modification.
(c) *Emulsion for Slurry Seals and Micro-Surfacing.* Emulsions for slurry seals and micro-surfacing shall conform to the requirements listed in Table 702-4. The modified emulsion shall contain a minimum of 3 percent polymer, SBR latex, or natural latex by weight.

### Table 702-4

**SLURRY SEAL AND MICRO-SURFACING EMULSIONS**

<table>
<thead>
<tr>
<th>Property</th>
<th>CQS-1hL</th>
<th>CQS-1hP</th>
<th>AASHTO Test No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity, at 25 °C, Saybolt-Furol, s</td>
<td>min</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>max</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Storage stability, 24 hr, % max&lt;sup&gt;1&lt;/sup&gt;</td>
<td></td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Particle charge test</td>
<td></td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Sieve test, % max</td>
<td></td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>Oil Distillate by volume, % max</td>
<td></td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Residue by distillation/evaporation, % min&lt;sup&gt;3&lt;/sup&gt;</td>
<td></td>
<td>62&lt;sup&gt;3&lt;/sup&gt;</td>
<td>62&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>Penetration, 25 °C, 100g, 5s, min, dmm</td>
<td></td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Penetration, 25 °C, 100g, 5s, max, dmm</td>
<td></td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Ductility, 25 °C, 5 cm/min, cm, min</td>
<td></td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Solubility, in trichloroethylene% min</td>
<td></td>
<td>97.5</td>
<td>97.5</td>
</tr>
</tbody>
</table>

<sup>1</sup>If successful application is achieved in the field, the Engineer may waive this requirement.

<sup>2</sup>CP-L 2212 is a rapid evaporation test for determining percent residue of an emulsion and providing material for tests on residue. CP-L 2212 is for acceptance only. If the percent residue or any test on the residue fails to meet specifications, the tests will be repeated using the distillation test in conformance with AASHTO T-59 to determine acceptability.

<sup>3</sup>For polymerized emulsions the distillation and evaporation tests will be in conformance with AASHTO T-59 or CP-L 2212 respectively with modifications to include 205 ± 5 °C (400 ± 10 °F) maximum temperature to be held for 15 minutes.
(d) *Emulsion for Prime Coat.* Emulsion for prime coat shall conform to the requirements of Table 702-5. Circulate before use if not used within 24 hours.

### Table 702-5

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
<th>AASHTO Test No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity, Saybolt Furol, at 50 °C (122 °F), s</td>
<td>20-150</td>
<td>T 59</td>
</tr>
<tr>
<td>% Residue</td>
<td>65% min.</td>
<td>T 59 to 260 °C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(500 °F)</td>
</tr>
<tr>
<td>Oil Distillate by Volume, %</td>
<td>7% max.</td>
<td>T 59</td>
</tr>
<tr>
<td><strong>Tests on Residue from Distillation:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solubility in Trichloroethylene, %</td>
<td>97.5 min.</td>
<td>T 44</td>
</tr>
</tbody>
</table>

(e) *Recycling Agent.* Recycling Agent for Item 406, Cold Bituminous Pavement (Recycle), shall be either a high float emulsified asphalt (polymerized) or an emulsified recycling agent as follows:

1. High Float Emulsified Asphalt (Polymerized). High Float Emulsified Asphalt (Polymerized) for Cold Bituminous Pavement (Recycle) shall be an emulsified blend of polymer modified asphalt, water, and emulsifiers conforming to Table 702-6 for HFMS-2sP. The asphalt cement shall be polymerized prior to emulsification, and shall contain at least 3 percent polymer.

The emulsion standing undisturbed for a minimum of 24 hours shall show no white, milky separation, and shall be smooth and homogeneous throughout.

The emulsion shall be pumpable and suitable for application through a pressure distributor.
### Table 702-6
**HIGH FLOAT EMULSIFIED ASPHALT (POLYMERIZED) (HFMS-2sP)**

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement Minimum</th>
<th>Requirement Maximum</th>
<th>AASHTO Test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tests on Emulsion:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viscosity, Saybolt Furol at 50 °C (122 °F), sec</td>
<td>50</td>
<td>450</td>
<td>T 59</td>
</tr>
<tr>
<td>Storage Stability test, 24 hours, %</td>
<td></td>
<td>1</td>
<td>T 59</td>
</tr>
<tr>
<td>Sieve test, %</td>
<td></td>
<td>0.10</td>
<td>T 59</td>
</tr>
<tr>
<td>% Residue(^1)</td>
<td></td>
<td>65</td>
<td>T 59</td>
</tr>
<tr>
<td>Oil distillate by volume, %</td>
<td>1</td>
<td>7</td>
<td>T 59</td>
</tr>
<tr>
<td><strong>Tests on Residue:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penetration, 25 °C (77 °F), 100g, 5 sec</td>
<td>150</td>
<td>300(^2)</td>
<td>T 49</td>
</tr>
<tr>
<td>Float Test, 60 °C (140 °F), sec</td>
<td>1200</td>
<td></td>
<td>T 50</td>
</tr>
<tr>
<td>Solubility in TCE, %</td>
<td>97.5</td>
<td></td>
<td>T 44</td>
</tr>
<tr>
<td>Elastic Recovery, 4 °C (39.2 °F), %</td>
<td>50</td>
<td></td>
<td>T 301</td>
</tr>
</tbody>
</table>

\(^1\)400 ± 10° F maximum temperature to be held for 15 minutes.

\(^2\)When approved by the Engineer, Emulsified Asphalt (HFMS-2sP) with a residual penetration greater than 300 dmm may be used with Cold Bituminous Pavement (Recycle) to address problems with cool weather or extremely aged existing pavement. Emulsified Asphalt (HFMS-2sP) with a residual penetration greater than 300 dmm shall meet all properties listed in Table 702-4 except that Elastic Recovery shall be reported for information only.
2. *Emulsified Recycling Agent*. Emulsified Recycling Agent for use in Cold Bituminous Pavement (Recycle) shall conform to the requirements in Table 702-7.

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum</td>
<td>Maximum</td>
</tr>
<tr>
<td><strong>Tests on Emulsion:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viscosity @ 25 °C, SFS</td>
<td>20</td>
<td>200</td>
</tr>
<tr>
<td>Pumping Stability</td>
<td>Pass</td>
<td>GB Method(^1)</td>
</tr>
<tr>
<td>Sieve Test, %w</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Cement Mixing, %w</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>Particle Charge</td>
<td>Positive</td>
<td></td>
</tr>
<tr>
<td>Conc. Of Oil Phase</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td><strong>Tests on Residue:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viscosity @ 60 °C , CST</td>
<td>2000</td>
<td>4000</td>
</tr>
<tr>
<td>Flash Point, COC, °C (° F)</td>
<td>232</td>
<td></td>
</tr>
<tr>
<td>Maltenes Dist. Ratio(^4)</td>
<td>0.3</td>
<td>0.6</td>
</tr>
<tr>
<td>PC/S Ratio</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>Asphaltenes, % max.</td>
<td>11.0</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\)Pumping stability is determined by charging 450 ml of emulsion into a one liter beaker and circulating the emulsion through a gear pump (Roper 29.B22621) having a 6.3 mm (1/4 inch) inlet and outlet. The emulsion passes if there is no significant separation after circulating ten minutes.

\(^2\)Test procedure identical with ASTM D 244 except that distilled water shall be used in place of 2 percent sodium oleate solution.

\(^3\)ASTM D 244 Evaporation Test for percent of residue is modified by heating 50 gram sample to 149°C (300 °F) until foaming ceases, then cooling immediately and calculating results.

\(^4\)In the Maltenes Distribution Ratio Test by ASTM Method D 2006.

PC = Polar Compounds  S = Saturates  
\(A_1\) = First Acidaffin  \(A_2\) = Second Acidaffins
(f) Asphalt Rejuvenating Agents. Asphalt rejuvenating agents (ARA) shall be composed of a petroleum resin-oil base uniformly emulsified with water and shall conform to the physical and chemical requirements of Table 702-8 or ASTM D 4552.

### Table 702-8

**ASPHALT REJUVENATING AGENT**

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity, S.F., @ 25 °C (77 °F), s</td>
<td>ASTM D 244</td>
<td>20-40</td>
</tr>
<tr>
<td>Residue, % min.</td>
<td>ASTM D 244</td>
<td>60-65</td>
</tr>
<tr>
<td>Miscibility Test</td>
<td>ASTM D 244</td>
<td>No coagulation</td>
</tr>
<tr>
<td>Sieve Test, % max.</td>
<td>ASTM D 244</td>
<td>0.10</td>
</tr>
<tr>
<td>Particle Charge Test</td>
<td>ASTM D 244</td>
<td>Positive</td>
</tr>
</tbody>
</table>

**ASTM D244 (Mod):**

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity, 60 °C (140 °F), mm²/s</td>
<td>ASTM D 445</td>
<td>100 - 200</td>
</tr>
<tr>
<td>Flash Point, COC, °C, min.</td>
<td>ASTM D 92</td>
<td>196</td>
</tr>
<tr>
<td>Asphaltenes, % max.</td>
<td>ASTM D2006</td>
<td>1.0</td>
</tr>
<tr>
<td>Maltenes Dist. Ratio</td>
<td>ASTM D 2006</td>
<td>0.3-0.6</td>
</tr>
<tr>
<td>Saturated Hydrocarbons, %</td>
<td>ASTM D 2006</td>
<td>21-28</td>
</tr>
</tbody>
</table>

1. ASTM D244 Modified Evaporation Test for percent of residue is made by heating 50-gram sample to 149 °C (300 °F) until foaming ceases, then cooling immediately and calculating results.
2. Test procedure identical with ASTM D244 except that 0.02 Normal Calcium Chloride solution shall be used in place of distilled water.
3. Test procedure identical with ASTM D244 except that distilled water shall be used in place of 2% sodium oleate solution.
4. In the Maltenes Distribution Ratio Test by ASTM Method D4124:

\[
\text{PC} = \text{Polar Compounds} \quad \text{S} = \text{Saturates} \\
\text{A}_1 = \text{First Acidaffins} \quad \text{A}_2 = \text{Second Acidaffins}
\]
For hot-in-place recycling ARA-1P is an acceptable alternative to ARA. ARA-1P shall meet the requirements below:

Emulsified Polymer Modified Asphalt Rejuvenating Agent (ARA-1P) for use in hot-in-place recycling of bituminous pavements shall be modified with a minimum of 1.5 percent styrene-butadiene solution polymer. The finished product shall conform to the physical requirements listed in Table 702-9 below.

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test on Emulsion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viscosity, Saybolt-Furol @ 77 °F, s</td>
<td>ASTM D 244</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Residue @ 350 °F, %</td>
<td>ASTM D 244 Mod</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Sieve Test, %</td>
<td>ASTM D 244</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>Oil distillate, %</td>
<td>ASTM D 244</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>Test on Residue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penetration @ 39.2 °F, 100g, 5s, dmm</td>
<td>ASTM D-5 Modified</td>
<td>150</td>
<td>250</td>
</tr>
<tr>
<td>Asphaltenes, %</td>
<td>ASTM D 4124</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

702.03 (unused)

702.04 Hot Poured Joint and Crack Sealant. Hot poured material for filling joints and cracks shall conform to the requirements of ASTM D 6690, Type II or Type IV. The concrete blocks used in the Bond Test shall be prepared in accordance with CP-L 4101.

Sealant material shall be supplied pre-blended, pre-reacted, and prepackaged. If supplied in solid form the sealant material shall be cast in a plastic or other dissolvable liner having the capability of becoming part of the crack sealing liquid. The sealant shall be delivered in the manufacturer’s original sealed container.

Each container shall be legibly marked with the manufacturer's name, the trade name of the sealer, the manufacturer’s batch or lot number, the application temperature range, the recommended application temperature, and the safe heating temperature.

The sealant shall be listed in CDOT’s Approved Products List prior to use.
Section 703 of the Standard Specifications is hereby revised for this project as follows:

In subsection 703.03, delete the first paragraph and replace with the following:

**703.03 Aggregate for Bases.** Aggregates for bases except Aggregate Base Course (RAP) shall be crushed stone, crushed slag, crushed gravel, natural gravel, or crushed reclaimed concrete. Aggregate Base Course (RAP) shall be 100 percent crushed recycled asphalt pavement material. All materials except Aggregate Base Course (RAP) shall conform to the quality requirements of AASHTO M 147 except that the requirements for the ratio of minus 75 µm (No. 200) sieve fraction to the minus 425 µm (No. 40) sieve fraction, stated in 3.2.2 of AASHTO M 147, shall not apply.

The requirements for the Los Angeles wear test (AASHTO T 96 & ASTM C535) shall not apply to Class 1, 2, and 3. Aggregates for bases shall meet the grading requirements of Table 703-3 for the class specified for the project, unless otherwise specified.
Section 703 of the Standard Specifications is hereby revised for this project as follows:

Delete subsection 703.04 and replace with the following:

703.04 Aggregates for Hot Mix Asphalt. Aggregates for hot mix asphalt (HMA) shall be of uniform quality, composed of clean, hard, durable particles of crushed stone, crushed gravel, natural gravel, or crushed slag. Excess of fine material shall be wasted before crushing. A percentage of the aggregate retained on the 4.75 mm (No. 4) sieve for Gradings S, SX and SG— and on the 2.36 mm (No. 8) sieve for Gradings SF and ST—shall have at least two mechanically induced fractured faces when tested in accordance with Colorado Procedure 45. This percentage will be specified in Table 403-1, as revised for the project in Section 403. The angularity of the fine aggregate shall be a minimum of 45.0 percent when determined according to AASHTO T 304. Grading SF mixes, when determined by RME, may not require fine aggregate angularity of 45.0 percent. Aggregate samples representing each aggregate stockpile shall be non-plastic if the percent of aggregate passing the 2.36 mm (No. 8) sieve is greater than or equal to 10 percent by weight of the individual aggregate sample. Plasticity will be determined in accordance with AASHTO T 90. The material shall not contain clay balls, vegetable matter, or other deleterious substances.

The aggregate for Gradings ST, S, SX and SG shall have a percentage of wear of 45 or less when tested in accordance with AASHTO T 96.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent by Weight Passing Square Mesh Sieves</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grading SF**</td>
</tr>
<tr>
<td>37.5 mm (1½&quot;)</td>
<td>100</td>
</tr>
<tr>
<td>25.0 mm (1&quot;)</td>
<td>100</td>
</tr>
<tr>
<td>19.0 mm (¾&quot;)</td>
<td>100</td>
</tr>
<tr>
<td>12.5 mm (½&quot;)</td>
<td>100</td>
</tr>
<tr>
<td>9.5 mm (⅜&quot;)</td>
<td>100</td>
</tr>
<tr>
<td>4.75 mm (#4)</td>
<td>90 – 100</td>
</tr>
<tr>
<td>2.36 mm (#8)</td>
<td>*</td>
</tr>
<tr>
<td>1.18 mm (#16)</td>
<td>30 – 54</td>
</tr>
<tr>
<td>600 μm (#30)</td>
<td>*</td>
</tr>
<tr>
<td>300 μm (#50)</td>
<td>*</td>
</tr>
<tr>
<td>150 μm (#100)</td>
<td>*</td>
</tr>
<tr>
<td>75 μm (#200)</td>
<td>2 – 12</td>
</tr>
</tbody>
</table>

* These additional Form 43 Specification Screens will initially be established using values from the As Used Gradation shown on the Design Mix.

**SF applications are limited and the CDOT Pavement Design Manual should be referenced, prior to use.

Aggregates for stone matrix asphalt (SMA) shall be of uniform quality, composed of clean, hard, durable particles of crushed stone, crushed gravel, or crushed slag. A minimum of 90 percent of the particles retained on the 4.75 mm (No. 4) sieve shall have at least two mechanically induced fractured faces when tested in accordance with Colorado Procedure 45. The particles passing the 4.75 mm (No. 4) sieve shall be the product of crushing rock larger than 12.5 mm (½ inch) and shall be non-plastic when tested in accordance with AASHTO T 90.
Additionally, each source of aggregate for SMA shall meet the following requirements:

(1) No more than 30 percent when tested in accordance with AASHTO T 96 Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

(2) No more than 12 percent when tested in accordance with AASHTO T 104 Soundness of Aggregate by Use of Sodium Sulfate.

The aggregate for Hot Mix Asphalt (HMA) shall meet the requirements of Table 703-4A when tested in accordance with CP-L 4211 Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus. The Contractor shall be assessed a price reduction of $1000 for each production sample of the combined aggregate with a value greater than 20 according to CP-L 4211.

<table>
<thead>
<tr>
<th>Combined Aggregate (Mix Design)</th>
<th>Not to exceed</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Combined Aggregate (1/10,000 tons, or fraction thereof during production)</th>
<th>20</th>
</tr>
</thead>
</table>
Section 703 of the Standard Specifications is hereby revised for this project as follows:

In subsection 703.03 delete Table 703-3 and replace with the following:

### Table 703-3

CLASSIFICATION FOR AGGREGATE BASE COURSE

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Mass Percent Passing Square Mesh Sieves</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LL not greater than 35</td>
</tr>
<tr>
<td></td>
<td>Class 1</td>
</tr>
<tr>
<td>150mm (6&quot;)</td>
<td>100</td>
</tr>
<tr>
<td>100mm (4&quot;)</td>
<td>100</td>
</tr>
<tr>
<td>75mm (3&quot;)</td>
<td>95-100</td>
</tr>
<tr>
<td>60mm (2 ½&quot;)</td>
<td>100</td>
</tr>
<tr>
<td>50mm (2&quot;)</td>
<td>95-100</td>
</tr>
<tr>
<td>37.5mm (2&quot;)</td>
<td>90-100</td>
</tr>
<tr>
<td>25mm (1&quot;)</td>
<td></td>
</tr>
<tr>
<td>19mm (3/4&quot;)</td>
<td></td>
</tr>
<tr>
<td>4.75mm (#4)</td>
<td>30-65</td>
</tr>
<tr>
<td>2.36mm (#8)</td>
<td></td>
</tr>
<tr>
<td>75 µm (#200)</td>
<td>3-15</td>
</tr>
</tbody>
</table>

**NOTE:** Class 3 material shall consist of bank or pit run material.
Section 703 of the Standard Specifications is hereby revised for this project as follows:

Delete the second paragraph of subsection 703.00 and Table 703-1.

Delete subsections 703.01 and 703.02 and replace with the following:

**703.01 Fine Aggregate for Concrete.** Fine aggregate for concrete shall conform to the requirements of AASHTO M 6, Class A. The minimum sand equivalent, as tested in accordance with Colorado Procedure 37 shall be 80 unless otherwise specified. The fineness modulus, as determined by AASHTO T 27, shall not be less than 2.50 or greater than 3.50 unless otherwise approved.

**703.02 Coarse Aggregate for Concrete.** Coarse aggregate for concrete shall conform to the requirements of AASHTO M 80, Class A aggregates, except that the percentage of wear shall not exceed 45 when tested in accordance with AASHTO T 96.
REVISION OF SECTION 709
EPOXY COATED REINFORCING BARS

Section 709 of the Standard Specifications is hereby revised for this project as follows:

In subsection 709.01, delete the last row of the table and replace with the following table:

| Epoxy Coated Reinforcing Bars | AASHTO A 775 |

Delete the first sentence of subsection 709.03 and replace with the following:

Tie bars for longitudinal and transverse joints shall conform to AASHTO A 775 and shall be grade 40, epoxy-coated, and deformed.
Section 712 of the Standard Specifications is hereby revised for this project as follows:

In subsection 712.08, delete the third and fourth paragraphs and replace with the following:

Physical requirements for all geotextiles shall conform to the requirements of AASHTO M-288. Materials shall be selected from the New York Department of Transportation’s Approved Products List of Geosynthetic materials that meet the National Transportation Product Evaluation Program (NTPEP) and AASHTO M-288 testing requirements. The current list of products that meet these requirements is located at:

www.dot.ny.gov

The Geotextile Approved Products List may be accessed by clicking on the following tabs once on the NYDOT site to:

(1) A To Z Site Index
(2) Approved List
(3) Approved Products
(4) Materials and Equipment
(5) Geosynthetics for Highway Construction
(6) Geotextiles

In subsection 712.08, delete Table 712-2 and replace with the following
**Table 712-2**

**TYPICAL VALUES OF PERMEABILITY COEFFICIENTS**

<table>
<thead>
<tr>
<th>Turbulent Flow</th>
<th>Particle Size Range</th>
<th>Effective Size</th>
<th>Permeability Coefficient k cm/s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Millimeters (inches)</td>
<td>D 20 mm</td>
<td></td>
</tr>
<tr>
<td>Derrick STONE</td>
<td>3000 (120)</td>
<td>900 (36)</td>
<td>1200 (48)</td>
</tr>
<tr>
<td>One-man STONE</td>
<td>300 (12)</td>
<td>100 (4)</td>
<td>150 (6)</td>
</tr>
<tr>
<td>Clean, fine to coarse GRAVEL</td>
<td>80 (3)</td>
<td>10 (¼)</td>
<td>13 (½)</td>
</tr>
<tr>
<td>Fine, uniform GRAVEL</td>
<td>8 (%)</td>
<td>1.5 (½₁₆)</td>
<td>3 (%)</td>
</tr>
<tr>
<td>Very coarse, clean, uniform SAND</td>
<td>3 (%)</td>
<td>0.8 (½₃₂)</td>
<td>1.5 (½₁₆)</td>
</tr>
<tr>
<td>Laminar Flow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uniform, coarse SAND</td>
<td>2 (%)</td>
<td>0.5 (½₆₄)</td>
<td>0.6</td>
</tr>
<tr>
<td>Uniform, medium SAND</td>
<td>0.5</td>
<td>0.25</td>
<td>0.3</td>
</tr>
<tr>
<td>Clean, well-graded SAND &amp; GRAVEL</td>
<td>10</td>
<td>0.05</td>
<td>0.1</td>
</tr>
<tr>
<td>Uniform, fine SAND</td>
<td>0.25</td>
<td>0.05</td>
<td>0.06</td>
</tr>
<tr>
<td>Well-graded, silty SAND &amp; GRAVEL</td>
<td>5</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>Silty SAND</td>
<td>2</td>
<td>0.005</td>
<td>0.01</td>
</tr>
<tr>
<td>Uniform SILT</td>
<td>0.05</td>
<td>0.005</td>
<td>0.006</td>
</tr>
<tr>
<td>Sandy CLAY</td>
<td>1.0</td>
<td>0.001</td>
<td>0.002</td>
</tr>
<tr>
<td>Silty CLAY</td>
<td>0.05</td>
<td>0.001</td>
<td>0.0015</td>
</tr>
<tr>
<td>CLAY (30% to 50% clay sizes)</td>
<td>0.05</td>
<td>0.0005</td>
<td>0.0008</td>
</tr>
<tr>
<td>Colloidal CLAY (-2 μm 50%)</td>
<td>0.01</td>
<td>10</td>
<td>40</td>
</tr>
</tbody>
</table>


Note: Since the permeability coefficient of the soil will be unknown in most non-critical, non-severe applications for erosion control and drainage, the soil-permeability coefficients listed in Table 712-2 may be used as a guide for comparing the permeability coefficient of the fabric with that of the in-place soil.
REVISION OF SECTION 712
WATER FOR MIXING OR CURING CONCRETE

Section 712 of the Standard Specifications is hereby revised for this project as follows:

Delete subsection 712.01 and replace it with the following:

**712.01 Water.** Water used in mixing or curing concrete shall be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetation, or other substance injurious to the finished product. Concrete mixing water shall meet the requirements of ASTM C1602. The Contractor shall perform and submit tests to the Engineer at the frequencies listed in ASTM C1602. Potable water may be used without testing. Where the source of water is relatively shallow, the intake shall be so enclosed as to exclude silt, mud, grass, and other foreign materials.
Section 713 of the Standard Specifications is hereby revised for this project as follows:

In subsection 713.10(a) 1., delete A. and replace with the following:

A. Delineator and Median Barrier Reflectors. The specific intensity of each delineator and median barrier reflector shall be at least equal to the following minimum values when tested in accordance with AASHTO T257, with an observation angle of 0.1 degrees.

<table>
<thead>
<tr>
<th>Entrance Angle Degrees</th>
<th>Specific Intensity Candlepower per Foot-Candle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Crystal</td>
</tr>
<tr>
<td>0</td>
<td>115</td>
</tr>
<tr>
<td>20</td>
<td>45</td>
</tr>
</tbody>
</table>
A. AFFIRMATIVE ACTION REQUIREMENTS

Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246)


2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor’s aggregate workforce in each trade on all construction work in the covered area are as follows:

<table>
<thead>
<tr>
<th>Economic Area</th>
<th>Standard Metropolitan Statistical Area (SMSA)</th>
<th>Counties Involved</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>157 (Denver)</td>
<td>2080 Denver-Boulder</td>
<td>Adams, Arapahoe, Boulder, Denver, Douglas, Gilpin, Jefferson</td>
<td>13.8%</td>
</tr>
<tr>
<td></td>
<td>2670 Fort Collins</td>
<td>Larimer</td>
<td>6.9%</td>
</tr>
<tr>
<td></td>
<td>3060 Greeley</td>
<td>Weld</td>
<td>13.1%</td>
</tr>
<tr>
<td></td>
<td>Non SMSA Counties</td>
<td>Cheyenne, Clear Creek, Elbert, Grand, Kit Carson, Logan, Morgan, Park, Phillips, Sedgwick, Summit, Washington &amp; Yuma</td>
<td>12.8%</td>
</tr>
<tr>
<td>158 (Colo. Spgs. - Pueblo)</td>
<td>1720 Colorado Springs</td>
<td>El Paso, Teller</td>
<td>10.9%</td>
</tr>
<tr>
<td></td>
<td>6560 Pueblo</td>
<td>Pueblo</td>
<td>27.5%</td>
</tr>
<tr>
<td></td>
<td>Non SMSA Counties</td>
<td>Alamosa, Baca, Bent, Chaffee, Conejos, Costilla, Crowley, Custer, Fremont, Huerfano, Kiowa, Lake, Las Animas, Lincoln, Mineral, Otero, Prowers, Rio Grande, Saguache</td>
<td>19.0%</td>
</tr>
<tr>
<td>159 (Grand Junction)</td>
<td>Non SMSA</td>
<td>Archuleta, Delta, Dolores, Eagle, Garfield, Gunnison, Hinsdale, La Plata, Mesa, Moffat, Montezuma, Montrose, Ouray, Pitkin, Rio Blanco, Routt, San Juan, San Miguel</td>
<td>10.2%</td>
</tr>
<tr>
<td>156 (Cheyenne - Casper WY)</td>
<td>Non SMSA</td>
<td>Jackson County, Colorado</td>
<td>7.5%</td>
</tr>
</tbody>
</table>

GOALS AND TIMETABLES FOR FEMALE UTILIZATION

Until Further Notice...6.9% -- Statewide
These goals are applicable to all the Contractor’s construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and non-federally involved construction.

The Contractor’s compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts meet the goals established for the geographical area where the contract resulting from this solicitation is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor’s goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Par 60-4.

Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor; employer identification number; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed.

4. As used in this specification, and in the contract resulting from this solicitation, the “covered area” is the county or counties shown on the Invitation for Bids and on the plans. In cases where the work is in two or more counties covered by differing percentage goals, the highest percentage will govern.
B. STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS

Standard Federal Equal Employment Opportunity Construction Contract Specifications (Executive Order 11246)

1. As used in these Specifications:
   a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;
   b. “Director” means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;
   d. “Minority” includes:
      (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
      (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
      (iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
      (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractor toward a goal in an approved Plan does not excuse any covered Contractor’s or Subcontractor’s failure to take good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered Construction contractors performing construction work in geographical areas where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any office of Federal Contract Compliance Programs Office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.
5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor’s obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor’s compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

   a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor’s employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor’s obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

   b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its union have employment opportunities available, and maintain a record of the organization’s responses.

   c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source of community organization and of what action was taken with respect to each individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.

   d. Provide immediate written notification to the Director when the union with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when he Contractor has other information that the union referral process has impeded the Contractor’s efforts to meet its obligations.

   e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor’s employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.

   f. Disseminate the Contractor’s EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc., by specific review of the policy with all management personnel and with all minority and female employees at least once a year, and by posting the Contractor’s EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.
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g. Review, at least annually, the Contractor’s EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with onsite supervisory personnel such as Superintendents, General Foreman, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the Contractor’s EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractors and Subcontractors with whom the Contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor’s recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor’s workforce.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc. such opportunities.

m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor’s obligations under these specifications are being carried out.

n. Ensure that all facilities and Contractor’s activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisor’s adherence to and performance under the Contractor’s EEO policies and affirmative action obligation.
8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association, joint contractor-union contractor-community, or other similar group of which the Contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goal and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even thought the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).

10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The Contractor in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form, however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).
C. SPECIFIC EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBILITIES.

1. General.

   a. Equal employment opportunity requirements not to discriminate and to take affirmative action to assure equal employment opportunity as required by Executive Order 11246 and Executive Order 11375 are set forth in Required Contract. Provisions (Form FHWA 1273 or 1316, as appropriate) and these Special Provisions which are imposed pursuant to Section 140 of Title 23, U.S.C., as established by Section 22 of the Federal-Aid highway Act of 1968. The requirements set forth in these Special Provisions shall constitute the specific affirmative action requirements for project activities under this contract and supplement the equal employment opportunity requirements set forth in the Required Contract provisions.

   b. The Contractor will work with the State highway agencies and the Federal Government in carrying out equal employment opportunity obligations and in their review of his/her activities under the contract.

   c. The Contractor and all his/her subcontractors holding subcontracts not including material suppliers, of $10,000 or more, will comply with the following minimum specific requirement activities of equal employment opportunity: (The equal employment opportunity requirements of Executive Order 11246, as set forth in Volume 6, Chapter 4, Section 1, Subsection 1 of the Federal-Aid Highway Program Manual, are applicable to material suppliers as well as contractors and subcontractors.) The Contractor will include these requirements in every subcontract of $10,000 or more with such modification of language as is necessary to make them binding on the subcontractor.

2. Equal Employment Opportunity Policy. The Contractor will accept as his operating policy the following statement which is designed to further the provision of equal employment opportunity to all persons without regard to their race, color, religion, sex, or national origin, and to promote the full realization of equal employment opportunity through a positive continuing program;

   It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, or national origin. Such action shall include; employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, preapprenticeship, and/or on-the-job training.

3. Equal Employment Opportunity Officer. The Contractor will designate and make known to the State highway agency contracting officers and equal employment opportunity officer (herein after referred to as the EEO Officer) who will have the responsibility for an must be capable of effectively administering and promoting an active contractor program of equal employment opportunity and who must be assigned adequate authority and responsibility to do so.

4. Dissemination of Policy.

   a. All members of the Contractor’s staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the Contractor’s equal employment opportunity policy and contractual responsibilities to provide equal employment opportunity in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum;

      (1) Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the Contractor’s equal employment opportunity policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer or other knowledgeable company official.
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(2) All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer or other knowledgeable company official, covering all major aspects of the Contractor’s equal employment opportunity obligations within thirty days following their reporting for duty with the Contractor.

(3) All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer or appropriate company official in the Contractor’s procedures for locating and hiring minority group employees.

b. In order to make the Contractor’s equal employment opportunity policy known to all employees, prospective employees and potential sources of employees, i.e., schools, employment agencies, labor unions (where appropriate), college placement officers, etc., the Contractor will take the following actions:

(1) Notices and posters setting forth the Contractor’s equal employment opportunity policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

(2) The Contractor’s equal employment opportunity policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

5. Recruitment.

a. When advertising for employees, the Contractor will include in all advertisements for employees the notation; “An Equal Opportunity Employer.” All such advertisements will be published in newspapers or other publications having a large circulation among minority groups in the area from which the project work force would normally be derived.

b. The Contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minority group applicants, including, but not limited to, State employment agencies, schools, colleges and minority group organizations. To meet this requirement, the Contractor will, through his EEO Officer, identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority group applicants may be referred to the Contractor for employment consideration.

In the event the Contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, he is expected to observe the provisions of that agreement to the extent that the system permits the Contractor’s compliance with equal employment opportunity contract provisions. (The U.S. Department of Labor has held that where implementation of such agreements have the effect of discriminating against minorities or women, or obligates the Contractor to do the same, such implementation violates Executive Order 11246, as amended.)

c. The Contractor will encourage his present employees to refer minority group applicants for employment by posting appropriate notices or bulletins in areas accessible to all such employees. In addition, information and procedures with regard to referring minority group applicants will be discussed with employees.

6. Personnel Actions. Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, or national origin. The following procedures shall be followed;

a. The Contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.
b. The Contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The Contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the Contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The Contract will promptly investigate all complaints of alleged discrimination made to the Contractor in connection with his obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the Contractor will inform every complainant of all of his avenues of appeal.

7. Training and Promotion.

a. The Contractor will assist in locating, qualifying, and increasing the skills of minority group and women employees, and applicants for employment.

b. Consistent with the Contractor’s work force requirements and as permissible under Federal and State regulations, the Contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

c. The Contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The Contractor will periodically review the training and promotion potential of minority group and women employees and will encourage eligible employees to apply for such training and promotion.

8. Unions. If the Contractor relies in whole or in part upon unions as a source of employees, the Contractor will use his/her best efforts to obtain the cooperation of such unions to increase opportunities for minority groups and women with the unions, and to effect referrals by such unions of minority and female employees. Actions by the Contractor either directly or thorough a contractor’s association acting as agent will include the procedures set forth below:

a. The Contractor will use best efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minority group members and women for membership in the unions and increasing the skills of minority group employees and women so that they may qualify for higher paying employment.

b. The Contractor will use best efforts to incorporate an equal employment opportunity clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, or national origin.

c. The Contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the Contractor, the Contractor shall so certify to the State highway department and shall set forth what efforts have been made to obtain such information.
d. In the event the union is unable to provide the Contractor with a reasonable flow of minority and women referrals within the time limit set forth in the collective bargaining agreement, the Contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex or national origin; making full efforts to obtain qualified and/or qualifiable minority group persons and women. (The U.S. Department of Labor has held that it shall be no excuse that the union with which the Contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees.) In the event the union referral practice prevents the Contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such Contractor shall immediately notify the State highway agency.

   a. The Contractor will use his best efforts to solicit bids from and to utilize minority group subcontractors or subcontractors with meaningful minority group and female representation among their employees. Contractors shall obtain lists of minority-owned construction firms from State highway agency personnel.
   b. The Contractor will use his best efforts to ensure subcontractor compliance with their equal employment opportunity obligations.

10. Records and Reports.
   a. The Contractor will keep such records as are necessary to determine compliance with the Contractor’s equal employment opportunity obligations. The records kept by the Contractor will be designed to indicate:
      (1) The number of minority and nonminority group members and women employed in each work classification on the project.
      (2) The Progress and efforts being made in cooperation with unions to increase employment opportunities for minorities and women (applicable only to contractors who rely in whole or in part on unions as a source of their work force).
      (3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority and female employees, and
      (4) The progress and efforts being made in securing the services of minority group subcontractors or subcontractors with meaningful minority and female representation among their employees.
   b. All such records must be retained for a period of three years following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the State highway agency and the Federal Highway Administration.
   c. The Contractors will submit an annual report to the State highway agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form PR 1391.
1. Overview

The Disadvantaged Business Enterprise (DBE) Program is a federally-mandated program that seeks to ensure non-discrimination in the award of U.S. Department of Transportation (DOT)-assisted contracts and to create a level playing field on which DBEs can compete fairly for DOT-assisted contracts. To such end, CDOT sets a contract goal for DBE participation for each DOT-assisted Contract.

In order to be awarded the Contract, the bidder shall show that it has committed to DBE participation sufficient to meet the goal or has otherwise made good faith efforts to do so. CDOT will amend the goal prior to award if the lowest apparent bidder demonstrates that good faith efforts were made but sufficient commitments to meet the goal could not be obtained.

CDOT will monitor the progress of the Contractor throughout the project to ensure that the Contractor’s DBE commitments are being fulfilled. Modifications to the commitments must be approved by CDOT. CDOT may withhold payment or seek other contractual remedies if the Contractor is not complying with the requirements of this special provision. Upon completion of the Contract, CDOT may reduce the final payment to the Contractor if the Contractor has failed to fulfill the commitments or made good faith efforts to meet the contract goal.

For general assistance regarding the DBE program and compliance, contact CDOT’s Civil Rights and Business Resource Center (CRBRC) at (303)757-9234. For project specific issues, contact the Engineer.

All forms referenced herein can be found on the CDOT website in the forms library:
http://www.coloradodot.info/library/forms/cdot-forms-by-number

2. Contract Assurance

By submitting a proposal for this Contract, the bidder agrees to the following assurance and shall include it verbatim in all (including non-DBE) subcontracts:

The contractor, subrecipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as CDOT deems appropriate.

3. Definitions

Terms not defined herein shall have the meaning provided in the CDOT Standard Specifications for Road and Bridge Construction.

A. Commitment. A commitment is a portion of the Contract, identified by dollar amount and work area, designated by the bidder or Contractor for participation by a particular DBE. Commitments are submitted to CDOT via Form 1414, Anticipated DBE Participation Plan, or via Form 1420, DBE Plan Modification Request. Once approved, commitments are obligations of the Contract that are enforceable by CDOT.

B. Commercially Useful Function (CUF). Responsibility for the execution of the work and carrying out such responsibilities by actually performing, managing and supervising the work as further described in Section 8 below.

C. Contract Goal. The percentage of the contract designated by CDOT for DBE participation. The contract goal for this contract is provided in the Project Special Provision Disadvantaged Business Enterprise
Contract Goal.

(1) The bidder/Contractor shall make good faith efforts to fulfill the contract goal with eligible DBE participation. For determining whether the contract goal was met prior to award, the contract goal shall be based upon the proposal amount excluding force account items. For determining whether the contract goal was met during and upon completion of the project, the contract goal shall be based upon the total earnings amount.

(2) If the lowest apparent bidder demonstrates that it was unable to meet the contract goal but made good faith efforts to do so, the contract goal will be amended and the revised contract goal will be provided on Form 1417, Approved DBE Participation Plan.


E. DBE Program Manual. The manual maintained by the CRBRC which details CDOT’s policies and procedures for administering the DBE program. A copy of the DBE Program Manual is available on the CRBRC webpage.

F. Eligible Participation. Work by a DBE that counts toward fulfillment of the contract goal as described in Section 4 below.

G. Good Faith Efforts. All necessary and reasonable steps to achieve the contract goal which, by their scope, intensity, and appropriateness to the objective, could reasonably be expected to obtain sufficient DBE participation, even if not fully successful. Good faith efforts are evaluated prior to award and throughout performance of the Contract. For guidance on good faith efforts, see 49 CFR Part 26, Appendix A.

H. Joint Check. A check issued by the Contractor or one of its subcontractors to a DBE firm and a material supplier or other third party for materials or services to be incorporated into the work.

I. Reduction. A reduction occurs when the Contractor reduces a commitment to a DBE. A reduction constitutes a partial termination.

J. Subcontractor. An individual, firm, corporation or other legal entity to whom the Contractor sublets part of the Contract. For purposes of this special provision, the term subcontractor includes suppliers.

K. Substitution. Substitution occurs when a Contractor seeks to find another DBE to perform work on the contract as a result of a reduction or termination.

L. Termination. A termination occurs when a Contractor no longer intends to use a DBE for fulfillment of a commitment.

M. Total Earnings Amount: Amount of the Contract earned by the Contractor, including approved changes and approved force account work performed, but not including any deductions for liquidated damages, price reduced material, work time violations, overweight loads or liens. The amount of the Contract earned does not include plan force account items (i.e. OJT, pavement incentives, etc).

N. Work Code. A code to identify the work that a DBE is certified to perform. A work code includes a six digit North American Industry Classifications System code plus a descriptor. Work codes are listed on a firm’s profile on the UCP DBE Directory. The Contractor may contact the CRBRC to receive guidance on whether a work code covers the work to be performed.
4. Eligible Participation

The following rules will be used to determine whether work performed by a DBE qualifies as eligible participation on the Contract:

A. Work Must be Identified in Commitment. The work performed by the DBE must be reasonably construed to be included in the work area and work code identified by the Contractor in the approved commitment.

   (1) If the Contractor intends to use a DBE for work that was not listed in the commitment, the Contractor shall submit Form 1420, DBE Participation Plan Modification for approval of the modification. Unapproved work will not count toward the contract goal.

   (2) A DBE commitment cannot be modified to include work for which the DBE was not certified at the time of the approval of the original commitment.

B. DBE Must be Certified to Perform the Work. The DBE must be certified to perform the work upon submission of the commitment and upon execution of the DBE’s subcontract.

   (1) When a commitment has been made, but upon review of Form 205 or 205B, Sublet Permit, CDOT determines that the DBE is no longer certified in the work code which covers the work to be performed, the Contractor may not use the DBE’s participation toward the contract goal. The Contractor shall terminate the DBE commitment and seek substitute DBE participation in accordance with Section 9 below.

   (2) A DBE’s work will continue to count as eligible participation if the DBE was certified upon approval of Form 205 or 205B, Sublet Permit and the certification status changes during the performance of the work.

   (3) Suppliers must be certified upon execution of the purchase order.

C. DBE Performs the Work. Eligible participation will only include work actually performed by the DBE with its own forces.

   (1) Work performed by the DBE includes the cost of supplies and materials obtained by the DBE for its work on the Contract, including any equipment leased by the DBE, provided that such supplies or equipment are not purchased or leased from the Contractor or a subcontractor that is subletting to the DBE.

   (2) If CDOT determines that a DBE has not performed a CUF on the project, no participation by such DBE shall count toward the contract goal.

D. DBE Subcontracts to Another Firm. When a DBE subcontracts part of the work, the value of the subcontracted work may only be counted toward the goal if the subcontractor is a DBE. Performance by non-DBE subcontractors, including non-DBE trucking firms and owner-operators, shall be deducted from the DBE’s participation.

E. DBE Received Payment for the Work. Eligible participation only includes work for which the DBE has received payment, including the release of its retainage.

F. Special Calculations for Suppliers. When a DBE supplies goods on a project, the DBE may be classified as a manufacturer, dealer or broker. The DBE’s status as a manufacturer, dealer or broker is determined on a contract-by-contract basis and is based upon the actual work performed.

   (1) When a DBE is deemed to be acting as a manufacturer, one hundred percent of the commitment will count as eligible participation.
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(2) When a DBE is deemed to be acting as a regular dealer (i.e. non-manufacturer supplier), only sixty percent of the commitment will count as eligible participation.

(3) When a DBE is deemed to be acting as a broker, only the reasonable brokerage fee will count as eligible participation.

G. **Reasonable Fee for Contract-Specific Services.** Services shall count toward the contract goal only if they are specifically required for the performance of the Contract. Non-contract specific expenses may not be counted toward the contract goal. Fees for services must be reasonable. Services include but are not limited to professional services, public involvement, etc. In the case of temporary employment placement agencies, only the placement fee for an individual to be specifically and exclusively used for work on the contract shall count as eligible participation.

H. **Pre-Approval for Joint Venture Participation.** When a DBE is a participant in a joint venture, the DBE must apply to CDOT to determine how much of the work performed by the joint venture will count toward the contract goal. The DBE shall complete Form 893, Information for Determining DBE Participation when a Joint Venture Includes a DBE. Form 893 shall be submitted to CDOT no less than ten days before the submission of the Proposal to ensure sufficient time for review.

5. **Proposal Requirements**

In order to be eligible for award, the following shall be submitted with the proposal, or, for electronic bidders, via email to cdot_hq_dbeforms@state.co.us by the proposal submission deadline. In order to avoid an error within the electronic bidding system, electronic bidders shall also enter the total percentage of anticipated eligible DBE participation into the Form 714 and electronically sign the form.

A. **Form 1413, Bidders List.** The bidder shall list each subcontractor (including both DBE and non-DBE subcontractors) that submitted a quote for participation on the project. Failure to submit a signed Form 1413 will result in rejection of the proposal.

B. **Form 1414, Anticipated DBE Participation Plan.** If the Contract Goal is greater than zero, the bidder shall submit Form 1414 to document anticipated DBE participation.

(1) If the Bidder has not obtained any DBE commitments, it shall still submit Form 1414 documenting zero anticipated participation. If the Contract Goal is greater than zero, failure to submit a signed Form 1414 shall result in rejection of the proposal.

(2) The bidder shall list the DBE, work area(s), commitment amount and estimated eligible participation for each commitment. Once Form 1414 is submitted, a commitment may only be terminated or reduced in accordance with Section 9 below. The bidder is responsible for ensuring that commitments, and the estimated eligible participation resulting therefrom, have been properly calculated prior to submitting its proposal.

(3) If the bidder is a DBE, the bidder must include itself in Form 1414 and list the work area(s) and amount that it intends to self-perform and count as eligible participation on the contract.

(4) Commitments may be made to second tier or lower DBE subcontractors; however, the Contractor is ultimately responsible for the fulfillment of the commitment and shall sign the Form 1415, Commitment Confirmation.

6. **Additional Forms Due Prior to Award.**

If the contract goal is greater than zero, or if the bidder has voluntarily made commitments, the Bidder shall submit the following forms within five calendar days of selection as the lowest apparent bidder:
A. **Form 1415, Commitment Confirmation.** A Form 1415, Commitment Confirmation shall be obtained from each DBE listed on Form 1414. The bidder shall complete Section 1 and the DBE shall complete Section 2 of Form 1415. Form 1415s shall be consistent with the commitments listed on Form 1414. The bidder shall not modify commitments listed on Form 1414 without good cause and approval from CDOT. The bidder shall contact CDOT if any issues arise which may require the bidder to alter or terminate a commitment.

B. **Form 1416, Good Faith Effort Report.** If the total eligible participation listed on Form 1414 does not meet the contract goal, the lowest apparent bidder shall also submit Form 1416, Good Faith Effort Report and any supporting documentation that the bidder would like considered by CDOT as evidence of good faith efforts.

7. **Commitment and Good Faith Effort Review**

A. **Commitment Review.** CDOT will evaluate the Form 1414 and each Form 1415 to ensure that it the commitment is valid and has been properly calculated. CDOT may investigate or request additional information in order to confirm the accuracy of a commitment. If CDOT determines that the total estimated eligible participation of the commitments does not meet the contract goal, within two business days of notice from CDOT or within the original five calendar day deadline, whichever is later, the bidder shall submit Form 1416 to CDOT.

B. **Good Faith Effort Review.** If the total eligible participation of Form 1414 and all supporting Form 1415s does not meet the contract goal, CDOT will review Form 1416 and all supporting documentation submitted by the bidder in order to determine whether the bidder has demonstrated good faith efforts to obtain DBE participation. CDOT will use 49 CFR Part 26, Appendix A as a guide for determining whether the bidder made good faith efforts to meet the contract goal. A bidder will be deemed to not have made good faith efforts if the bidder lists a DBE for a work area for which the DBE is not certified and the bidder cannot establish a reasonable basis for its determination. CDOT may consider and approve commitments made after submission of the bid if the Bidder demonstrates that (1) good faith efforts were made prior to submission of the bid and (2) there is a reasonable justification for not obtaining the commitments prior to submission of the bid.

C. **Administrative Reconsideration.** If CDOT determines that the bidder did not demonstrate good faith efforts to meet the contract goal, it will provide the bidder with written notice of its determination and an opportunity to appeal. The process for reconsideration is set forth in the **Good Faith Effort Appeal Process**, which is an Appendix I to the DBE Program Manual. A copy of the **Good Faith Effort Appeal Process** will be included in the written notice from CDOT.

D. **Form 1417, Approved DBE Participation Plan.** If CDOT determines that the bidder has met the contract goal or made good faith efforts to do so, CDOT will issue Form 1417, Approved DBE Participation Plan, documenting the approved commitments. If CDOT determines that the bidder did not meet the contract goal but made good faith efforts to do so, via the Form 1417 CDOT will amend the contract goal in accordance with the commitments that were obtained and attach an explanation of its determination.

8. **Ongoing Oversight of DBE Participation**

A. **Consistency Review.** CDOT will review Form 205 or 205B, Sublet Permit Application to determine whether the work being sublet is consistent with the DBE commitments. CDOT may withhold approval of the sublet or stop performance of the work if the Contractor has reduced, terminated, or otherwise modified the type or amount of work to be performed by a DBE without seeking prior approval.

B. **Form 1419, DBE Participation Report.** The Contractor shall submit Form 1419, DBE Participation Report to the Engineer on a quarterly basis (January 15, April 15, July 15, and October 15) and upon completion of the Contract. CDOT may withhold progress payments if the quarterly Form 1419 is not received on time. CDOT will not provide final payment on the Contract in accordance with subsection 109.09 of
CDOT’s *Standard Specifications for Road and Bridge Construction* until the final Form 1419 has been reviewed and approved.

C. **Joint Checks.** All joint checks must be approved by CDOT before they are used in payment to a DBE. Joint checks used in payments to DBEs will be monitored closely to ensure (1) the DBE is performing a CUF and (2) the joint checks are not being used in a discriminatory manner. The Contractor shall request approval for the use of a joint check in a written letter signed by the DBE and the Contractor, stating the reason for the joint checks and the approximate number of checks that will be needed.

D. **Commercially Useful Function.** CDOT will monitor performance during the Contract to ensure each DBE is performing a CUF. If CDOT determines that a DBE is not performing a CUF, no work performed by such DBE shall count as eligible participation. The DBE, Contractor, and any other involved third parties may also be subject to additional enforcement actions.

(1) When determining whether a DBE is performing a CUF, CDOT will consider the amount of work subcontracted, industry practices, the amount the firm is to be paid compared to the work performed and eligible participation claimed, and any other relevant factors.

(2) With respect to material and supplies used on the Contract, in order to perform a CUF the DBE must be responsible for negotiating price, determining quality and quantity, ordering the material, installing the material, if applicable, and paying for the material itself.

(3) With respect to trucking, in order to perform a CUF, the DBE trucking firm must own and operate at least one fully licensed, insured and operational truck used on the Contract. Additionally, the DBE trucking firm must be responsible for the management and supervision of the entire trucking operation for which it is responsible on the Contract.

(4) A DBE does not perform a CUF when its role is limited to that of an extra participant in a transaction, contract or project through which funds are passed in order to obtain the appearance of DBE participation. CDOT will evaluate similar transactions involving non-DBEs in order to determine whether a DBE is an extra participant.

(5) If a DBE does not perform or exercise responsibility for at least 30 percent of the total cost of its contract with its own work force, or the DBE subcontracts a greater portion of the work than would be expected on the basis of normal industry practice for the type of work involved, CDOT will presume that the DBE is not performing a CUF. The DBE may present evidence to rebut this presumption.

(6) If the Contractor disagrees with CDOT’s determination regarding CUF, in accordance with 49 CFR 26.55 the Contractor may seek review of the determination by the applicable USDOT operating administration, however, CUF determination is not subject to administrative appeal.

9. **DBE Participation Plan Modifications**

   A. **Form 1420, DBE Participation Plan Modification Request.** During the performance of the Contract, the Contractor shall use Form 1420, DBE Participation Plan Modification Request to communicate all requests for termination, reduction, substitution, and waivers to CDOT. One Form 1420 may include multiple requests and must be submitted at the time of the occurrence or, if that is not possible, within a reasonable time of the occurrence requiring termination, reduction, substitution or waiver.

   B. **Commitment Terminations and Reductions.** No commitment shall be terminated or reduced without CDOT’s approval. Terminations and reductions include, but are not limited to, instances in which a Contractor seeks to perform work originally designated for a DBE subcontractor with its own forces, those of an affiliate, a non-DBE firm or with another DBE firm. In order to receive approval, the Contractor shall:
DISADVANTAGED BUSINESS ENTERPRISE (DBE) DEFINITIONS AND REQUIREMENTS

(1) Have good cause for termination or reduction. Good cause may include:

(i) the DBE fails or refuses to execute a written contract;

(ii) the DBE fails or refuses to perform the work of its subcontract consistent with normal industry standards, provided that such failure is not the result of bad faith or discriminatory actions of the Contractor or one of its subcontractors;

(iii) the DBE fails to meet reasonable, nondiscriminatory bond requirements;

(iv) the DBE becomes bankrupt, insolvent, or exhibits credit unworthiness;

(v) the DBE is ineligible to work because of suspension or debarment proceedings or other state law;

(vi) the DBE is not a responsible contractor;

(vii) the DBE voluntarily withdraws from the project and provides written notice to CDOT,

(viii) the DBE is ineligible to receive DBE credit for the work required;

(ix) the DBE owner dies or becomes disabled and is unable to complete the work;

(x) the DBE ceases business operations or otherwise dissolves;

(xi) or other documented good cause that compels termination. Good cause does not exist if the Contractor seeks to terminate a DBE it relied upon to obtain the contract so that the Contractor can self-perform the work for which the DBE was engaged or so that the Contractor can substitute another DBE or non-DBE contractor after contract award.

(2) Provide the DBE notice of the Contractor’s intent to terminate or reduce the commitment and the reason for such termination or reduction, with a copy to CDOT;

(3) In the notice of intent, provide the DBE at least five calendar days to respond to the notice and inform CDOT and the Contractor of the reasons, if any, why it objects to the proposed termination or reduction and any reasons that it shall not be approved. The Contractor is not required to provide the five calendar days written notice in cases where the DBE in question has provided written notice that it is withdrawing from the subcontract or purchase order. The notice period may be reduced by CDOT if required by public necessity.

(4) Following the notice period, if the Contractor decides to proceed, submit Form 1420 requesting approval of the termination or reduction.

(5) When a commitment is terminated or reduced (including when a DBE withdraws), make good faith efforts to find another DBE to substitute. These good faith efforts shall be directed at finding another DBE to perform at least the same amount of work under the contract as the participation that was terminated or reduced up to the contract goal.

C. Contract Changes. In the event of a contract change:

(1) If CDOT eliminates or reduces work committed to a DBE, such change shall be considered good cause for termination or reduction in accordance with Section 9.B above. The Contractor shall follow the processes outlined in Section 9.B but is not required to substitute. If the change
reduces the Contractor's DBE participation to below the contract goal, the Contractor shall indicate so on a Form 1420 and request a waiver of the unmet participation.

(2) If CDOT issues a change which increases or adds new work items, the Contractor shall ensure that it has obtained sufficient DBE participation to meet the Contract Goal, or has made good faith efforts to do so.

D. Process for Substitution or Increase in Participation to Meet the Contract Goal. When the Contractor must obtain additional DBE participation to meet the Contract Goal, whether resulting from an approved termination or reduction or a change to the Contract, the Contractor shall:

(1) Increase the participation of a DBE for any work items previously identified in an approved commitment without seeking CDOT approval; provided, however, that at its discretion, CDOT may request a Form 1420 documenting such additional participation; or

(2) If the Contractor needs to add new work to a commitment or obtain additional participation from a DBE that is not already participating on the contract pursuant to an approved commitment, submit a Form 1420 and Form 1415 requesting approval of the additional participation; or

(3) If the Contractor determines that additional DBE participation cannot be obtained, submit a Form 1420 requesting waiver of the participation. The Contractor shall include its justification for not obtaining additional participation and, at its discretion, CDOT may require additional information regarding the efforts of the Contractor.

10. Payment Reduction

The Contractor's retainage will not be released until CDOT has determined whether the Contractor will be subject to a payment reduction. Payment reductions will be calculated as follows:

A. Failure to Fulfill Commitments. If the Contractor terminated or reduced a commitment, the Contractor will be subject to a payment reduction for any termination or reduction which was not approved via a Form 1420.

B. Failure to Meet Contract Goal. If the Contractor failed to meet the contract goal, the Contractor will be subject to a payment reduction for the portion of the contract goal that was not met and was not waived via an approved Form 1420.

C. Duplication. The contractor will not be subject to duplicate reduction for the same offense.

D. Adjustments. CDOT may adjust the payment reduction wherein the Contractor demonstrates that its failure to obtain DBE participation was due to circumstances outside of its control.

11. Other Enforcement

A. Investigations. As it determines necessary, CDOT may conduct reviews or investigations of participants. All participants, including, but not limited to, DBE firms and applicants for DBE certification, complainants,
and contractors using DBE firms to meet contract goals, are required to cooperate fully and promptly with compliance reviews, certification reviews, investigations, and other requests for information.

B. **Intimidation and retaliation.** Participants shall not intimidate, threaten, coerce, or discriminate against any individual or firm for the purpose of interfering with any right or privilege secured by the DBE program or because the individual or firm has made a complaint, testified, assisted, or participated in any manner in an investigation, proceeding, or hearing under the DBE program.

C. **Consequences of Non-Compliance.** Failure to comply with subsections 11 A. or 11 B. shall be a ground for appropriate action against the party involved (e.g., with respect to recipients, a finding of noncompliance; with respect to DBE firms, denial of certification or removal of eligibility and/or suspension and debarment; with respect to a complainant or appellant, dismissal of the complaint or appeal; with respect to a contractor which uses DBE firms to meet goals, findings of non-responsibility for future contracts and/or suspension and debarment).

D. **Fraud and Misrepresentation.** If CDOT determines that a Contractor or subcontractor was a knowing and willing participant in any intended or actual subcontracting arrangement contrived to artificially inflate DBE participation or any other business arrangement determined by CDOT to be unallowable, or if the Contractor engages in repeated violations, falsification or misrepresentation, CDOT may:

1. refuse to count any fraudulent or misrepresented DBE participation;
2. withhold progress payments to the Contractor commensurate with the violation;
3. suspend or reduce the Contractor’s prequalification status;
4. refer the matter to the Office of Inspector General of the US Department of Transportation for investigation; or
5. seek any other available contractual remedy.
When work within a project is located in two or more counties and the minimum wages and fringe benefits are different for one or more job classifications, the higher minimum wages and fringe benefits shall apply throughout the project.

General Decision No. CO160022 applies to the following counties: Alamosa, Archuleta, Chaffee, Conejos, Custer, Delta, Dolores, Fremont, Gunnison, Hinsdale, La Plata, Mineral, Montezuma, Montrose, Ouray, Rio Grande, Saguache, San Juan, and San Miguel counties.

### General Decision No. CO160022

The wage and fringe benefits listed below reflect collectively bargained rates.

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**POWER EQUIPMENT OPERATOR:**

- **Drill Rig Caisson**
  - Smaller than Watson 2500 and similar: 24.73, 9.15
  - Watson 2500 similar or larger: 25.04, 9.15

- **Mechanic**
  - La Plata County: 24.88, 9.15

### General Decision No. CO160022

The wage and fringe benefits listed below do not reflect collectively bargained rates.

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    - La Plata: 18.60, 5.38

- **CEMENT MASON/CONCRETE FINISHER:**
  - Alamosa, Archuleta, Conejos, Custer, Delta, Dolores, Fremont, Gunnison, Hinsdale, Mineral, Montezuma, Ouray, Rio Grande, Saguache, San Juan, San Miguel: 17.67, 2.85
The wage and fringe benefits listed below do not reflect collectively bargained rates.

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The wage and fringe benefits listed below do not reflect collectively bargained rates.

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General Decision No. CO160022

The wage and fringe benefits listed below do not reflect collectively bargained rates.

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<th>Fringe Benefits</th>
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The wage and fringe benefits listed below do not reflect collectively bargained rates.

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<th>Fringe Benefits</th>
<th>Last Mod</th>
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The wage and fringe benefits listed below do not reflect collectively bargained rates.

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<td>3.04</td>
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<td>Montezuma</td>
<td>14.88</td>
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</table>
WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

============================================================================================================

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(ii)).

============================================================================================================

In the listing above, the "SU" designation means that rates listed under the identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

============================================================================================================
WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:
   * an existing published wage determination
   * a survey underlying a wage determination
   * a Wage and Hour Division letter setting forth a position on a wage determination matter
   * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

   Branch of Construction Wage Determinations
   Wage and Hour Division
   U.S. Department of Labor
   200 Constitution Avenue, N.W.
   Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

   Wage and Hour Administrator
   U.S. Department of Labor
   200 Constitution Avenue, N.W.
   Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

   Administrative Review Board
   U.S. Department of Labor
   200 Constitution Avenue, N.W.
   Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION NO. CO160022
ON THE JOB TRAINING

This training special provision is an implementation of 23 U.S.C. 140 (a). The Contractor shall meet the requirements of the FHWA 1273 for all apprentices and trainees.

As part of the Contractor's Equal Employment Opportunity Affirmative Action Program, training shall be provided on projects as follows:

1. The Contractor shall provide on the job training aimed at developing full journey workers in the skilled craft identified in the approved training plan. The Contractor shall provide at a minimum, required training hours listed in the Project Special Provisions for each project.

2. The primary objective of this specification is to train and upgrade women and minority candidates to full journey worker status. The Contractor shall make every reasonable effort to enroll and train minority and women workers. This training commitment shall not be used to discriminate against any applicant for training whether or not the applicant is a woman or minority.

3. The Contractor may employ temporary workers from CDOT supportive services providers to meet OJT requirements. Information pertaining to supportive services providers may be obtained by calling the CDOT OJT Coordinator at the number shown on the link [http://www.coloradodot.info/business/equal-opportunity/training.html](http://www.coloradodot.info/business/equal-opportunity/training.html)

4. An employee shall not be employed or utilized as a trainee in a skilled craft in which the employee has achieved journey status.

5. The minimum length and type of training for each skilled craft shall be as established in the training program selected by the Contractor and approved by the Department and the Colorado Division of the Federal Highway Administration (FHWA), or the U.S. Department of Labor (DOL), Office of Apprenticeship or recognized state apprenticeship agency. To obtain assistance or program approval contact:

   CDOT Center for Equal Opportunity
   4201 East Arkansas Avenue
   Denver, CO 80222
   eo@dot.state.co.us
   1-800-925-3427

6. The Contractor shall pay the training program wage rates and the correct fringe benefits to each approved trainee employed on the project and enrolled in an approved program. The minimum trainee wage shall be no less than the wage for the Guardrail Laborer classification as indicated in the wage decision for the project.

7. The CDOT Regional Civil Rights Manager must approve all proposed apprentices and trainees for the participation to be counted toward the project goal and reimbursement. Approval must occur before training begins. Approval for the apprentice or trainee to begin work on a CDOT project will be based on:

   A. Evidence of the registration of the trainee or apprentice into the approved training program.
   B. The completed Form 838 for each trainee or apprentice as submitted to the Engineer.

8. Before training begins, the Contractor shall provide each trainee with a copy of the approved training program, pay scale, pension and retirement benefits, health and disability benefits, promotional opportunities, and company policies and complaint procedures.

9. Before training begins, the Contractor shall submit a copy of the approved training program and CDOT Form 1337 to the Engineer. Progress payments may be withheld until this is submitted and approved and may be withheld if the approved program is not followed.
10. On a monthly basis, the Contractor shall provide to the Engineer a completed On the Job Training Progress Report (Form 832) for each approved trainee or apprentice on the project. The Form 832 will be reviewed and approved by the Engineer before reimbursement will be made. The Contractor will be reimbursed for no more than the OJT Force Account budget. At the discretion of the Engineer and if funds are available, the Engineer may increase the force account budget and the number of reimbursable training hours through a Change Order. The request to increase the force account must be approved by the Engineer prior to the training.

11. Upon completion of training, transfer to another project, termination of the trainee or notification of final acceptance of the project, the Contractor shall submit to the Engineer a “final” completed Form 832 for each approved apprentice or trainee.

12. All forms are available from the CDOT Center for Equal Opportunity, through the CDOT Regional Civil Rights Manager, or on CDOT’s website at http://www.coloradodot.info/business/bidding/Bidding%20Forms/Bid%20Winner%20Forms

13. Forms 838 and 832 shall be completed in full by the Contractor. Reimbursement for training is based on the number of hours of on the job training documented on the Form 832 and approved by the Engineer. The Contractor shall explain discrepancies between the hours documented on Form 832 and the corresponding certified payrolls.

14. The OJT goal (# of training hours required) for the project will be included in the Project Special Provisions and will be determined by the Regional Civil Rights Manager after considering:

A. Availability of minorities, women, and disadvantaged for training;
B. The potential for effective training;
C. Duration of the Contract;
D. Dollar value of the Contract;
E. Total normal work force that the average bidder could be expected to use;
F. Geographic location;
G. Type of work; and
H. The need for additional journey workers in the area
I. The general guidelines for minimum total training hours are as follows:

<table>
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<tr>
<th>Contract dollar value</th>
<th>Minimum total training hours to be provided on the project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 1 million</td>
<td>0</td>
</tr>
<tr>
<td>&gt;1 - 2 million</td>
<td>320</td>
</tr>
<tr>
<td>&gt;2 - 4 million</td>
<td>640</td>
</tr>
<tr>
<td>&gt;4 - 6 million</td>
<td>1280</td>
</tr>
<tr>
<td>&gt;6 - 8 million</td>
<td>1600</td>
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<tr>
<td>&gt;8 - 12 million</td>
<td>1920</td>
</tr>
<tr>
<td>&gt;12 - 16 million</td>
<td>2240</td>
</tr>
<tr>
<td>&gt;16 - 20 million</td>
<td>2560</td>
</tr>
<tr>
<td>For each increment of $5 million, over $20 million</td>
<td>1280</td>
</tr>
</tbody>
</table>
15. The number of training hours for the trainees to be employed on the project shall be as shown in the Contract. The trainees or apprentices employed under the Contract shall be registered with the Department using Form 838, and must be approved by the Regional Civil Rights Manager before training begins for the participation to be counted toward the OJT project goal. The goal will be met by an approved trainee or apprentice working on that project; or, if a Contractor's apprentice is enrolled in a DOL approved apprenticeship program and registered with CDOT using Form 838 and working for the Contractor on a non-CDOT project. The hours worked on the non-CDOT project may be counted toward the project goal with approved documentation on Form 832. Training hours will be counted toward one project goal.

16. Subcontractor trainees who are enrolled in an approved Program may be used by the Contractor to satisfy the requirements of this specification.

17. The Contractor will be reimbursed $2.00 per hour worked for each apprentice or trainee working on a CDOT project and whose participation toward the OJT project goal has been approved.

18. The Contractor shall have fulfilled its responsibilities under this specification if the CDOT Regional Civil Rights Manager has determined that it has provided acceptable number of training hours.

19. Failure to provide the required training will result in the following disincentives: A sum representing the number of training hours specified in the Contract, minus the number of training hours worked as certified on Form 832, multiplied by the journey worker hourly wages plus fringe benefits: \[(A \text{ hours} - B \text{ hours worked}) \times (C \text{ dollar per hour} + D \text{ fringe benefits})\] = Disincentives Assessed. Wage rate will be determined by averaging the wages for the crafts listed on Form 1337. The Engineer will provide the Contractor with a written notice at Final Acceptance of the project informing the Contractor of the noncompliance with this specification which will include a calculation of the disincentives to be assessed.
Attached is Form FHWA 1273 titled *Required Contract Provisions Federal-Aid Construction Contracts*. As described in Section I. General, the provisions of Form FHWA 1273 apply to all work performed under the Contract and are to be included in all subcontracts with the following modification:

For TAP (Transportation Alternatives Program) funded Recreational Trails projects, Section I (4) regarding convict labor and all of Section IV of the FHWA 1273 do not apply.

Except for Local Agency projects, the Contractor and all subcontractors who are subject to Davis-Bacon Related Acts (DBRA) requirements, shall submit all payrolls and Contractor Fringe Benefit Statements electronically via LCPtracker, utilizing the following web link:

https://prod.lcptracker.net/WebForms/login.aspx

The Contractor and subcontractors shall submit a Contractor Fringe Benefit Statement, either for each individual, or for groups of people, for all employees who perform work on the project and whose wages are covered by the Davis-Bacon Related Acts. Other approved deductions shall be noted within the LCPtracker system, and supporting documentation shall be attached. If for any reason the fringe benefits are altered during the life of the project, the Contractor, subcontractor, or both shall submit a revised Contractor Fringe Benefit Statement to accurately reflect the changes.

Each construction subcontractor shall submit their payrolls directly into LCP Tracker for approval by the Contractor.

The Contractor shall submit and approve their own payrolls in LCPtracker.

The Engineer will approve or reject weekly payrolls for the Contractor.
REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

II. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of $10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding $10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the
provisions prescribed herein, and imposed pursuant to 23
U.S.C. 140 shall constitute the EEO and specific affirmative
action standards for the contractor's project activities under
this contract. The provisions of the Americans with Disabilities
35 and 29 CFR 1630 are incorporated by reference in this
contract. In the execution of this contract, the contractor
agrees to comply with the following minimum specific
requirement activities of EEO:

a. The contractor will work with the contracting agency and
the Federal Government to ensure that it has made every
good faith effort to provide equal opportunity with respect to all
of its terms and conditions of employment and in their review
of activities under the contract.

b. The contractor will accept as its operating policy the
following statement:

"It is the policy of this Company to assure that applicants
are employed, and that employees are treated during
employment, without regard to their race, religion, sex, color,
national origin, age or disability. Such action shall include:
employment, upgrading, demotion, or transfer; recruitment or
recruitment advertising; layoff or termination; rates of pay or
other forms of compensation; and selection for training,
including apprenticeship, pre-apprenticeship, and/or on-the-
job training."

2. EEO Officer: The contractor will designate and make
known to the contracting officers an EEO Officer who will have
the responsibility for and must be capable of effectively
administering and promoting an active EEO program and who
must be assigned adequate authority and responsibility to do
so.

3. Dissemination of Policy: All members of the contractor's
staff who are authorized to hire, supervise, promote, and
discharge employees, or who recommend such action, or who
are substantially involved in such action, will be made fully
cognizant of, and will implement, the contractor's EEO policy
and contractual responsibilities to provide EEO in each grade
and classification of employment. To ensure that the above
agreement will be met, the following actions will be taken as a
minimum:

a. Periodic meetings of supervisory and personnel office
employees will be conducted before the start of work and then
not less often than once every six months, at which time the
contractor's EEO policy and its implementation will be
reviewed and explained. The meetings will be conducted by
the EEO Officer.

b. All new supervisory or personnel office employees will be
given a thorough indoctrination by the EEO Officer, covering
all major aspects of the contractor's EEO obligations within
thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for
the project will be instructed by the EEO Officer in the
contractor's procedures for locating and hiring minorities and
women.

d. Notices and posters setting forth the contractor's EEO
policy will be placed in areas readily accessible to employees,
applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to
implement such policy will be brought to the attention of
employees by means of meetings, employee handbooks, or
other appropriate means.

4. Recruitment: When advertising for employees, the
contractor will include in all advertisements for employees the
notation: "An Equal Opportunity Employer." All such
advertisements will be placed in publications having a large
circulation among minorities and women in the area from
which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid
bargaining agreement, conduct systematic and direct
recruitment through public and private employee referral
sources likely to yield qualified minorities and women. To
meet this requirement, the contractor will identify sources of
potential minority group employees, and establish with such
identified sources procedures whereby minority and women
applicants may be referred to the contractor for employment
consideration.

b. In the event the contractor has a valid bargaining
agreement providing for exclusive hiring hall referrals, the
contractor is expected to observe the provisions of that
agreement to the extent that the system meets the contractor's
compliance with EEO contract provisions. Where
implementation of such an agreement has the effect of
discriminating against minorities or women, or obligates the
contractor to do the same, such implementation violates
Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to
refer minorities and women as applicants for employment.

5. Personnel Actions: Wages, working conditions, and
employee benefits shall be established and administered, and
personnel actions of every type, including hiring, upgrading,
promotion, transfer, demotion, layoff, and termination, shall be
taken without regard to race, color, religion, sex, national
origin, age or disability. The following procedures shall be
followed:

a. The contractor will conduct periodic inspections of project
sites to insure that working conditions and employee facilities
do not indicate discriminatory treatment of project site
personnel.

b. The contractor will periodically evaluate the spread of
wages paid within each classification to determine any
evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel
actions in depth to determine whether there is evidence of
discrimination. Where evidence is found, the contractor will
promptly take corrective action. If the review indicates that the
discrimination may extend beyond the actions reviewed, such
corrective action shall include all affected persons.
d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants / Employees with Disabilities: The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors and suppliers and lessees of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurance Required by 49 CFR 26.13(b):

a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.
a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;

b. The contractors and subcontracts will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of $10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor’s control, where the facilities are segregated. The term “facilities” includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding $2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt.

Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 “Contract provisions and related matters” with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer’s payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.d. of this section) and the Davis-Bacon poster (WH–1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b. (1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee’s social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Web site at [http://www.dol.gov/esa/whd/forms/wh347instr.htm](http://www.dol.gov/esa/whd/forms/wh347instr.htm)
or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency.

(2) Each payroll submitted shall be accompanied by a “Statement of Compliance,” signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §§5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §§5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH–347 shall satisfy the requirement for submission of the “Statement of Compliance” required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor or his or her agent to criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeymen's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable
predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6. Subcontracts. The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility.

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).


V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The following clauses apply to any Federal-aid construction contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As
used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.

3. Withholding for unpaid wages and liquidated damages. The FHWA or the contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

   a. The term “perform work with its own organization” refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

      (1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;
      (2) the prime contractor remains responsible for the quality of the work of the leased employees;
      (3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and
      (4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

   b. “Specialty Items” shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1.) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is
evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

“Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both.”

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.

2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA
1. Instructions for Certification – First Tier Participants:

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency’s determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CF Parts 180 and 1200. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contractor). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers to the participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

* * * * *

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. Instructions for Certification - Lower Tier Participants:

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost $25,000 or more - 2 CFR Parts 180 and 1200)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (https://www.epsl.gov/), which is compiled by the General Services Administration.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed $100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of
Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, “Disclosure Form to Report Lobbying,” in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such recipients shall certify and disclose accordingly.
ATTACHMENT A - EMPLOYMENT AND MATERIALS PREFERENCE FOR APPALACHIAN DEVELOPMENT HIGHWAY SYSTEM OR APPALACHIAN LOCAL ACCESS ROAD CONTRACTS

This provision is applicable to all Federal-aid projects funded under the Appalachian Regional Development Act of 1965.

1. During the performance of this contract, the contractor undertaking to do work which is, or reasonably may be, done as on-site work, shall give preference to qualified persons who regularly reside in the labor area as designated by the DOL wherein the contract work is situated, or the subregion, or the Appalachian counties of the State wherein the contract work is situated, except:

   a. To the extent that qualified persons regularly residing in the area are not available.

   b. For the reasonable needs of the contractor to employ supervisory or specially experienced personnel necessary to assure an efficient execution of the contract work.

   c. For the obligation of the contractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that the number of nonresident persons employed under this subparagraph (1c) shall not exceed 20 percent of the total number of employees employed by the contractor on the contract work, except as provided in subparagraph (4) below.

2. The contractor shall place a job order with the State Employment Service indicating (a) the classifications of the laborers, mechanics and other employees required to perform the contract work, (b) the number of employees required in each classification, (c) the date on which the participant estimates such employees will be required, and (d) any other pertinent information required by the State Employment Service to complete the job order form. The job order may be placed with the State Employment Service in writing or by telephone. If during the course of the contract work, the information submitted by the contractor in the original job order is substantially modified, the participant shall promptly notify the State Employment Service.

3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.

4. If, within one week following the placing of a job order by the contractor with the State Employment Service, the State Employment Service is unable to refer any qualified job applicants to the contractor, or less than the number requested, the State Employment Service will forward a certificate to the contractor indicating the unavailability of applicants. Such certificate shall be made a part of the contractor’s permanent project records. Upon receipt of this certificate, the contractor may employ persons who do not normally reside in the labor area to fill positions covered by the certificate, notwithstanding the provisions of subparagraph (1c) above.

5. The provisions of 23 CFR 633.207(e) allow the contracting agency to provide a contractual preference for the use of mineral resource materials native to the Appalachian region.

6. The contractor shall include the provisions of Sections 1 through 4 of this Attachment A in every subcontract for work which is, or reasonably may be, done as on-site work.