

PROJECT PECIAL PROVISIONS

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**COLORADO
DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISIONS
US 50 - McCulloch Blvd to Wills Blvd
STANDARD SPECIAL PROVISIONS**

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NOTICE TO BIDDERS

The proposal guaranty shall be a certified check, cashier's check, or bid bond in the amount of 5 percent of the Contractor's total bid.

Pursuant to subsections 102.04 and 102.05, it is recommended that bidders on this project review the work site and plan details with an authorized Department representative. Prospective bidders shall contact one of the following listed authorized Department representatives at least 12 hours in advance of the time they wish to go over the project.

PROGRAM ENGINEER	Ajin Hu, PE 902 Erie Avenue Pueblo, CO 81001 (719) 546-5430 – Office (719) 251-2573 – Cell
RESIDENT ENGINEER	Dan Dahlke, PE 902 Erie Avenue Pueblo, CO 81001 (719) 562-5509 – Office (719) 251-7981 – Cell
PROJECT ENGINEER	Dean Sandoval 902 Eric Avenue Pueblo, CO 81001 (719)546-5440 – Office (719)251-6978– Cell

The above referenced individuals are the only representatives of the Department with authority to provide any information, clarification, or interpretation regarding the plans, specifications, and any other contract documents or requirements.

Questions received from bidders along with CDOT responses will be posted on the CDOT web site listed below as they become available.

<http://www.coloradodot.info/business/bidding/future-bidding-opportunities>

If the bidder has a question or requests clarification that involves the bidder's innovative or proprietary means and methods, phasing, scheduling, or other aspects of construction of the project, the Project Engineer will direct the bidder to contact the Resident Engineer directly to address the question or clarification. The Resident Engineer will keep the bidder's innovation confidential and will not share this information with other bidders.

The Resident Engineer will determine whether questions are innovative or proprietary in nature. If the Resident Engineer determines that a question does not warrant confidentiality, the bidder may withdraw the question. If the bidder withdraws the question, the Resident Engineer will not answer the question and the question will not be documented on the CDOT web site. If the bidder does not withdraw the question, the question will be answered, and both the question and CDOT answer will be posted on the web site. If the Resident Engineer agrees that a question warrants confidentiality, the Resident Engineer will answer the question, and keep both question and answer confidential. CDOT will keep a record of both question and answer in their confidential file.

All questions shall be directed to the CDOT contacts listed above no later than 7:00 A.M. Monday of the week of bid opening. Final questions and answers will be posted no later than Tuesday morning of bid opening week. Questions and answers shall be used for reference only and shall not be considered part of the Contract.

COMMENCEMENT AND COMPLETION OF WORK

The Contractor shall commence work under the Contract on or before the 5th day following Contract execution or the 20th day following the date of award, whichever comes later, unless such time for beginning the work is changed by the Chief Engineer in the "Notice to Proceed." The Contractor shall complete all work within **275** working days in accordance with the "Notice to Proceed."

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

Subsection 108.03 shall include the following:

The Contractor's progress schedule shall be a Critical Path Method (CPM) Schedule.

Salient features to be shown on the Contractor's CPM Schedule are:

- (1) Traffic Control
- (2) Public Information Services
- (3) Pavement Mix Design
- (4) Mobilization
- (5) Removal of Asphalt Mat (Planing)
- (6) Removal of structures and obstructions (pipes)
- (7) Removal of overhead VMS
- (8) Removal of portions of present structure (bridge)
- (9) Relocate utilities
- (10) Detour(s)
- (11) Construction surveying
- (12) Waterproofing (Membrane)
- (13) Concrete Curb Ramps (all items associated with the removal and installation thereof)
- (14) Removal of Asphalt Mat, Curb and Gutter, Sidewalk and Median Cover
- (15) Unclassified Excavation (CIP) (Special) and ABC (Class 6)
- (16) Curb and Gutter Type 2 (Section II-B) and (Section II-M), Sidewalk, Concrete Bikeway
- (17) Clearing and grubbing
- (18) Earthwork
- (19) Erosion control
- (20) Bridge construction
- (21) Sign structure for VMS – cantilever
- (22) Traffic signals
- (23) Water Quality Ponds
- (24) Hot Mix Asphalt
- (25) Storm Drainage
- (26) Permanent pavement markings and Final Signing
- (27) Soil Conditioning, seeding, mulching, and cleanup
- (28) Cleanup

Contractor shall develop and submit a construction phasing plan for review and approval prior to the start of work.

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

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COMMENCEMENT AND COMPLETION OF WORK

Subsection 108.03 shall include the following:

The Contractor's initial and monthly progress schedule shall be provided in the Microsoft Project (latest version) electronic file and hard copy formats and shall clearly depict the critical path of the project. The schedule shall consider time required to obtain all necessary permits and all material fabrication and delivery. The schedule shall consider the time required for signal(s) shop drawing review, fabrications, and delivery.

The schedule shall contain a clear demonstration of the construction phasing.

The Contractor's initial and monthly work cost draw down schedule shall be provided in the Microsoft Excel electronic file and hard copy formats. The work cost draw down schedule shall consider all costs associated with the project to the time of project completion.

The Contractor shall submit an updated project schedule, monthly and total project, and work cost draw down schedule prior to the approval of each monthly pay estimate.

DISADVANTAGED BUSINESS ENTERPRISE (DBE) CONTRACT GOAL

This is a federally-assisted construction project. As described in the CDOT DBE Standard Special Provision, the Bidder shall make good faith efforts to meet the following contract goal:

2 % Percent DBE participation.

ON THE JOB TRAINING CONTRACT GOAL

The Department has determined that On the Job Training shall be provided to trainees with the goal of developing full journey workers in the types of trade or classification involved. The contract goal for On the Job Trainees working in an approved training plan in this Contract has been established as follows:

Minimum number of total On the Job Training required **1920** hours

**REVISION OF SECTION 102
PROJECT PLANS AND OTHER DATA**

Section 102 of the Standard Specifications is hereby revised for this project as follows:

Subsection 102.05 shall include the following:

After the proposals have been opened, the low responsible bidder may obtain from the Reproduction Branch, Room 107, 4201 East Arkansas Avenue, Denver, Colorado 80222, at no cost: 10 sets of plans and special provisions; and if available for the project, one set of full-size cross sections, one set of full size major structure plan sheets, and one set of computer output data. If the low bidder has not picked up the plans and other available data by 4:30 p.m. on the second Friday after bid opening, they will be sent to the Resident Engineer in charge of the project. Additional sets of plans and other available data may be purchased on a cash sale basis from the Reproduction Branch at current reproduction prices. Subcontractors and suppliers may obtain plans and other data from the successful bidder or they may purchase copies on a cash sale basis from the Reproduction Branch at current reproduction prices.

The following information will be available for review at the Resident Engineer's office (902 Erie Ave., Pueblo, Colorado):

1. Survey information (electronic)
2. Roadway cross sections
3. Final Geotechnical Engineering Report, by RockSol, Dated July 31 2014
4. Final Pavement Report, by RockSol, Dated July 31 2014
5. Structure Selection Report- Bridge, by FHU, Dated August 30, 2013
6. Final Hydraulics Drainage Report, by J. F. Sato and Associates, Dated July 31 2014
7. Colorado Discharge Permit System – Storm Water
8. Application for Pueblo County Air Quality Permit
9. Impacted Black-Tailed Prairie Dog Policy, January 15, 2009
10. Summary of Impacts and Mitigation for the Proposed Action, Table-4, US 50 West EA, June, 2014
11. Section 404 Permit, Nationwide-14 Linear Transportation Projects; US Army Corp of Engineers

**REVISION OF SECTION 105
CONTRACTOR SUBMITTALS**

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

In subsection 105.02, add the following to Table 105-1:

Section No.	Description	Type	Contractor P.E. Seal Required?
206	Shoring	Working Drawings	Yes
514	Pedestrian Railing Steel (Special)	Shop Drawing	No
518	Expansion Devices: 0-4"	Shop Drawing	No
606	Bridge Rail Type 10 (Special)	Shop Drawing	No

**REVISION OF SECTIONS 105, 106, AND 203
CONFORMITY TO THE CONTRACT OF EMBANKMENT**

Sections 105, 106 and 203 of the Standard Specifications are hereby revised for this project as follows:

Subsection 105.03 shall include the following:

Conformity to the contract of embankment construction shall be determined in accordance with the following:

(a) *Quality Control Plan.* The Contractor shall be responsible for Quality Control (QC) for all embankment material on this project. The Contractor shall submit a written Quality Control Plan (QCP), including a methods statement, to the Engineer for acceptance. The QCP shall include but not be limited to the following:

- (1) Maximum lift thickness of eight inches in accordance with subsection 203.06 or as directed.
- (2) Compaction equipment capable of obtaining the specified compaction.
- (3) Water trucks with an adequate distribution system that will apply water evenly.
- (4) List of all inspection and materials testing forms and procedures utilized by the Contractor.
- (5) Adherence to Table 106-4 requiring minimum testing frequency.

The Contractor shall submit the QCP at least five working days prior to the start of the work. The Engineer's review of the QCP will not exceed two working days. Work shall not begin until the QCP has been accepted in writing, unless otherwise approved.

(b) *Documentation.* The Contractor shall maintain current records of quality control operation activities, and tests performed. These records shall be in the form shown in the QCP, and shall include as a minimum, the Contractor or Subcontractor, the number of personnel working, weather conditions, type of equipment being used, delays and their cause, and deficiencies along with corrective action taken. Such records shall cover both conforming and defective or deficient features. Additional documentation to the Engineer shall include all daily test results, daily inspection reports, daily non-compliance reports, and monthly certification reports. Copies of these records and a statement that work incorporated in the project complies with the Contract shall be submitted to the Engineer prior to payment for the work or upon request. Monthly certification reports shall be stamped with the seal of a Professional Engineer registered in Colorado. Failure to provide the Engineer with the necessary documentation will result in the suspension of payments on embankment until the documentation has been completed and accepted by the Engineer. CDOT Quality Assurance documentation shall not be used as supporting documentation for the Contractor's certification.

CDOT or CDOT's certified representative will be responsible for Quality Assurance (QA) and Independent Assurance Testing (IAT).

Subsection 106.03 shall include the following:

Testing of embankment construction shall conform to the following:

The supervisor responsible for the direct supervision for the process control sampling and testing shall be identified in the QCP and be qualified according to the requirements of CP-10 (Note: this will require a PE or a NICET Level III certification). The technicians taking samples and performing tests must be qualified according to requirements of CP 10 (Note: this will require WAQTC qualification). A WAQTC qualified QC technician, employed by the Contractor, shall be on site full-time while any earthwork or embankment operations are taking place.

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**REVISION OF SECTIONS 105, 106, AND 203
 CONFORMITY TO THE CONTRACT OF EMBANKMENT**

The project verification sampling and testing procedures shown in the CDOT Field Materials Manual under the frequency guide schedule for minimum materials sampling, testing and inspection shall be used for the elements shown in Table 106-4.

**Table 106-4
 EXCAVATION AND EMBANKMENT TESTING SCHEDULE**

Minimum Testing Frequency	Element	CDOT verification Testing
None Required 1 per soil type 1 per 500 cubic yards or fraction thereof. 1 per 300 cubic yards or fraction thereof. 1 per 5,000 cubic yards or fraction thereof.	Soil Survey (Classification) Moisture – Density Curve In-Place Density In-Place Density when within 100 ft. of Bridge Approach(s). 1 Point Check	See CDOT Field Materials Manual for Frequency 1 per soil type 1 per 1,000 cubic yards or fraction thereof. 1 per 500 cubic yards or fraction thereof. 1 per 10,000 cubic yards or fraction thereof.

Qualifications for testing and personnel are contained in Section 203, Chapter 200 of the CDOT Field Materials Manual, CP-10, CP 13, CP 15, and CP 80, and the CDOT Inspectors Checklist.

Subsection 203.02 (a) shall include the following:

Unclassified Excavation shall include removal of unstable or unsuitable material within the roadway as determined and directed by the Engineer.

Subsection 203.02 (c) shall include the following:

Embankment material containing significantly more than optimum moisture that would become stable if dried shall not be considered muck.

Subsection 203.13 (b) shall include the following:

The disposal of unsuitable material and replacement of embankment will not be measured and paid for separately, but shall be included in the work.

The Contractor's Quality Control efforts will not be measured and paid for separately but shall be included in the work.

**REVISION OF SECTION 107
PERFORMANCE OF SAFETY CRITICAL WORK**

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

Add subsection 107.061 immediately following subsection 107.06 as follows:

107.061 Performance of Safety Critical Work. The following work elements are considered safety critical work for this project:

- (1) Removal of Portion of Bridge (Structure No. K-18-CW)
- (2) Excavation and embankment adjacent to the roadway
- (3) Overhead Cantilever erection

The Contractor shall submit, for record purposes only, an initial detailed construction plan that addresses safe construction of each of the safety critical elements. When the specifications already require an erection plan, a bridge removal plan, or a removal of portion of bridge plan, it shall be included as a part of this plan. The detailed construction plan shall be submitted two weeks prior to the safety critical element conference described below. The construction plan shall be stamped "Approved for Construction" and signed by the Contractor. The construction plan will not be approved by the Engineer.

The Construction Plan shall include the following:

- (1) Safety Critical Element for which the plan is being prepared and submitted.
- (2) Contractor or Subcontractor responsible for the plan preparation and the work.
- (3) Schedule, procedures, equipment, and sequence of operations, that comply with the working hour limitations
- (4) Temporary works required: falsework, bracing, shoring, etc.
- (5) Additional actions that will be taken to ensure that the work will be performed safely.
- (6) Names and qualifications of workers who will be in responsible charge of the work:
 - A. Years of experience performing similar work
 - B. Training taken in performing similar work
 - C. Certifications earned in performing similar work
- (7) Names and qualifications of workers operating cranes or other lifting equipment
 - A. Years of experience performing similar work
 - B. Training taken in performing similar work
 - C. Certifications earned in performing similar work
- (8) The construction plan shall address how the Contractor will handle contingencies such as:
 - A. Unplanned events (storms, traffic accidents, etc.)
 - B. Structural elements that don't fit or line up
 - C. Work that cannot be completed in time for the roadway to be reopened to traffic
 - D. Replacement of workers who don't perform the work safely
 - E. Equipment failure
 - F. Other potential difficulties inherent in the type of work being performed
- (9) Name and qualifications of Contractor's person designated to determine and notify the Engineer in writing when it is safe to open a route to traffic after it has been closed for safety critical work.
- (10) Erection plan when submitted as required elsewhere by the specifications. Plan requirements that overlap with above requirements may be submitted only once.

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**REVISION OF SECTION 107
PERFORMANCE OF SAFETY CRITICAL WORK**

A safety critical element conference shall be held two weeks prior to beginning construction on each safety critical element. The Engineer, the Contractor, the safety critical element Subcontractors, and the Contractor's Engineer shall attend the conference. Required pre-erection conferences or bridge removal conferences may be included as a part of this conference.

After the safety critical element conference, and prior to beginning work on the safety critical element, the Contractor shall submit a final construction plan to the Engineer for record purposes only. The Contractor's Engineer shall sign and seal temporary works, such as falsework, shoring etc., related to construction plans for the safety critical elements, Removal of Portion of Bridge. The final construction plan shall be stamped "Approved for Construction" and signed by the Contractor.

The Contractor shall perform safety critical work only when the Engineer is on the project site. The Contractor's Engineer shall be on site to inspect and provide written approval of safety critical work for which he provided signed and sealed construction details. Unless otherwise directed or approved, the Contractor's Engineer need not be on site during the actual performance of safety critical work, but shall be present to conduct inspection for written approval of the safety critical work.

When ordered by the Engineer, the Contractor shall immediately stop safety critical work that is being performed in an unsafe manner or will result in an unsafe situation for the traveling public. Prior to stopping work, the Contractor shall make the situation safe for work stoppage. The Contractor shall submit an acceptable plan to correct the unsafe process before the Engineer will authorize resumption of the work.

When ordered by the Engineer, the Contractor shall remove workers from the project that are performing the safety critical work in a manner that creates an unsafe situation for the public in accordance with subsection 108.06.

Should an unplanned event occur or the safety critical operation deviate from the submitted plan, the Contractor shall immediately cease operations on the safety critical element, except for performing any work necessary to ensure worksite safety, and provide proper protection of the work and the traveling public. If the Contractor intends to modify the submitted plan, he shall submit a revised plan to the Engineer prior to resuming operations.

All costs associated with the preparation and implementation of each safety critical element construction plan will not be measured and paid for separately, but shall be included in the work.

Nothing in the section shall be construed to relieve the Contractor from ultimate liability for unsafe or negligent acts or to be a waiver of the Colorado Governmental Immunity Act on behalf of the Department.

**REVISION OF SECTION 107
LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC**

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

The following shall be added to Subsection 107.08, Railroad-Highway Provisions:

The "Railroad" as shown in the plans and specifications shall refer to the BNSF Railway Company.

The requirements of the AREMA "Manual for Railway Engineering" - 2013 Edition shall be met by the Contractor. References to additional guidelines and requirements within these documents shall be met as well.

Railroad coordination, including time spent to improve the Contractor's understanding of Railroad requirements, shall be included in the Contractor's work.

The Contractor shall submit all construction submittals to CDOT for review and approval.

All work required of the Contractor in conjunction with or directed by the Railroad shall not be paid for separately but shall be included in the project.

**REVISION OF SECTION 108
PROSECUTION AND PROGRESS**

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

Subsection 108.08 shall include the following:

The Contractor shall establish daily working hours, Monday through Friday during daylight hours, for the project and submit them to the Engineer for approval along with his Progress Schedule; all work performed by the Contractor or any of the Contractor's agents during a working day shall be accomplished within these pre-established working hours. Neither the Contractor nor any of the Contractor's agents shall work during times outside of the daily working hours without written approval by the Engineer. Requests for changes in working hours shall be submitted to the Engineer in writing at least 48 hours before the proposed change in working hours would take effect. Working hours outside of these times will not be allowed unless it is necessary due to weather restrictions or to comply with safety requirements or as specified by the plans and specifications by the plans and specifications and approved by the Engineer.

**REVISION OF SECTION 201
CLEARING AND GRUBBING - PROTECTION OF PRAIRIE DOGS**

Section 201 of the Standard Specifications is hereby revised for this project as follows:

DESCRIPTION

Subsection 201.01 shall include the following: This work shall consist of protecting Black-tailed Prairie Dogs. The Contractor shall coordinate clearing and grubbing operations to avoid impacts to the Black-tailed Prairie Dog.

CONSTRUCTION REQUIREMENTS

Subsection 201.02 shall include the following:

Prairie dog colonies are known to occur on or adjacent to CDOT ROW within the project area, as shown on the Environmental Plan Sheets. A minimum of 10 business days prior to any work in areas with Prairie Dog colonies, the Contractor shall request, through the CDOT Project Engineer, that a Prairie Dog survey be performed by a qualified biologist. Should active Prairie Dog colonies be found, from approximately July 1 to March 15 (mid-summer to mid-spring), a CDOT Project Engineer designated qualified biologist shall assist the Contractor in passive relocation of prairie dogs, if construction cannot avoid the prairie dog colony. During the pupping season from approximately March 15 to July 1 (mid-spring to mid-summer), as determined by the CDOT Project Engineer designated qualified biologist, disturbance of Prairie Dog colonies will not be allowed. No staging of equipment, vehicles, or materials will be allowed within any prairie dog colony at any time.

Passive relocation method:

The Contractor shall install silt fences in a manner that creates a rectangular enclosure that limits the prairie dogs field of view. These enclosures will be constructed as to avoid blocking access to residences. Silt fence shall be entrenched to a depth of 6 inches.

Phase I: Silt fence is to be installed parallel to the highway at the minimum distance necessary for ground disturbance in the work area where prairie dogs are present, but not to exceed the limits of disturbance shown on the plans. Should the planned disturbance exceed the limits of disturbance shown on the plans, relocation methods other than passive relocation may be necessary at the discretion of the CDOT qualified biologist to include live trapping or other means.

Phase II: Grade the area between the silt fence and highway to a depth of 6 inches.

Phase III: Install silt fence 5 feet off the edge of existing oil in the same areas fenced in Phase I. Perpendicular fencing may be installed, as recommended by the qualified biologist, to reduce prairie dog sight distance within each enclosure.

Phase IV: Re-grading of the area should occur as necessary (i.e. at least once a day) until the prairie dogs have left the work area (approximately 3 days). Once the Contractor no longer sees any evidence of prairie dogs in the work area (i.e. prairie dogs or new burrows), they shall call the qualified biologist to resurvey the area so a final clearance can be given.

Exclusion during the pupping season:

If construction occurs between March 15 – July 1 (within the prairie dog “pupping” season, as determined by the qualified biologist), no work will be allowed within any active prairie dog colonies.

The qualified biologist shall assist the Contractor in locating and installing barrier fencing (silt fencing) to protect active prairie dog colonies from construction activities during the “pupping” season (March 15 - July 1).

201.04 Measurement and Payment

All costs incidental to the foregoing requirements and will not be measured or paid for separately, but shall be included in the work.

**REVISION OF SECTION 202
REMOVAL OF STRUCTURES AND OBSTRUCTIONS**

Section 202 of the Standard Specifications is hereby revised for this project as follows:

In Subsection 202.02 delete the sixth paragraph and include the following:

The sawing of concrete and pavements shall be done carefully and all concrete or pavement to remain in place, which is damaged due to Contractors operations, shall be removed and replaced at the Contractors expense.

Subsection 202.02 shall include the following:

When removing any fence, the posts on either side of the section to be removed shall be securely braced with an approved end post before the fence is cut to prevent any slacking of the remaining fence.

Subsection 202.11 shall include the following:

The cutting of asphalt mat to a neat line where removal of asphalt mat will abut a new pavement will not be paid for separately but shall be included in the work. The Contractor shall perform necessary investigations required to determine the thickness of existing asphalt pavements designated for removal.

Saw cutting of concrete pavements, curbs, gutters, or sidewalks to provide a neat line at the removal limit will not be measured or paid for separately, but shall be included in the item for which it is required.

Subsection 202.12, third paragraph, shall be revised to read as follows:

When the contract does not include pay items for removal of a particular type of structure or obstruction, the removal will not be paid for separately, but shall be included in the work.

Subsection 202.12 shall include the following:

Payment for Removal of Pipe will be full compensation for all work required to remove the pipe and other appurtenances not specifically paid for under other pay items; custody, preservation, storage, transport and disposal of those items; excavation and subsequent backfill.

Backfill for voids created by removed structures will not be measured and paid for separately, but shall be included in the work.

**REVISION OF SECTION 202
REMOVAL AND TRIMMING OF TREES**

Section 202 of the Standard Specifications is hereby revised for this project as follows:

Subsection 202.01 shall include the following:

This work includes the removal and the trimming of trees as directed by the Engineer. This work includes the preservation from injury or defacement of all vegetation and objects that are to remain.

The Engineer will establish environmental limits. All trees, shrubs, plants, grasses, and other vegetative materials shall remain, except as designated by the Engineer.

Subsection 202.02 shall include the following:

Prior to beginning any construction; removal, trimming, and pruning of encroaching vegetation (as determined by the Engineer) shall be completed.

Once all directed clearing, trimming, and pruning is completed and accepted, no additional clearing, trimming, cutting, or pruning will be allowed unless approved, in writing, by the Engineer.

This work shall be done by a Contractor or Subcontractor who is a qualified tree surgeon and a member of the National Arborist Association. The firm's or individual's name and qualifications shall be submitted at the preconstruction conference for the Engineer's approval. A list of references and other clients shall be included with the qualifications statement. A written description of work methods and time schedules shall be submitted and approved in writing by the Engineer prior to work commencing.

Access for the removal or pruning of trees will be extremely limited. Strict limits of disturbance are defined in the plans and shall be adhered to. Trees shall be felled at the risk of the Contractor. If damage or destruction occurs outside of the pre-established limits, the provisions of "Revision of Section 107 – Protection of Existing Vegetation" will be enforced

Branches on trees or shrubs shall be removed as directed by the Engineer. All trimming shall be done by skilled workmen. All work shall be done according to the following requirements:

- Pruning shall be done with proper, sharp, clean tools in such a manner as to preserve the natural character of the tree.
- All final cuts shall leave no projections on or off the branch and shall not be cut so close as to eliminate the branch collar.
- To avoid bark stripping, all branches 2 inches in diameter and larger shall be cut using the 3-cut method. These branches shall be lowered to the ground by proper ropes.
- Tools used on trees known or found to be diseased, shall be disinfected with alcohol before they are used on other trees.
- Structure weaknesses, decayed trunk or branches, or spilt crotches shall be reported to the Engineer
- When cutting back or topping trees, the Contractor shall use the drop-crotch method and avoid cutting back to small suckers. Smaller limbs and twigs shall be removed in such a manner so as to leave the foliage pattern evenly distributed.

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**REVISION OF SECTION 202
REMOVAL AND TRIMMING OF TREES**

- When reducing size (cut back or topping) not more than one-third of the total area shall be reduced at a single operation.
- Climbing spikes shall not be used on trees not scheduled for removal.
- Remove man-made structures including wires and cables from existing trees.
- Make smooth cuts on any severed tree roots greater than 2 inches in diameter. Do not rip or tear, by excavation equipment, roots of trees to remain.

All brush, trunks, branches, limbs, and foliage shall be chipped into mulch and stockpiled at a designated site. Stumps shall be left no higher than 2 feet above the ground surface and shall not be removed when within the areas to be excavated. When trees being cut off are outside the excavation limits, the stumps shall be cut so that no more than 3 inches remains above the ground surface.

Subsection 202.12 shall include the following:

Trimming of trees shall be included in Clearing and Grubbing; Removal of Trees shall be paid for separately.

Chipping, stockpiling mulch, and hauling and stockpiling trunks and limbs will not be paid for separately but shall be included in the work. Removal of trees less than 6 inches in diameter at breast height (DBH) will not be paid for separately but shall be included in the Clearing and Grubbing item.

**REVISION OF SECTION 202
REMOVAL OF ASPHALT MAT (PLANING)**

Section 202 of the Standard Specifications is hereby revised for this project as follows:

Delete subsection 202.09, and replace it with the following:

202.09 Removal of Asphalt Mat (Planing). Prior to beginning planing operations, the Contractor shall submit a planing plan and a Quality Control Plan (QCP) for approval by the Engineer. The planing plan shall include at a minimum:

- (1) The number, types and sizes of planers to be used.
- (2) The width and location of each planing pass.
- (3) The number and types of brooms to be used and their locations with respect to the planers.
- (4) The proposed method for planing and wedging around existing structures such as manholes, valve boxes, and inlets.
- (5) The longitudinal and transverse typical sections for tie-ins at the end of the day.
- (6) If requested by the Engineer, a plan sheet showing the milling passes.

The QCP shall include as a minimum:

- (1) The schedule for replacing the cutting teeth.
- (2) The daily preventive maintenance schedule and checklist.
- (3) Proposed use of automatic grade controls.
- (4) The surface testing schedule for smoothness.
- (5) The process for filling distressed areas.
- (6) The schedule for testing macrotexture of the milled surface.
- (7) Corrective procedures if the milled surface does not meet the minimum macrotexture specification.
- (8) Corrective procedures if the milled surface does not meet the minimum transverse or longitudinal surface finish when measured with a 10 foot straightedge.

The Contractor shall not start the planing operation until the hot mix asphalt (HMA) mix design has been approved and a Form 43 has been signed by the Engineer.

The existing pavement shall be milled to the cross-slope as shown on the plans, and shall have a surface finish that does not vary longitudinally or transversely more than 3/8 inch from a 10 foot straightedge. A 10 foot straightedge shall be supplied by the Contractor.

All milled surfaces shall be broomed with a pick-up broom, unless otherwise specified, before being opened to traffic. A sufficient number of brooms shall be used immediately after planing to remove all milled material remaining in the roadway.

If the Contractor fails to adequately clean the roadway, work shall cease until the Engineer has approved the Contractor's revised written proposal to adequately clean the roadway.

The milled surface shall have a macrotexture equal to or less than 0.170 inches for single-lift overlays and 0.215 inches for multiple-lift overlays as tested in accordance with CP 77. Milled surfaces that do not meet these criteria shall require corrective action in accordance with the QCP. The Contractor shall be responsible for testing the macrotexture of the milled surface at the location directed by the Engineer in accordance with CP 77 at a stratified random frequency of one test per 10,000 square yards or a minimum of once per work day.

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**REVISION OF SECTION 202
REMOVAL OF ASPHALT MAT (PLANING)**

At the completion of each day's work, longitudinal vertical edges greater than 1 inch shall be tapered. No transverse vertical edges will be allowed. Longitudinal milled surface tie-ins to existing pavement shall be tapered to not less than a 3:1 slope, transverse milled surface tie-ins to existing pavement shall be tapered to not less than a 50:1 slope. Transverse tapered joints may be tapered with the planing machine, a temporary asphalt ramp, or other methods approved by the Engineer. No longitudinal joint between the milled and existing surfaces shall fall between 1 to 5 feet of any lane line.

If the transverse joint is tapered with a temporary asphalt ramp, the milled surface at the joint shall be constructed as a butt joint the full depth of the lift of asphalt to be placed on the milled surface. The Contractor shall be responsible for maintaining this asphalt ramp until all corresponding HMA is placed. All work associated with this joint will not be paid for separately, but shall be included in the cost of planing.

If the transverse joint is tapered with a planing machine, a butt joint shall be cut into the taper the full depth of the lift of asphalt to be placed on the milled surface prior to commencement of resurfacing. All work associated with this joint will not be paid for separately, but shall be included in the cost of planing.

Other approved transverse joint tapers shall be maintained at the expense of the Contractor, and at a minimum shall incorporate a butt joint the full depth of the lift of asphalt to be placed on the milled surface prior to commencement of resurfacing.

Distressed or irregular areas identified in the planed surface by the Engineer shall be patched.

The roadway shall be left in a safe and usable condition at the end of each work day. The Contractor shall take appropriate measures to ensure that the milled surface does not trap or hold water. All required pavement markings removed by the planing shall be restored before the roadway is opened to traffic.

All milled surfaces to be overlaid with HMA shall be covered with new asphalt within 5 working days. All areas on this project that are not overlaid within the specified working days will be assessed a lane rental fee of \$13,000 per occurrence for each day or fraction thereof and any required surface repairs shall be paid for by the Contractor.

All planing shall be completed full width and parallel to the travel lanes before resurfacing commences unless otherwise directed by the Engineer.

All material generated by the planing operation shall become the property of the Contractor unless otherwise noted in the Contract.

Add subsection 202.091 immediately following subsection 202.09 as follows:

202.091 Equipment

Each planer shall conform to the following:

The planer shall have sufficient power, traction and stability to maintain an accurate depth of cut. The propulsion and guidance system of the planer shall be maintained in such condition that the planer may be operated to straight and true lines.

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**REVISION OF SECTION 202
REMOVAL OF ASPHALT MAT (PLANING)**

The planer shall be capable of operating with automatic grade controls (contact or non-contact) on both sides of the machine using a 30 foot averaging system or other approved grade control systems. The use of such controls shall be described in the Contractor's QCP.

The planer shall be capable of picking up the removed material in a single operation. A self loading conveyor shall be an integral part of the planer. Windrows will not be allowed.

Subsection 202.12 shall include the following:

Macrottexture testing, macrottexture corrective actions, planers, brooms and all other work necessary to complete the item will not be measured and paid for separately, but shall be included in the work.

**REVISION OF SECTION 202
REMOVAL OF MAT FROM BRIDGE**

Section 202 of the Standard Specifications is hereby revised for this project as follows:

Subsection 202.02 shall include the following:

The removal of the asphalt mat overlay shall be performed in a safe manner.

The Contractor shall have all necessary workers, materials, and equipment at the site prior to closing any lanes to traffic to accommodate removal of mat from bridge operations. While the lanes are closed to public traffic, work shall be pursued promptly and without interruption until the roadway is reopened to traffic.

Removal of hazardous material shall be in accordance with Section 250.

The Contractor shall take all steps to avoid contaminating state waters, in accordance with subsection 107.25.

Subsection 202.09 shall include the following:

This work consists of removal of the existing asphalt mat overlay from the existing bridge deck to within 1-inch of the existing concrete bridge deck as shown in the bridge plans or as directed. Care shall be exercised to avoid damage to the existing waterproofing membrane. Small width rotomills (1-foot head) and low impact tools shall be used in confined areas. Damage to the existing waterproofing membrane or concrete surfaces shall be repaired at the direction of the Engineer by the Contractor without compensation or time extension.

Subsection 202.11 shall include the following:

Removal of Mat from Bridge will be measured by the area in square yards, completed to the required depth and accepted.

Subsection 202.12 shall include the following:

Payment will be made under:

Pay Item	Pay Unit
Removal of Mat from Bridge	Square Yard

Payment will be full compensation for all labor and materials required to complete the work, including but not limited to equipment, debris handling and disposal, handling and disposal of all hazardous materials, disposal of non-salvable materials and cleaning the roadway.

Contractor to verify depth of asphalt on the bridge deck before milling. This will not be paid for separately and will be included in the work.

**REVISION OF SECTION 202
REMOVAL OF PORTIONS OF PRESENT STRUCTURE**

Section 202 of the Standard Specifications is hereby revised for this project as follows:

Subsection 202.01 shall include the following:

This work consists of the removal and disposal of portions of the existing bridge deck, concrete bridge rail, abutments and wingwalls as shown on the plans carrying Eastbound US50 West over the Wild Horse Dry Creek.

Subsection 202.02 shall include the following:

- (a) *Removal Plan.* The Contractor shall be required to submit a detailed Structure Removal Plan to the Engineer for review at least 20 working days prior to beginning demolition operations.

The Structure Removal Plan shall provide complete details of the structure removal process, including:

- (1) The removal sequence, including staging of removal operations. Sequence of operation shall include a detailed schedule that complies with the working hour limitations.
- (2) Equipment descriptions including size, number, type, capacity, and location of equipment during removal operations.
- (3) List of disposal sites for materials to be removed.
- (4) Shoring that exceeds 5 feet in height, all falsework and bracing.
- (5) Detailed methods for mitigation of fugitive dust resulting from the demolition.
- (6) Methods of Handling Traffic, in a safe and controlled manner. The Contractor shall have all necessary workers, material, and equipment at the site prior to closing any lanes to traffic to accommodate bridge removal operations. While the lanes are closed to public traffic, work shall be pursued promptly and without interruption until the roadway is reopened to traffic.

A Pre-Removal Conference shall be held at least seven days prior to the beginning of removal of any portion of the bridge. The Engineer, the Contractor, the removal Subcontractor, the Contractor's Engineer, and the Traffic Control Supervisor (TCS) shall attend the Pre-Removal Conference. The Structure Removal Plan shall be finalized at this Conference.

The Contractor's Engineer shall sign and seal (4) listed above in the final Structure Removal Plan. Calculations shall be adequate to demonstrate the stability of the structure during removal.

The final Structure Removal Plan shall be stamped "Approved for Construction" and signed by the Contractor. The Contractor shall submit a final Removal Plan to the Engineer prior to removal of the Pump Station for record purposes only. The Contractor shall not begin the removal process without the Engineer's written authorization.

Submittal of the final Structure Removal Plan to the Engineer, and field inspection performed by the Engineer, will in no way relieve the Contractor and the Contractor's Engineer of full responsibility for the removal plan and procedures.

Prior to reopening the roadway to public traffic, all debris, protective pads, material, and devices shall be removed and the roadways swept clean.

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**REVISION OF SECTION 202
REMOVAL OF PORTIONS OF PRESENT STRUCTURE**

Explosives shall not be used for removal work.

- (b) *Live Waterway.* When removal operations are located in proximity to any live water way , additional coordination with the appropriate agency, (United States Army Corps of Engineers (USACE), US Fish and Wildlife Service, US Forest Service, etc.) shall be required. Detailed methods for protection of live waterways including minimization of turbidity and sedimentation, and protection of existing wetlands shall be provided. The Contractor shall take all steps to avoid contaminating state waters, in accordance with subsection 107.25.
- (c) *Hazardous Materials.* Removal of hazardous material shall be in accordance with Section.
- (d) *Notification.* The Contractor shall notify all emergency response agencies of the proposed removal work and any detours 24 hours in advance of work. This shall include the Colorado State Patrol, local Police Department, local Fire Department, all local ambulance services, and the Sheriff's Department, as appropriate.

Subsection 202.08 shall include the following:

The Contractor's Engineer shall inspect the removal site and report in writing on a daily basis the progress of the operation and the status of the removal. A copy of this daily report shall be available at the site of the work at all times, and a copy of the previous day's inspection report shall be submitted to the Engineer daily.

The Contractor shall prevent over-cutting the bridge deck and abutments, and shall protect the existing transverse reinforcing deck steel and existing bridge girders adjacent to the removal work. Any damage to the reinforcing steel or girders by the Contractor's operations shall be repaired or replaced at the Contractor's expense.

The portion of the existing structure upon which new concrete will bond shall be sandblasted within 24 hours before new concrete is placed. Sandblasting shall roughen the surface and remove all fractured or loose particles in order to promote bond with the new concrete.

Subsection 202.12 shall include the following:

Payment will be made under:

Pay Item	Pay Unit
Removal of Portions of Present Structure	Lump Sum

Payment for Removal of Portions of Present Structure will be full compensation for all labor and materials required to complete the work, including but not limited to, preparation and implementation of the removal operations, inspection, equipment, debris handling and disposal, salvaging, handling and storage of salvable materials, handling and disposal of all hazardous materials and disposal of non-salvable materials.

**REVISION OF SECTION 203
EXCAVATION AND EMBANKMENT MATERIAL**

Section 203 of the Standard Specifications is hereby revised for this project as follows:

In subsection 203.03(a), first paragraph, replace the second sentence with the following:

Embankment material shall have a resistance value of at least 10 when tested by the Hveem Stabilometer.

Embankment material shall consist of approved material acquired from excavations, hauled and placed in embankments. All embankment material shall have a maximum dry density of not less than 90 lb./cu. ft. All embankment material shall be free of topsoil, organic matter, claystone, and other deleterious materials, shall have less than 35% passing the #200 sieve, and a plasticity index of less than 20. The material must be stable when tested in accordance with Colorado Procedure L-3102.

If embankment material will be obtained from a source outside the project limits, the imported material shall be free of topsoil, organic matter, claystone, and other deleterious materials. Imported material shall have less than 35% passing the #200 sieve, and a plasticity index of less than 20. A representative sample of the proposed material shall be submitted to the Engineer for testing. If requested, the Contractor shall inform the Engineer of the location of the proposed borrow source and provide access for the Engineer to inspect and/or test material at the source.

Subsection 203.05(b), first paragraph, shall be revised to read as follows:

Unclassified. Excess or unsuitable excavated material, including rock and boulders, that cannot be used in embankments shall become the property of the Contractor and disposed of properly outside the project limits.

Subsection 203.05(e), shall include the following:

Borrow will be from an undesignated source.

In Subsection 203.06, fourth paragraph, sentences 1-3 shall be deleted and replaced with the following:

Broken concrete, broken asphalt, or other solid materials more than 150 mm (6 inches) in greatest dimension, shall be removed from the project and shall become the property of the Contractor.

In Subsection 203.06, delete the fifteenth paragraph and replace with the following:

Frozen materials shall not be used in construction of embankments. In addition, embankment material shall not be placed on top of frozen material.

In Subsection 203.09, delete the first, second, and third paragraphs and replace with the following:

203.09 Proof Rolling. After final subgrade elevation has been reached and the required compaction has been obtained, the top of the subgrade material shall be proof rolled within 24 hours prior to commencing the paving operation.

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**REVISION OF SECTION 203
EXCAVATION AND EMBANKMENT MATERIAL**

Proof rolling shall be performed in the following manner:

- a. Proof rolling shall be performed with a three axle loaded truck with at least 18,000 pounds per axle load on two of the axles and tire pressures of at least 80 psi. A weigh ticket from an approved scale shall be furnished by the Contractor to substantiate this weight.
- b. The loaded truck shall make a minimum of two complete passes.
- c. The proof roller shall be operated in a systematic manner so that a record may be readily kept of the area tested. Areas that are observed to have soft spots in the subgrade, where deflection is not uniform or is excessive, or otherwise fail the proof roll as determined by the Engineer shall be ripped, scarified, wetted or dried as necessary and recompacted to meet the requirements for density and moisture. These areas shall then be proof rolled again and retested for acceptance to meet all requirements. This work shall be performed if required at no additional cost.
- d. Prior to commencing proof rolling, the Contractor shall provide adequate notice to the Engineer in order to allow the Engineer to perform inspection and documentation of the proof rolling operations. This work shall be done after the Contractor has performed his own quality control proof rolling and testing and has stabilized the subgrade.

Areas which, in the opinion of the Engineer, pump or deform an excessive amount during proof roll shall be reworked until such deformation does not occur during subsequent proof rolling. This rework may consist of additional compaction, excavation and replacement of embankment and/or additional excavation of unsuitable subgrade material as directed by the Engineer. This rework will not be paid for, except that unsuitable material below the limits of embankment material will be treated as described in subsection 203.05(c).

Subsection 203.14, fifth and sixth paragraphs, shall be deleted and replaced with the following:

Excavated materials which, when specified, require more than one handling prior to final placement will be paid for at the contract unit price for unclassified excavation, embankment, rock excavation, stripping, muck excavation, or borrow as appropriate. Such payment shall be considered full compensation with no additional payment being made for stockpiling, cross hauling, or subsequent handling.

Payment for Unclassified Excavation (Complete in Place) shall be full compensation for all work necessary to complete the item including construction of embankments; unclassified excavation, rock excavation, borrow, hauling, compaction, construction, compaction of bases of cuts and fills; all work in available materials pits; and disposal of excess or unsuitable excavated material.

**REVISION OF SECTION 206
EXCAVATION AND BACKFILL FOR STRUCTURES**

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

Subsection 206.03 shall include the following:

Structure Backfill (Class 1) and Structure Backfill (Flow-fill) will be required for all pipes and electrical conduits located within the roadway prism.

Subsection 206.06(b) shall be deleted and replaced with the following:

(b) For pipes, electrical conduits and concrete box culverts, structure excavation, structure backfill, and pipe bedding will not be measured, but will be included in the work.

In Subsection 206.07, delete the fourth paragraph and replace with the following:

Structure excavation, structure backfill (including flow-fill), filter material and bedding material required for all pipe culverts and pipe culvert extensions (including end sections), riprap, grouted riprap, clay lining, inlets, manholes, storm sewer pipes, and other drainage structures, will not be measured and paid for separately but shall be included in the work. Compaction, water, pumping, bailing, draining, sheeting, bracing, and all other work necessary to complete the above items will not be measured and paid for separately, but shall be included in the work.

**REVISION OF SECTION 206
SHORING**

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

Subsection 206.08 shall include the following:

Safety railing shall be installed on top of all shoring walls for the entire length of fall hazard. The cost of safety railing will not be measured and paid for separately, but shall be included in the work.

Subsection 206.09 shall include the following:

Shoring shall include fall protection provisions for public safety.

Subsection 206.10 shall include the following:

Shoring will not be measured, but will be paid for on a lump sum basis for each area as follows;

Area 1: Shoring required for bridge abutment construction

Area 2: Shoring required for bridge abutment construction

**REVISION OF SECTION 207
TOPSOIL**

Section 207 of the Standard Specifications is hereby revised for this project as follows:

Delete Subsection 207.01 and replace with the following:

This work includes salvaging and stockpiling on-site suitable topsoil and, or amending additional embankment material that is to be placed on disturbed areas within the project limits. It shall include placing of topsoil and or amending embankment upon constructed cut and fill slopes after grading operations are completed.

Subsection 207.02 shall include the following:

Imported topsoil will not be accepted on this project. All topsoil must be salvaged from on-site materials and be free from noxious weeds as determined by the engineer. If additional topsoil is required then on site soils shall be amended according to the soil conditioning requirements outlined in the stormwater management plans.

The Contractor shall insure that the source location and the area which is used to store topsoil shall be free of noxious weeds. Failure will result in the rejection of this topsoil.

Delete the first three paragraphs and the last paragraph in subsection 207.04 and replace with the following:

Topsoil will be measured in place by measuring random depths of topsoil and or additional amended embankment, and computing the volume by multiplying the area times the average depth. Measured depths greater than 4 inches will be measured as 4 inches, or maximum depth required in the plans.

Subsection 207.05 shall include the following

The addition of soil amendments needed to bring the topsoil into conformance with the specifications will not be measured and paid for separately, but shall be included in the work. Stockpile topsoil will not be measured and paid for separately, but shall be included in the work.

**REVISION OF SECTION 208
PERMANENT WATER QUALITY BMP
AS CONSTRUCTED SURVEY**

Section 208 of the Standard Specifications is hereby revised for this project as follows:

Subsection 208.10(b) shall include the following:

The permanent BMPs to be surveyed will be discussed at the Environmental Preconstruction Conference. The results of the survey shall be provided on an electronic drawing of each BMP in MicroStation format showing the information specified in section 6.1.3 of the CDOT Survey Manual.

The survey shall be performed in accordance with the Section 6.1.3 of the CDOT Survey Manual. The Contractor may request copies of the MicroStation electronic design files for the permanent BMPs if available. A draft of the printed copy of the MicroStation format drawing shall be provided 14 days in advance of the final water quality project walkthrough. At the final water quality walkthrough the as constructed BMP survey shall be reviewed and any necessary revisions determined. The Contractor shall make the requested revisions as needed within 5 days of the final water quality walkthrough and submit final copies of the electronic files on a CD to the Project Engineer.

The permanent BMPs in this project are water quality ponds:

- Pond A
- Pond B

(Refer to 'Final Hydraulics Drainage report for US 50: McCulloch Blvd to Wills Blvd, MP 307.34 to MP 313.15' dated July 31, 2014 for the permanent water quality BMPs to be surveyed.)

Subsection 208.12 shall include the following:

All work and materials required to perform the permanent BMP survey and furnish the three electronic files shall be included in the original unit price bid for surveying.

**REVISION OF SECTION 209
WATERING AND DUST PALLIATIVES**

Section 209 of the Standard Specifications is hereby revised for this project as follows:

Subsection 209.05 shall include the following:

The Contractor shall be responsible for controlling vehicle and equipment speeds within the project site to keep dust to a minimum. If excessive dust is being generated by construction traffic, the Contractor shall immediately take corrective measures.

In Subsection 209.08, delete paragraphs one, two, and three and replace with the following:

Water required for all work covered under the contract will not be measured and paid for separately but shall be included in the work. The source of this water is the Contractor's responsibility. Water may not be taken from on-site ditches, creeks, or their tributaries.

**REVISION OF SECTION 210
RESET MICROWAVE VEHICLE RADAR DETECTOR**

Section 210 of the Standard Specifications is hereby revised for this project as follows:

Subsection 210.09 shall include the following:

Microwave vehicle radar detector- This work shall consist of resetting microwave based vehicle detectors on main corridors at the intersections. The vehicle detectors shall be reset on the existing signal poles. CAT 5e cable shall be used to wire the detector to the existing signal cabinet at each intersection.

The microwave based sensor shall detect trucks, vehicles, motor cycles and bicycles and send a signal representative of a loop type detector in a presence mode to a traffic controller device. The sensor shall operate in the field under harsh environments and shall be immune to the effects of weather, sun rays, night low-light, head light glare, and not be susceptible to in-road breakage. It shall not be necessary to mount any hardware in the road way, or above the roadway.

Operation

The microwave-based motion and presence sensor used for intersection control shall interface with the traffic control cabinet, and shall output signals when vehicles are present in user defined zones. These zones will be created by CDOT using an X-Y coordinate system, and have its operation verified and optimized using a laptop with Internet Explorer TM 6.0 or greater as part of the installation process.

The sensor shall allow the user to create up to eight (8) zones and assign vehicle presence in each of these zones to up to four (4) outputs to the control cabinet. It shall be possible to create detection zones to a maximum distance of 400 feet from the sensor itself.

The sensor shall track the presence of a vehicle in a detection zone for a predetermined time, user selectable from 0 to 960 seconds.

The sensor shall be able to track multiple moving and stationary vehicles simultaneously.

Each vehicle shall be tracked using its X-Y coordinates to determine the vehicles location.

The sensor shall update the X-Y coordinates typically 20 times per second.

The sensors range from the front of the sensor (to the signal controller) shall be a minimum of 50 feet to a maximum of 400 feet.

The sensor shall be able to determine and display the speed of each vehicle in the detection zones.

The sensor shall be able to provide grid tracking for the live interactive zones.

The sensor shall be able to provide a histogram to verify setup of the zones.

The sensor interface shall use either English (standard) or metric units at the option of the user.

The sensor shall be able to provide user defined delay and/or extension times for each zone.

The sensor Explorer interface shall be able to provide a graphical representation of the vehicle track as they approach the intersection.

The sensor shall provide a diagnostic and demonstration mode for various operations.

The sensor shall operate via an Ethernet interface with power supplied over the Ethernet connector (PoE).

Mounting

The sensor shall operate optimally, and shall be mounted on the side of a pole at a height from 14 to 19 feet.

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REVISION OF SECTION 210 RESET MICROWAVE VEHICLE RADAR DETECTOR

The range of operation shall be from 50 feet to 400 feet from the front of the sensor to the signal controller cabinet.

When mounted on the side of the pole, a maximum of a 30 degree offset from the traffic direction shall be allowed and provide for optimal operation.

Interface Boards – Operation

The TCIB modules shall operate at 24 VDC and provide the power supply for the sensor over the Ethernet cable.

The Interface modules shall have up to four (4) LEDs to indicate the activity of each zone. Each output shall be optically isolated with a LED and status indicator.

There shall be an indication for a fault mode (no Ethernet connection) such that all LEDs and Opto-isolator are on. This action shall place calls on the traffic controller.

There shall be an RS-232 port for diagnostics on each TCIB.

The TCIB shall provide power and short circuit protection for the sensor.

The TCIB shall automatically recover from a power failure and start up with 20 seconds of a cold start.

Wiring Cable

CAT 5e STP, CMXT outdoor/direct burial, foil + waterproof tape, 350MHZ, solid, 24 AWG black cable should be used to wire the detector to the signal controller.

Installation and Testing

The Contractor shall arrange for a qualified representative from the microwave vehicle radar detector manufacture to be on site for the following:

- (1) The Contractor shall be adequately trained by the manufacturer's representative to ensure proper installation of the unit, the model and the wiring.
- (2) The manufacturer's representative shall check installation and test the unit after completion.

PoE Extender for the Microwave Vehicle Radar Detector

Microwave vehicle radar detectors units are required to have PoE extenders if the distance from the detector to the controller is more than 300'. When an extender is needed at a specific location, CDOT will furnish the extender and the Contractor is responsible for the installation.

The extender shall be supplied with two Ethernet Cat 5e cable connections, one on each end. The Cat 5e cable connected to the controller cabinet card shall be inserted into a weather proof IP66 connection on the input side of the extender. The output side shall also have an IP66 connector to allow the Cat 5e cable to be electrically and physically extended up to another 300 feet +/- (100 meters) to connect to the Radar/microwave unit located in the field. The extended shall be rugged and streamlined with an enclosure having IP66 rated connectors with covers on each end that allow for easy connections with Cat 5e and Cat 6 cables.

The overall dimension shall be no greater than 50mm W x 31mm H x 125mm long (210mm with fitted connections). A mounting plate shall be supplied that measures 74mm x 97mm x 2mm when needed for installation.

The extender shall operate within the range of -40 degrees F to 140 degrees F. (-40 degree C to +60 degrees C). The connections shall be IP66 rated. The entire enclosure shall be Polycarbonate.

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**REVISION OF SECTION 210
RESET MICROWAVE VEHICLE RADAR DETECTOR**

The network shall operate at 10Base-T to 100Base-Tx. The unit shall operate in Full/Half Duplex (Auto-Negotiated) with RJ-45 Connectors.

The extender shall extend the Ethernet Cable Range an additional 300 feet (100 meters) that provides a total range of 600 feet or (200 meters). The power consumption shall be 1.3 Watts. The PoE signal shall be always on and provide a 24VDC pass-through for the intersector .

The extender should be installed in the hand hole near the pole base.

Subsection 210.12 shall include the following:

Microwave vehicle radar detector shall be measured on the basis of the number of units reset. All necessary modules, wiring, manufacturer representative's service, material, testing, installation of the detectors and extenders will not be paid separately but shall be included in the pay item for microwave vehicle radar detector.

Subsection 210.13 shall include the following:

Payment will be made under:

Pay Item	Pay Unit
Reset Microwave Vehicle Radar Detector (MVRD)	EA

**REVISION OF SECTION 210
RELAY RIPRAP**

Section 210 of the Standard Specifications is hereby revised for this project as follows:

Subsection 210.01 shall include the following:

Relay riprap consists of removing and stockpiling existing native riprap material resulting from construction operations on this project. The riprap shall then be relaid at the bridge abutments as shown on the plans.

Subsection 210.02 shall include the following as the fifth paragraph:

Riprap to be relaid shall be graded rock removed and stockpiled during construction of the bridge widening. Riprap shall be cleaned and placed in accordance with construction requirements in Section 506.03 of the Standard Specifications. Riprap rock shall have a minimum d50 of 18", and shall be placed as shown in the plans.

Riprap material removed as part of this project that does not meet the material requirements of Section 506.02 of the Standard Specifications, shall not be relaid. New riprap material of a minimum d50 of 18" shall be placed in accordance with Section 506 of the Standard Specifications, and placed as shown on the plans.

The Contractor will obtain the Engineer's inspection and written approval before accepting the work.

Subsection 210.12 shall include the following:

The quantity to be measured for "Relay Riprap" shall be the volume in cubic yards of material relaid, in place, completed and accepted.

Subsection 210.13 shall include the following:

Payment will be made under:

Pay Item	Unit
Relay Riprap	Cubic Yard

Payment for Relay Riprap will be full compensation for all work and material required to complete the item. Structure excavation and structure backfill required for "Relay Riprap" will not be measured and paid for separately but shall be included in the work.

**REVISION OF SECTION 217
 HERBICIDE TREATMENT**

Section 217 of the Standard Specifications is hereby revised for this project as follows:

The Contractor is advised that several species of noxious weeds were identified within the project area in a survey done in the summer of 2013 (June and July). The Contractor shall implement actions identified in the Environmental Plan Sheets. The Contractor shall have an environmental specialist or botanist familiar with the noxious weed requirements of the State of Colorado (Colorado Noxious Weed Act 35-5.5-115, C.R.S.: 1996 Supp.) and certified by the State, to conduct noxious weed spraying and maintenance per the attached Table.

Subsection 217.02 is hereby revised for the project as follows:

Herbicide shall be applied as a spot spray in locations as directed by the Engineer and according to the most recent manufacturer label. Follow the herbicide treatment recommendations in the following table.

Table Noxious Weed Control Summary

Common Name	Scientific Name	Herbicide Treatment Action
Musk thistle	<i>Carduus nutans</i>	Dense population in the southeast quadrant of the Purcell Boulevard and US 50 intersection. Successful control will involve spraying aminopyralid combined with continuous mowing operations. Aminopyralid can be applied to water's edge; but not directly to water. Add non-ionic surfactant. Follow manufacturer label. Be sure to properly dispose of the flowering cut plants, since seeds can mature and become viable after the plant has been cut down. See attached noxious weed profile.
Canada thistle	<i>Cirsium arvense</i>	Dense along Williams Creek and in the southeast quadrant of the US 50/McCulloch Blvd. intersection. Successful control will involve spraying aminopyralid combined with continuous mowing operations.
Hoary Cress	<i>Cardaria draba</i>	Patches found in Wild Horse Dry Creek - Successful control will involve spraying aquatic-safe glyphosate in flowering stage in combination with mowing in May – June.
Leafy spurge	<i>Euphorbia esula</i>	Patches found in Wild Horse Dry Creek – Control with aminopyralid. Aminopyralid can be applied to water's edge; but not directly to water. Add non-ionic surfactant. Follow manufacturer label. See attached noxious weed profile.
Diffuse knapweed	<i>Centaurea diffusa</i>	Successful control involves preventing the plant from flowering and going to seed. Spraying in the spring/fall, mowing during flowering stage and seeding with competitive native grasses works well. Spray with aminopyralid. Add non-ionic surfactant.
Perennial Pepperweed	<i>Lepidium latifolium</i>	Patches found in Wild Horse Dry Creek – Successful control will involve spraying aquatic-safe glyphosate in flower bud stage in combination with mowing in early summer to mid-summer.
Saltcedar/tamarisk	<i>Tamarix chinensis</i>	Dense along Williams Creek and Wild Horse Dry Creek - All areas infested with Saltcedar/tamarisk shall be treated with Triclopyr (Garlon 4 - aquatic approved label) by either the basal bark method or cut stump method. Follow manufacturer label. See attached noxious weed profile.

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**REVISION OF SECTION 217
HERBICIDE TREATMENT**

Subsection 217.02 is hereby revised for the project as follows (Continued):

Herbicide shall not be applied when raining or rain is imminent in the area; around desirable plants when temperatures are expected to be above 85 degrees Fahrenheit; when wind may cause spray to drift onto desirable plants; when areas are directly adjacent to water or desirable plants.

In the Williams Creek and Wild Horse Dry Creek drainages, all herbicides applied on-site should be aquatic safe herbicides. Noxious weeds control should be in accordance with the following:

Saltcedar/Tamarisk - All areas infested with Saltcedar/tamarisk shall be treated with Triclopyr - Garlon 4 by either the basal bark method or cut stump method. Treatment is to be as directed by the Engineer and according to manufacturer's recommendations.

Subsection 217.03 is hereby revised to include the following:

Herbicide shall be applied to all areas infested with noxious weeds not less than 2 months prior to native seeding and not less than 2 weeks prior to the start of topsoil or suitable material on site salvaging operation begins.

The Engineer may request several mobilizations of herbicide applications. Applications may be required in the beginning of the project, prior to securing on site topsoil, and throughout construction for applications requiring post-seeding treatments.

All equipment will be thoroughly cleaned before entering and exiting the project area. Any equipment used in a noxious weed area shall be thoroughly cleaned prior to moving to another site or leaving the project. Wash water shall be contained in a bermed contained site and shall not be allowed to enter into a storm drain. Failure to do so will be deemed a violation of the Environmental Plan Sheets.

All herbicides shall be applied by commercial pesticide applicators licensed by the Colorado Department of Agriculture as qualified applicators. The Contractor shall furnish documentation of such licensing prior to herbicide application. Herbicide mixing and application shall be done in accordance with instructions on the registered product label. The Engineer shall be furnished such label information prior to mixing and application.

The Contractor shall notify the Engineer at least 24 hours prior to each herbicide application and shall indicate the time and location application will begin. Application will not be allowed on Saturdays, Sundays, or holidays unless otherwise approved by the Engineer. All noxious weed treatments will be coordinated with the Pueblo County Weed Supervisor.

Herbicides shall not be applied when weather conditions, including wind conditions, are unsuitable for such work. Herbicides shall not be applied when soil is extremely dry.

Herbicide application method shall be such that plant growth outside the designated treatment areas (see Environmental Plan Sheet) will not be damaged. Herbicides will be applied by hand with spot-sprayers, wicks, and/or sponges to avoid off-target application. Broadcast herbicide spraying will only be approved through written consent of the project engineer and will be applied when weather conditions (including wind) are suitable for such work. All damage caused by improper herbicide application shall be repaired at the Contractor's expense.

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**REVISION OF SECTION 217
HERBICIDE TREATMENT**

Pre-treat all noxious weed populations in areas where disturbance is planned. Imported topsoil will be minimized during construction, and if necessary pre-treated with herbicides. Noxious weeds observed in and near the construction area at the start of construction will be treated with herbicides or physically removed to prevent seeds blowing into disturbed areas during construction.

All plant and mulch materials used on the site must be inspected and regulated by the Weed Free Forage Act, Title 35, Article 27.5 Colorado Revised Statutes (CRS). Certified weed-free mulch will be used for reclamation, and all seed mixes and nursery materials used for reclamation will be free of noxious weed seeds, roots, and rhizomes. All mulches, erosion bales, and erosion logs used at the site will be certified weed-free.

During construction and reclamation/reseeding all areas disturbed by construction and adjacent undisturbed vegetation should be monitored for noxious weeds in the spring, mid-summer, and fall, or as long as construction activities are active. Monitoring personnel should be familiar with identification of the noxious weed species and native species that may resemble them.

All weed control actions should be recorded, including the date, personnel, methods used, areas of application, and result of any follow-up surveys with noxious weed monitoring results also recorded and kept on file.

Saltcedar/Tamarisk - For saltcedar/tamarisk, herbicide shall be applied while the plant is actively growing and translocating nutrients, preferably after the plant has bloomed and prior to dormancy. Herbicide shall not be applied in the spring, under any circumstance. All saltcedar/tamarisk on the project shall be treated at the beginning of the project. Any saltcedar/tamarisk that has survived or re-sprouted 3 months after treatment shall be sprayed again. Sprouts shall be 4-8' in length prior to application. To insure all stumps or stems are covered with herbicide, an oil-soluble dye shall be added to the chemical mixture, which allows the applicator to see the amount of coverage.

Basal bark application:

Garlon 4: Mix Garlon 4 at 25% volume/volume (v/v) +75% volume/volume oil carrier. Use a hand-held spray bottle or backpack sprayer with a low volume solid cone or flat fan nozzle to apply the mixture to the lower 12-15" of the stems. Spray to completely wet the entire circumference of the stem, but not to the point of run-off.

BASIS OF PAYMENT

Subsection 217.03 shall include the following:

Payment will be made under:

Pay Item	Pay Unit
Noxious Weed Management	Square Yard

Clearing and grubbing will be measured and paid for in accordance with Section 201. Mowing will not be measured and paid for separately, but shall be included in the work.

**REVISION OF SECTION 240
PROTECTION OF MIGRATORY BIRDS
BIOLOGICAL WORK PERFORMED BY A CDOT BIOLOGIST**

Section 240 is hereby revised to include the following:

The Contractor is advised that migratory birds and nests were identified at the Wild Horse Dry Creek bridge and within the project area in a survey done in the summer of 2013 (June and July), as identified on the environmental plan sheets. Western Burrowing Owls could also be present in Prairie Dog Colonies.

DESCRIPTION

240.01 This work consists of protecting migratory birds during construction.

MATERIALS AND CONSTRUCTION REQUIREMENTS

240.02 The Contractor shall schedule clearing and grubbing operations and work on structures to avoid taking (pursue, hunt, take, capture or kill; attempt to take, capture, kill or possess) migratory birds protected by the Migratory Bird Treaty Act (MBTA).

(a) *Vegetation Removal.* When possible, vegetation shall be cleared prior to the time active nests are present. Vegetation removal activities shall be timed to avoid the migratory bird breeding season which begins on April 1 and runs to August 31. All areas scheduled for clearing and grubbing between April 1 and August 31 shall first be surveyed within the work limits by a CDOT biologist for active migratory bird nests. The CDOT biologist will also survey for active migratory bird nests within 50 feet outside of the work limits. Project personnel shall enter areas outside CDOT right of way only if a Form 730, *Permission to Enter Property*, has been signed by the property owner. The Contractor shall avoid all active migratory bird nests. The Contractor shall avoid the area within 50 feet of the active nests or the area within the distance recommended by the biologist until all nests within that area have become inactive. Inactive nest removal and other necessary measures shall be incorporated into the work as follows:

1. *Tree and Shrub Removal or Trimming.* Tree and shrub removal or trimming shall occur before April 1 or after August 31 if possible. If tree and shrub removal or trimming will occur between April 1 and August 31, a survey for active nests will be conducted by the CDOT biologist within the seven days immediately prior to the beginning of work in each area or phase of tree and shrub removal or trimming. The Contractor shall notify the Engineer at least ten working days in advance of the need for the CDOT biologist to perform the survey.

If an active nest containing eggs or young birds is found, the tree or shrub containing the active nest shall remain undisturbed and protected until the nest becomes inactive. The nest shall be protected by placing fence (plastic) a minimum distance of 50 feet from each nest to be undisturbed. This buffer dimension may be changed if determined appropriate by the CDOT biologist and approved by the Engineer. Work shall not proceed within the fenced buffer area until the young have fledged or the nests have become inactive.

If the fence is knocked down or destroyed by the Contractor, the Engineer will suspend the work, wholly or in part, until the fence is satisfactorily repaired at the Contractor's expense. Time lost due to such suspension will not be considered a basis for adjustment of time charges, but will be charged as contract time.

2. *Grasses and Other Vegetation Management.* Due to the potential for encountering ground nesting birds' habitat, if work occurs between April 1 and August 31, the area shall be surveyed by the CDOT biologist within the seven days immediately prior to ground disturbing activities. The Contractor shall notify the Engineer at least ten working days in advance of the need for the CDOT biologist to perform the survey.

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**REVISION OF SECTION 240
PROTECTION OF MIGRATORY BIRDS
BIOLOGICAL WORK PERFORMED BY A CDOT BIOLOGIST**

The undisturbed ground cover to 50 feet beyond the planned disturbance, or to the right of way line, whichever is less, shall be maintained at a height of 6 inches or less beginning April 1 and continuing until August 31 or until the end of ground disturbance work, whichever comes first.

If birds establish a nest within the survey area, an appropriate buffer of 50 feet will be established around the nest by the CDOT biologist. This buffer dimension may be changed if determined appropriate by the CDOT biologist and approved by the Engineer. The Contractor shall install fence (plastic) at the perimeter of the buffer. Work shall not proceed within the buffer until the young have fledged or the nests have become inactive.

If the fence is knocked down or destroyed by the Contractor, the Engineer will suspend the work, wholly or in part, until the fence is satisfactorily repaired at the Contractor's expense. Time lost due to such suspension will not be considered a basis for adjustment of time charges, but will be charged as contract time.

(b) *Work on structures.* The Contractor shall prosecute work on structures in a manner that does not result in a taking of migratory birds protected by the Migratory Bird Treaty Act (MBTA). The Contractor shall not prosecute the work on structures during the primary breeding season, April 1 through August 31, unless he takes the following actions:

- (1) The Contractor shall remove existing nests prior to April 1. If the Contract is not awarded prior to April 1 and CDOT has removed existing nests, then the monitoring of nest building shall become the Contractor's responsibility upon the Notice to Proceed.
- (2) During the time that the birds are trying to build or occupy their nests, between April 1 and August 31, the Contractor shall monitor the structures at least once every three days for any nesting activity.
- (3) If birds have started to build any nests, the nests shall be removed before they are completed. Water shall not be used to remove the nests if nests are located within 50 feet of any surface waters.
- (4) Installation of netting may be used to prevent nest building. The netting shall be monitored and repaired or replaced as needed. Netting shall consist of a mesh with openings that are $\frac{3}{4}$ inch by $\frac{3}{4}$ inch or less.

If an active nest becomes established, i.e., there are eggs or young in the nest, all work that could result in abandonment or destruction of the nest shall be avoided until the young have fledged or the nest is unoccupied as determined by the CDOT Biologist and approved by the Engineer. The Contractor shall prevent construction activity from displacing birds after they have laid their eggs and before the young have fledged.

If the project continues into the following spring, this cycle shall be repeated. When work on the structure is complete, the Contractor shall remove and properly dispose of netting used on the structure.

(c) *Work in/adjacent to prairie dog colonies.* Prairie dog colonies are known to occur in or adjacent to CDOT ROW within the project area, as shown on the Environmental Plan Sheets. Western burrowing owls occupy prairie dog colonies. Therefore any work occurring within these limits during the nesting season (March 15 – October 31) will require a burrowing owl survey prior to work commencing. A minimum of 10 business days prior to any work in areas with Prairie Dog colonies, the Contractor shall request, through the CDOT Project Engineer, that a Western Burrowing Owl Survey be performed by a qualified biologist. If prairie construction activities are initiated during the nesting season for burrowing owls (March 15 to October 31), a burrowing owl survey is required. If burrowing owls are identified, the qualified biologist shall assist the Contractor in locating and installing safety barrier fencing (silt fencing) within 150 feet of the work zone to protect active

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**REVISION OF SECTION 240
PROTECTION OF MIGRATORY BIRDS
BIOLOGICAL WORK PERFORMED BY A CDOT BIOLOGIST**

burrows from construction activities during the nesting season (March 15 – October 31). Work shall not proceed within the 150 foot buffer until the young have fledged or the nests have become inactive.

(d) Taking of a Migratory Bird. The taking of a migratory bird shall be reported to the Engineer. The Contractor shall be responsible for all penalties levied by the U. S. Fish and Wildlife Service (USFWS) for the taking of a migratory bird.

METHOD OF MEASUREMENT

240.03 Removal of nests (excludes Western Burrowing Owls work) will be measured by the actual number of man-hours spent removing inactive nests just prior to and during the breeding season, April 1 through August 31. During this period, the Contractor shall submit to the Engineer each week for approval a list of the workers who removed nests and the number of hours each one spent removing nests.

Netting will be measured by the square yard of material placed to keep birds from nesting on the structure. Square yards will be calculated using the length of netting measured where it is attached to the ground and the average height of the netting where it is attached to the structure

BASIS OF PAYMENT

240.04 The accepted quantities measured as provided above 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:

Pay Item	Pay Unit
Removal of Nests	Hour
Netting	Square Yard

Payment for Removal of Nests will be full compensation for all work and material required to complete the work.

Payment for netting will be full compensation for all work and material required to complete the item. Overlaps of netting will not be measured and paid for separately, but shall be included in the work. Maintenance and replacement, removal, and disposal of netting will not be measured and paid for separately, but shall be included in the work.

Clearing and grubbing will be measured and paid for in accordance with Section 201. Mowing will not be measured and paid for separately, but shall be included in the work.

Removal and trimming of trees will be measured and paid for in accordance with Section 202.

Fence (Plastic) will be measured and paid for in accordance with Section 607.

**REVISION OF SECTION 304
AGGREGATE BASE COURSE**

Section 304 of the Standard Specifications is hereby revised for this project as follows:

Subsection 304.02 shall include the following:

Materials for the base course shall be Aggregate Base Course (Class 6) as shown in subsection 703.03

The aggregate base course (Class 6) must meet the gradation requirements and have a resistance value of at least 78 when tested by the Hveem Stabilometer method.

**REVISION OF SECTION 401
HOT MIX ASPHALT COMPACTION
(PNEUMATIC TIRE ROLLERS)**

Section 401 of the Standard Specifications is hereby revised for this project as follows:

In subsection 401.17, first paragraph, delete the second sentence and replace with the following:

Both steel wheel and pneumatic tire rollers will be required on this project. If the Contractor has demonstrated that all of the manufacturer's recommendations were followed and the pneumatic tire roller is detrimental to the finished surface of the HMA, the Engineer, in cooperation with the Contractor and the Region Materials Engineer, may waive the pneumatic tire roller requirement.

**REVISION OF SECTION 403
 HOT MIX ASPHALT**

Section 403 of the Standard Specifications is hereby revised for this project as follows:

Subsection 403.02 shall include the following:

The design mix for hot mix asphalt shall conform to the following:

Table 403-1							
Property	Test Method	Value For Grading					
				SX(100)	S(100)		Patching
Air Voids, percent at: N (design)	CPL 5115			3.5 – 4.5	3.5 – 4.5		3.5 – 4.5
Lab Compaction (Revolutions): N (design)	CPL 5115			100	100		100
Stability, minimum	CPL 5106			30	30		30
Aggregate Retained on the 4.75 mm (No. 4) Sieve for S, SX and SG, and on the 2.36mm (No. 8) Sieve for ST and SF with at least 2 Mechanically Induced fractured faces, % minimum*	CP 45			65	65		65
Accelerated Moisture Susceptibility Tensile Strength Ratio (Lottman), minimum	CPL 5109 Method B			80	80		80
Minimum Dry Split Tensile Strength, kPa (psi)	CPL 5109 Method B			205 (30)	205 (30)		205 (30)
Grade of Asphalt Cement, Top Layer				PG 76-28			
Grade of Asphalt Cement, Layers below Top					PG 64-22		PG 64-22
Voids in the Mineral Aggregate (VMA) % minimum	CP 48			See Table 403-2	See Table 403-2		See Table 403-2
Voids Filled with Asphalt (VFA), %	AI MS-2			65-75	65-75		65-75
Dust to Asphalt Ratio Fine Gradation Coarse Gradation	CP 50			0.6 – 1.2 0.8 – 1.6	0.6 – 1.2 0.8 – 1.6		0.9 – 2.0 1.1 – 2.2
Note: AI MS-2 = Asphalt Institute Manual Series 2 Note: Mixes with gradations having less than 40% passing the 4.75 mm (No. 4) sieve shall be approached with caution because of constructability problems. Note: Gradations for mixes with a nominal maximum aggregate size of one-inch or larger are considered a coarse gradation if they pass below the maximum density line at the #4 screen. Gradations for mixes with a nominal maximum aggregate size of 3/4" to 3/8" are considered a coarse gradation if they pass below the maximum density line at the #8 screen. Gradations for mixes with a nominal maximum aggregate size of #4 or smaller are considered a coarse gradation if they pass below the maximum density line at the #16 screen. *Fractured face requirements for SF may be waived by RME depending on project conditions.							

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**REVISION OF SECTION 403
 HOT MIX ASPHALT**

All mix designs shall be run with a gyratory compaction angle of 1.25 degrees and properties must satisfy Table 403-1. Form 43 will establish construction targets for Asphalt Cement and all mix properties at Air Voids up to 1.0 percent below the mix design optimum.

Table 403-2

Nominal Maximum Size*, mm (inches)	Minimum Voids in the Mineral Aggregate (VMA)			
	***Design Air Voids **			
	3.5%	4.0%	4.5%	5.0%
37.5 (1½)	11.6	11.7	11.8	N/A
25.0 (1)	12.6	12.7	12.8	
19.0 (¾)	13.6	13.7	13.8	
12.5 (½)	14.6	14.7	14.8	
9.5 (⅜)	15.6	15.7	15.8	
4.75 (No. 4)	16.6	16.7	16.8	16.9
	* The Nominal Maximum Size is defined as one sieve larger than the first sieve to retain more than 10%. ** Interpolate specified VMA values for design air voids between those listed. *** Extrapolate specified VMA values for production air voids beyond those listed.			

The Contractor shall prepare a quality control plan outlining the steps taken to minimize segregation of HMA. This plan shall be submitted to the Engineer and approved prior to beginning the paving operations. When the Engineer determines that segregation is unacceptable, the paving shall stop and the cause of segregation shall be corrected before paving operations will be allowed to resume.

CDOT approved Warm Mix Asphalt (WMA) may be allowed on this project in accordance with CP 59. Unique requirements for WMA design, production and acceptance testing as documented during CDOT WMA approval shall be submitted and approved prior to creation of the Form 43 and before any WMA production on the project. Delays to the project due to WMA submittal and review will be considered within the Contractor's control and will be non-excusable.

Hot mix asphalt for patching shall conform to the gradation requirements for Hot Mix Asphalt (Grading S).

A minimum of 1 percent hydrated lime by weight of the combined aggregate shall be added to the aggregate for all hot mix asphalt.

Acceptance samples shall be taken at the location specified in either Method B or C of CP 41.

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**REVISION OF SECTION 403
HOT MIX ASPHALT**

Subsection 403.03 shall include the following:

If liquid anti-stripping additive is added at the plant, an approved in-line blender must be used. The blender shall be in the line from the storage tank to the drier drum or pugmill. The blender shall apply sufficient mixing action to thoroughly mix the asphalt cement and anti-stripping additive.

The Contractor shall construct the work such that all roadway pavement placed prior to the time paving operations end for the year, shall be completed to the full thickness required by the plans. The Contractor's Progress Schedule shall show the methods to be used to comply with this requirement.

Delete subsection 403.05 and replace with the following:

403.05 The accepted quantities of hot mix asphalt will be paid for in accordance with subsection 401.22, at the contract unit price per ton for the bituminous mixture.

Payment will be made under:

Pay Item	Pay Unit
Hot Mix Asphalt (Grading SX)(100)(PG 76-28)	Ton
Hot Mix Asphalt (Grading S)(100)(PG 64-22)	Ton
Hot Mix Asphalt (Patching)(Asphalt)	Ton

Aggregate, asphalt recycling agent, additives, hydrated lime, and all other work necessary to complete each hot mix asphalt item will not be paid for separately, but shall be included in the unit price bid. When the pay item includes the PG binder grade, the asphalt cement will not be measured and paid for separately, but shall be included in the work. When the pay item does not include the PG binder grade, asphalt cement will be measured and paid for in accordance with Section 411. Asphalt cement used in Hot Mix Asphalt (Patching) will not be measured and paid for separately, but shall be included in the work.

Excavation, preparation, and tack coat of areas to be patched will not be measured and paid for separately, but shall be included in the work.

**REVISION OF SECTION 403
HOT MIX ASPHALT TICKET COLLECTION**

Section 403 of the Standard Specifications is hereby revised for this project as follows:

Subsection 403.05 shall include the following:

The Contractor shall collect the scale ticket on each load when it is delivered to the project site, and ensure that the information required in subsection 109.01 is shown on each ticket.

The scale tickets shall be available on site for CDOT personnel to inspect.

Each day the Contractor shall provide to the Engineer envelopes which contain the previous day's signed tickets and the following:

1. On each envelope: Project number, date of paving, type of material, daily total and cumulative total.
2. One of the following:
 - A. Two adding machine tape tabulations of the weight tickets with corresponding totals run and signed by different persons,
 - B. One signed adding machine tape tabulation of the weight tickets that has been checked and signed by a second person,
 - C. Signed check tape of computer scale tickets that have a cumulative total. These scale tickets must be consecutive and without voids adjustments.
3. A listing of any overweight loads on the envelope, including ticket numbers and amount over legal limit.
4. A comparison of the actual yield for each day's placement to the theoretical yield. Theoretical yield shall be based on the actual area paved, the planned thickness, and the actual density of the mixture being placed. Any variance greater than +2.5% shall be indicated on the envelope and a written explanation included.

The Contractor shall provide a vehicle identification sheet that contains the following information for each vehicle:

- (1) Vehicle number
- (2) Length
- (3) Tare weight
- (4) Number of axles
- (5) Distance between extreme axles
- (6) All other information required to determine legal weight
- (7) Legal weight limit

**REVISION OF SECTION 506
SOIL RIPRAP**

Section 506 of the Standard Specifications is hereby revised for this project as follows:

Section 506.03 shall include the following:

Soil riprap is a uniform mixture of seventy percent riprap and thirty percent topsoil. Riprap voids shall be filled with topsoil. Riprap is to be placed in lifts approximately 1.5 times in thickness with rock pieces fully interlocking and minimal voids, with topsoil added on the top of each lift and vibrated or washed into the voids before the next lift of riprap is placed.

Section 506.04 shall include the following:

Soil riprap will be measured by the cubic yard and includes both the rock (riprap) and topsoil as required in the proportions in Section 506.03.

Section 506.05 shall include the following:

Pay Item	Pay Unit
Riprap (9 Inch)	Cubic Yard
Riprap (18 Inch)	Cubic Yard

Subsection 506.05 delete the last paragraph and replace with the following:

Structure excavation and structure backfill will not be measured and paid for separately but shall be included in the work

**REVISION OF SECTION 514
PEDESTRIAN RAILING (STEEL) (SPECIAL)**

Section 514 of Standard Specification is hereby revised for this project as follows:

Section 514.01 shall include the following:

This work consists of furnishing Pedestrian Railing (Steel) (Special), in accordance with the details provided in the Bridge plans, and the specifications herein. The railing shall be fabricated to fit the grade of the bridge deck.

Subsection 514.06 shall include the following:

Shop Drawings are required to be submitted in accordance with Sections 101 and 105 for this project. Submit shop drawings of all fabrications to Engineer for approval, showing sizes and thickness of all members, types of materials, methods of connection and assembly, complete dimensions, clearances, anchorage, relationship to surrounding work by other trades, shop paint and protective coatings, and other pertinent details of fabrication and installation.

The Contractor shall be responsible for implementing all necessary means and methods to provide a finished product that is rust resistant, with special attention given to achieve a product that prevents rust bleeding from the contact surfaces and joints. The Contractor's shop drawings shall detail the Contractor's selected methods of controlling rust. The Contractor shall select the protection and sealing system. All welds, whether structural or seal welds for rust control, shall be ground smooth. The Contractor shall perform the welding with a procedure that prevents distortion of the panel due to heat.

Painting of the Pedestrian Fence shall be conducted in accordance with Section 509, with the following exception: All steel on the Pedestrian Fence shall be shop painted using a two coat system with organic zinc-rich primer and high-build urethane top coat. The primer shall be applied per the manufacturer's recommendations with a minimum dry film thickness of 3 mils. The manufacturer shall certify in writing to the Engineer that SSPC-SP 6 steel cleaning is compatible with the primer used. The top coat shall be applied per the manufacturer's recommendations with a minimum dry film thickness of 3 mils. To prevent bubbling, a mist coat shall be applied prior to application of the top coat.

The paint color shall be as designated on the plans. At least four weeks prior to painting the pedestrian railing panels, the Contractor shall submit two color samples for the Engineer's approval. The Engineer will either approve the color for use on the test section, or shall be entitled to order a change in the color, and request additional coating samples. All color samples shall be submitted on a 6"x6"x1/8" steel plate. The cost of up to two sets of color samples per color shall be incidental to the work. In the event that additional samples are requested by the Engineer, compensation for providing the additional samples will be paid as extra work in accordance with Standard Specification Section 109.

The Contractor shall fabricate and submit a full scale section of the fencing for approval by the Engineer after the review of the shop drawings. The test section shall be submitted at least four weeks in advance of the start of fabrication. The Engineer may order changes to the fabrication if the results observed in the test section are unacceptable. The test section shall not be installed on the project unless it is accepted. Rejected test sections shall be returned to the Contractor for correction or disposal at no additional cost to the project. The test section process shall be repeated at no additional cost in the event the test sections are rejected.

The Contractor shall be responsible for repairing damage from shipment or installation. Damage shall be reported to the Engineer prior to repair. Painted items that arrive to the job site damaged or that are damaged at the worksite prior to acceptance with damaged areas greater than one (1) square inch in area shall be rejected and returned to the manufacturer. The Contractor shall return to the shop such articles for cleaning and painting per

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**REVISION OF SECTION 514
PEDESTRIAN RAILING (STEEL) (SPECIAL)**

the manufacturer's recommendations at no additional cost to the project. Damage to the coating that is one (1) square inch or smaller shall be repaired in the field as recommended by the manufacturer. The manufacturer's recommendations shall be followed in the application and curing of field repairs.

If rust or rust bleeding occurs on the pedestrian railing at any time prior to the final inspection and acceptance, for or by any reason, the Contractor shall remove the rusted section, completely clean the section of all paint and primer, completely re-prime and re-paint the entire section and re-install at no additional cost to the project.

Subsection 514.08 shall include the following:

Payment will be made under:

Pay Item	Pay Unit
Pedestrian Railing (Steel) (Special)	Linear Foot

Payment will be full compensation for all labor, material, and equipment necessary to completely construct the Pedestrian Railing (Steel) (Special) assembly, including, but not limited to: fabrication, steel members, priming and painting, plates, bolts and connections, test section(s), installation, field welding, touch-up painting, and leveling grout.

The Contractor shall supply to the Engineer the manufacturer and brand name of the paint, manufacturer's application instructions, and the lot number(s) and color formula(s). In addition, the Contractor shall supply to the Engineer thirty-six (36), twelve ounce aerosol spray cans of paint the same as or matching that used for painting the railing for future touchup and repairs. Cost of aerosol spray paint will not be paid for separately, but shall be included in the cost of the work.

**REVISION OF SECTION 522
DUPLEX COATING SYSTEM**

Section 522 of the standard specifications is hereby added to the Standard Specifications for this project as follows:

DESCRIPTION

522.01 This work consists of hot dip galvanizing and duplex coating steel structures as shown in the Contract.

MATERIALS AND CONSTRUCTION REQUIREMENTS

522.02

- (a) *General.* The Contractor shall provide, install, and repair if necessary, all steel items that are prepared and coated in conformance with this Section. All repair and replacement of the finished coating necessary for final acceptance shall be at the Contractor's expense.

Steel products to be galvanized and coated shall be cleaned of weld spatter and bevel finished at exposed corners, edges and points. Areas having welds, cuts, bores, notches, or grooves shall also be beveled unless otherwise noted in the Contract or directed by the Engineer. Bevel work shall produce a uniform, smooth finish for galvanizing. Bevel size to be used is based on steel thickness and other criteria as follows:

Steel Thickness/Type	Bevel Size (inches)
Less than 1/2" thick	1/32" to 1/16"
Over 1/2" thick	1/16" to 1/8"
Bores, notches & grooves	root face of 1/32" to 1/16"

Welds shall be cleaned and finished according to AWS standards.

All coating measurements shall be taken with a Type 2 fixed probe Dry Film Thickness (DFT) gauge. The gauge shall be calibrated, and measurements shall be taken, according to the Society for Protective Coatings (SSPC) Standard PA-2.

- (b) *Galvanizing.* Galvanizing shall be done in accordance with the Contract requirements and AASHTO M 111 (ASTM A123) for the type of material being galvanized, except that items shall only be quenched with ambient air. The poles and arms for traffic signals and signs shall be hot dipped galvanized inside and outside. Chromate treatment of any type will not be permitted. Zinc-phosphate pretreatment or acrylic passivation pretreatments shall be as described in (d) below.

The Contractor shall submit a certificate of compliance (COC), conforming to subsection 106.12, confirming that all materials meet or exceed the galvanizing requirements described herein.

All galvanized surfaces shall be free from drips, slag or surface irregularities.

Spot areas not requiring galvanizing shall be marked and cleanly patched with material that prevents galvanization but does not weaken the adjacent spelter coating. Repair of patched areas shall be achieved by metallizing as described in (c) below.

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SECTION 522
DUPLEX COATING SYSTEM

Prior to galvanizing, the Contractor's galvanizer shall notify the Engineer in writing that the galvanized order is chromate free and air quenched. Products not certified chromate free by the Contractor's galvanizer shall be tested prior to galvanizing. The Contractor shall provide the Engineer with certification from an independent ASTM accredited laboratory listing all individual items that test chromate free. Testing shall comply with ASTM D-2092 Appendix X2. Test results shall be provided to the Engineer prior to galvanizing.

- (c) *Repair of Galvanized Products.* Uncoated areas or damaged coating exceeding applicable specification limits shall be re-galvanized to meet the original specification requirements. Cuts made after galvanizing shall be ground, beveled, and smoothed before repair. Damaged galvanized areas shall be re-galvanized or metallized.

Re-galvanizing shall conform to ASTM A-780, Annex A1. Metalizing shall conform to ASTM A-780, Annex A3, except that minor repair areas shall be cleaned according to SSPC method SP-3. SSPC Method SP-2 may be used to clean difficult access areas. Thickness of the repair coat shall match adjacent galvanizing, as measured by a calibrated DFT gauge.

Coating imperfections such as burring, runs or drips, high spots, heavy dross, or ash inclusion shall be removed and cleaned at the Contractor's expense. Areas of re-work falling below zinc thickness limits shall be repaired at the Contractor's expense.

Printed Technical Data Sheets (PTDS) shall be provided to the Engineer for repair materials used.

- (d) *Preparing Galvanized Surfaces for Coating.* Products shall be inspected for shipping and handling damage before surface preparation begins. Damage shall be reported to the Contractor's galvanizer and to the Engineer prior to repair. The Engineer will determine whether damaged items are to be repaired or replaced. Minor repair of galvanizing shall conform to (c) above, and shall be at the Contractor's expense.

The Contractor shall prepare each surface to be coated so that it has a slightly roughened profile without removing over 1.0 mil of the galvanized coating. Minimum ASTM zinc thickness specifications shall still apply after preparation.

Surfaces of fasteners to be coated shall be lightly brushed or sanded in a manner that will remove the least amount of zinc.

Surfaces that become soiled after pretreatment shall be cleaned prior to coating by low pressure, mild detergent wash and rinse. Stained or oiled surfaces may also be mildly scrubbed with a soft bristle nylon brush. Stubborn stains may be mildly scrubbed with a mix of 1 - 2 percent ammonia solution and thoroughly rinsed. Wash and rinse pressure shall not exceed 100 psi at 185° F temperature.

Surface preparation work shall be done according to one of the following methods:

1. *Zinc-Phosphate Pretreatment.* This treatment may be used only on new galvanizing less than 48 hours of age.

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**SECTION 522
DUPLEX COATING SYSTEM**

Items shall be immersed in a bath of acidic zinc-phosphate solution for 3 - 6 minutes, rinsed with clean water, and dried. The first epoxy coat shall be applied within 48 hours after immersion treatment.

If treated items are shipped to a different coating facility they shall be rewashed, rinsed and dried to remove surface soiling. The first epoxy coat must still be applied within 48 hours after immersion treatment.

2. *Acrylic Passivation Pretreatment.* This treatment may be used only on fresh hot galvanizing or new galvanizing less than 48 hours of age. Only chrome-free solutions shall be used, applied by a method that ensures complete coverage of all surfaces to be coated. The Contractor shall provide the Engineer with treatment dates for each item and the PTDS for the solutions used.

The Contractor's galvanizer may apply solution to fresh hot galvanizing that is less than 6 hours of age, still clean, and dry and that has cooled to treatment application temperature guidelines.

If newly galvanized items are shipped to another treatment facility they shall be washed, rinsed and dried to remove surface soiling. The solution shall then be applied and cured according to the supplier's instructions.

Fully cured and treated items shall be rewashed, rinsed, and dried again just before coating. Items not coated within 100 days of treatment shall be abrasive blasted in conformance with subsection (d) 3.

3. *Abrasive Blasting.* This treatment may be used on galvanized items of any age if beveling requirements as listed in the third and fourth paragraphs of subsection (a) have been met.

The Contractor shall notify the Engineer in writing at least five working days before blasting begins. Zinc thickness shall be measured and recorded immediately after blasting and provided to the Engineer within 48 hours of blasting. Thickness limits and measurement frequency shall comply with the original applicable ASTM specification. Blast operations shall reasonably conform to ASTM Standard Practice D-6386, Subsection 5.4.1 except for small areas falling below required zinc thickness. These areas shall be repaired in accordance with subsection (c). No single area shall exceed 2 inches at its largest width or 12 inches at its longest dimension. The total repair area shall not exceed 1 percent of the coatable surface of the item; if limits are exceeded or zinc thickness is below the specification requirement, the item shall be re-galvanized in conformance with the original specification.

The Contractor shall measure and record the size, location and repair method used for all repairs. This information shall be included on the report of thickness measurements.

The first epoxy coat shall be applied within 24 hours of abrasive blasting. Items shall be cleaned free of blast debris before coating. Compressed air used to clean items shall be free of oil, residue, oil and other harmful contaminants.

Thickness measurement is not required after surface preparation work has been completed.

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SECTION 522
DUPLEX COATING SYSTEM

- (e) *Coating and Paint Systems.* Prepared items shall be coated with a two or three coat system described in this subsection. Alternative coating systems shall be pre-approved in writing by the Engineer. Manufacturer's PTDS for each coating type shall state test values for ASTM requirements of this subsection. Prior to product use the coating supplier shall provide the PTDS and certify to the Engineer in writing that all furnished coating materials meet applicable requirements of this subsection.

Faying surfaces shall not be painted unless written approval is given by the Engineer. All shop fabrication, including welds and attachments, shall be completed prior to coating unless otherwise specified in the Contract or directed in writing by the Engineer.

Inorganic zinc coatings shall not be used. Combined DFT of all coats applied over the galvanizing shall range from 6.5 to 10 mils with a topcoat DFT of 3 mils minimum. Dried color of the base coat and topcoat shall be visually contrasting. Finished color shall not vary more than 4 ΔE^*_{ab} units from the specified color determined in accordance with ASTM D 2244.

Volatile Organic Compound (VOC) levels shall not exceed 3.5 pounds per gallon for each applied coat. Dry films shall contain less than 1 percent lead and other toxic heavy metals. The zinc concentration of each epoxy coat shall not exceed 40 percent. Top coats shall have a semi-gloss value of 50-75.

All coatings shall be able to withstand temperatures up to 180° F without sag, blister, or peel damage. Topcoat formulation shall provide weathering, chemical, and ultraviolet (UV) resistance. All coatings shall meet the following ASTM requirements as amended:

- (1) Corrosion Weathering. ASTM D-5894, minimum 6-cycles of exposure:
Corrosion rating of 8 or higher according to ASTM D-1654.
Blistering rating of 8 or higher according to ASTM D-714.
- (2) Impact Resistance. ASTM D-2794, 30 day test:
Epoxies – Minimum 40 inch-pounds
All Topcoats – Minimum 90 inch-pounds
- (3) Adhesion Testing. ASTM D-4541, 30 day test, Minimum 500 psi for either: Method B - flat surface or Method E - curved surface.
- (4) Abrasion Resistance. ASTM D-4060, 30 day test: Maximum 90 mg loss after 1000 cycles with a CS10 or CS17 wheel.
- (5) Flexibility. ASTM D-522, 30 day test - Method B: Epoxies shall pass a 180 degree bend over a ¼ inch mandrel. All Topcoats shall pass a 180 degree bend over a 3/8 inch mandrel.

Each coat shall be applied uniformly to provide an appearance free of laps, streaks, sags, drips, pinholes, and other discontinuities; all such defects shall be repaired prior to product shipment.

The Contractor's coater shall measure the DFT of each applied coat according to SSPC, Guide PA-2, except that measurements shall be taken with a calibrated Type 2 fixed probe gauge. Thickness records shall be provided to the Engineer prior to project shipment. The following two coating systems do not require pre-approval:

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**SECTION 522
DUPLEX COATING SYSTEM**

1. Powder Coating. The Contractor's coater shall oven preheat the articles to abate out-gassing potential. The Contractor's coater shall use compatible materials and coating processes to obtain proper coat to coat adhesion.

The epoxy powder base coat shall measure 2 to 6 mils DFT and be applied by electrostatic or airstatic spray. The powder formulation shall be a non-hybrid epoxy of anti-gassing grade.

The powder topcoat shall be electrostatic or airstatic spray applied and measure 3 to 6 mils DFT. The powder formulation shall be a non-acrylic, high-build, aliphatic-based, enhanced polyester or urethane polyester of anti-gassing grade.

2. Liquid Coating. The Contractor's coater shall apply coats by conventional or airless spray according to the supplier's guidelines. Minimal striping at difficult work areas is permissible. The Contractor's Coater shall use proper work methods and compatible materials to obtain proper coat adhesion. Thinning of paints shall be done according to the manufacturer's instructions so that thinned products conform to the solids content and VOC limits of this subsection.

The epoxy base coat shall measure 2 to 6 mils DFT. Paint shall be a low-blush epoxy polyamide, or a low-blush cycloaliphatic bisphenol-A polyamine. Minimum solids by weight of all epoxies used shall be 68 percent.

The topcoat shall measure 3 to 6 mils DFT. Paint shall be an aliphatic-based urethane polyester or aliphatic-based polyurea urethane. Specially formulated aliphatic-based polyaspartic polyureas may also be used over compatible epoxy bases.

- (f) *Repair of Coated Products.* The Contractor shall repair damage from shipment, installation, field welding, or other activity during the construction. Damage shall be reported to the Engineer prior to repair. Repairs shall be as directed by the Engineer.

Significant repair procedures require written submittal of a proposed repair process from the Contractor. The Engineer shall approve the proposal in writing before repairs begin. Significant repairs are classified as:

- (1) Any damaged area to the base coat material over 1 square inch
- (2) Total repair areas exceeding 5 percent of the coating per item
- (3) Any single topcoat repair area over 64 square inches

Minor and touchup repair of topcoats shall be done as follows:

A UV rated, aliphatic-based liquid topcoat paint shall be used. The paint shall be compatible with the existing topcoat material and closely match existing color. The paint shall meet the requirements of subsection (e). The paint supplier shall provide the Engineer with PTDS for the products used.

Single areas smaller than 8 square inches requiring repair shall be scuffed with 220 grit sandpaper or equivalent scuff material. Larger areas up to 64 square inches may be cleaned according to SSPC, Method SP-2. All border areas at the undamaged topcoat shall be scuffed with 220 grit material.

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**SECTION 522
DUPLEX COATING SYSTEM**

Cleaned, scuffed areas shall be bordered and coated by airless or conventional spray. Work areas shall be adequately shielded to contain errant spray. Fresh repair areas shall be protected as necessary during the initial cure. Repair thickness shall reasonably match the adjacent coating.

The repair coat shall provide an appearance free of sags, runs, streaks, drips, pinholes, or other discontinuities. Spray can paint repair shall not be used.

(g) *Conditions for Final Acceptance of Coating.* Within six weeks immediately prior to final project acceptance, the Engineer and a representative of CDOT's Staff Bridge Branch will conduct a final inspection of the coating. The Contractor's Superintendent shall also attend the inspection. Before final project acceptance, the Contractor shall repair the following defects found during the inspection:

- a. Peeling on any portion of the coatings.
- b. Blistering on any portion of the coatings.
- c. Color fading below a 35 gloss rating, in accordance with ASTM D523.
- d. Mottling defects that exceed 3 percent of the topcoat surface.
- e. Visible cracking of the topcoat material.
- f. Visible rusting discoloration on the coating.
- g. Sag or other evidence of coating adhesion loss.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

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

**REVISION OF SECTION 603
STORM SEWER PIPE**

Section 603 of the Standard Specifications is hereby revised for this project as follows:

Subsection 603.02 shall include the following:

The provision in the General Notes for Standard Plan M-603-2, which allows the use of non-reinforced concrete pipe in lieu of reinforced concrete pipe, is deleted.

All storm sewer pipe shall be reinforced concrete pipe.

In addition to any deficiencies covered by the applicable AASHTO & ASTM Specifications, concrete pipe, which has any of the following visual defects, will not be accepted.

- (1) Porous spots on either the inside or the outside surface of a pipe having an area of more than 10 square inches and a depth of more than 1/2 inch.
- (2) Pipe which has been patched to repair porous spots, cracks, or other defects, when such patching was not approved by the Engineer.
- (3) Exposure of the reinforcement when such exposure would indicate that the reinforcement is misplaced.
- (4) Pipe that has been damaged during shipment or handling, even if previously approved before shipment.

Acceptance of the pipe at the point of delivery will not relieve the Contractor of full responsibility for any defects in material or workmanship of the completed pipeline

Subsection 603.03 shall be revised to include the following:

The Contractor shall clean all drainage structures and connecting pipes (including existing appurtenances within project limits) upon completion of the project. Adequate sediment control must be in place prior to cleaning.

Subsection 603.04 shall be revised to include the following:

No open trench for storm sewer, culverts, or other pipeline construction shall be left exposed during non-working hours by the Contractor.

Any trench excavation that is made in advance of pipe or structure installation shall be utilized by placing pipe and backfilling during the same working shift. If any open trench remains after pipe laying or structure construction takes place, the trench shall be backfilled or adequately protected with construction fencing at the Contractor's expense prior to the time that the Contractor's work stops and the site is vacated.

The length of trench permitted to be open at any one time may be limited when such limitation is necessary for the safety and convenience of the public. All excavation, trenching, shoring, and stockpiling of excavated materials shall be in strict compliance with the applicable OSHA rules and regulations.

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**REVISION OF SECTION 603
STORM SEWER PIPE**

Subsection 603.06 shall include the following:

When temporary plugs are needed to accommodate construction phasing, they shall be precast concrete or match the pipe material being plugged.

Subsection 603.07 shall include the following:

The Contractor shall use rubber gasketed joints conforming to ASTM C443 in all storm sewer pipe work. All joints shall be constructed in such a manner that the alignment and flow line grade of the bottom of the pipe is accurately maintained.

Subsection 603.12 shall include the following:

Cleaning all drainage structures and connecting pipes upon completion of the project will not be measured and paid for separately, but shall be included in the work.

Installation and removal of plugs (temporary) will not be measured and paid for separately, but shall be included in the work.

Subsection 603.12 delete the third paragraph and replace with the following:

Structure excavation and structure backfill for pipe culverts (including end sections) and storm sewers will not be measured and paid for separately but shall be included in the work.

**REVISION OF SECTION 603
REINFORCED CONCRETE PIPE**

Section 603 of the Standard Specifications is hereby revised for this project as follows:

Subsection 603.02 shall include the following:

Reinforced concrete pipe shall be manufactured from concrete that meets the requirements for severity of sulfate exposure Class 10 specified in subsection 601.04.

Subsection 603.12 shall include the following:

Structure Excavation and Structure Backfill for R.C.P. will not be measured and paid for separately but shall be included in the work.

**REVISION OF SECTION 604
MANHOLES AND INLETS**

Section 604 of the Standard Specifications is hereby revised to include the following:

Subsection 604.02 shall include the following:

The structure sizes shown on the plans for all inlets and manholes are based on the use of a cast-in-place structure. Precast structures are allowed for non-special structures, in conformance with the provisions of subsection 604.04.

Subsection 604.04(b) shall include the following:

The Contractor shall ensure that all rims match the proposed grades, for both precast and cast-in-place manholes. If field conditions are not as anticipated, required modifications to all precast structures shall be at the Contractor's expense.

Subsection 604.04 shall include the following:

The Contractor shall set all manhole rings and covers 1/4 inch below the finished grade of the paved surface to match cross slope and profile.

Subsection 604.04(c) shall include the following:

Precast inlets are allowed. The Contractor shall ensure that all tops, rims and gutter sections shall be cast-in-place to match road profile, cross-section, and field conditions. If field conditions are not as anticipated, required modifications to all precast structures shall be at the Contractor's expense.

Inlet lip of gutter elevations shall be controlled by profile grade line and/or curblin profile elevations as shown in the plans.

Subsection 604.05 shall include the following:

Wherever new drainage structures are to be constructed on existing pipes, the existing pipe within the new structure shall be removed and pipe adjacent to the new structure shall be relayed, as shown on the plans. The removal or relaying of pipe connecting to new structures will not be paid for separately, but shall be included in the work.

Subsection 604.07 shall include the following:

If the use of precast inlets and manholes requires an increase in the structure size denoted on the plans, the cost associated with an increase in structure size due to the use of precast structures shall be included in the work.

**REVISION OF SECTION 606
GUARDRAIL**

Section 606 of the Standard Specification is hereby revised for this project as follows:

In subsection 606.02 delete the seventh paragraph and replace with the following:

The Contractor shall furnish steel posts and FHWA approved synthetic material blocks for guardrail and end sections as shown on the plans. Posts and guardrail shall be steel galvanized. Posts for end section shall be metal posts.

**REVISION OF SECTION 606
BRIDGE RAIL TYPE 10 (SPECIAL)**

Section 606 of Standard Specification is hereby revised for this project as follows:

Section 606.01 shall include the following:

Bridge Rail Type 10 (Special) is required as part of this project for the US50 West Eastbound Bridge over Wild Horse Dry Creek (Str. No. K-18-CW). This work shall include the cost of fabricating, galvanizing, painting, and constructing the combination bridge and bicycle railing as shown on the plans. For galvanizing and painting requirements see Project Special Provision Revision of Section 522 – Duplex Coating System.

Section 606.03 shall include the following:

Shop drawings are required to be submitted in accordance with Sections 101 and 105 for all railing on this project.

Section 606.06 shall include the following:

Payment will be made under:

Pay Item	Pay Unit
Bridge Rail Type 10 (Special)	Linear Foot

Payment will be full compensation for all labor, material, and equipment necessary to completely construct the bridge and bicycle railing as shown on the plans and as required by these specification, including, but not limited to: concrete and reinforcing steel, fabrication, steel members, cleaning, galvanizing and painting, anchor bolts, plates, bolts and connections, test section(s), installation, field welding and touch-up painting.

The Contractor shall supply to the Engineer the manufacturer and brand name of the paint; manufacturer's application instructions; and the lot number(s) and color formula(s). In addition, the Contractor shall supply to the Engineer, thirty-six (36), twelve ounce aerosol spray cans of paint the same as or matching that used for painting railing for future touchup and repairs. Cost of aerosol spray paint will not be paid for separately, but shall be included in the cost of the work.

**REVISION OF SECTION 608
DETECTABLE WARNINGS**

Section 608 of the Standard Specifications is hereby revised for this project as follows:

Subsection 608.01 shall include the following:

This work includes the installation of detectable warnings on concrete curb ramps as shown on the plans.

Subsection 608.02 shall include the following:

Detectable warnings on curb ramps shall be truncated domes. Domes shall be prefabricated by the manufacturer as a pattern on embeddable surface plates, concrete pavers, or masonry pavers.

Plates and pavers shall meet all Americans with Disabilities Act (ADA) requirements for truncated domes, and when installed, shall be capable of producing the pattern of domes shown on the plans.

Pavers shall meet the requirements of ASTM C 902 or ASTM C 936

Plates used shall be one of the products approved for use as detectable warnings listed on CDOT's Approved Products List.

The domes and their underlying surface shall have a discernible contrast of color from the adjacent surface. The contrasting colors shall not be black and white.

The paver contrast shall be achieved by adding pigment during the fabrication of the paver. Prior to the start of work, the Contractor shall submit appropriate documentation from the manufacturer verifying that the contrast has been met, along with a sample paver, to the Engineer for approval.

When plates are used, prior to the start of work, the Contractor shall submit appropriate documentation from the manufacturer verifying that the contrast has been met, along with a sample plate, to the Engineer for approval.

Bedding and joint sand for pavers shall be free of deleterious or foreign matter. The sand shall be natural or manufactured from crushed rock. Limestone screenings or stone dust shall not be used. Sand for bedding material shall conform to ASTM C 33. Sand that is to be placed between joints shall conform to ASTM C144.

Subsection 608.03 shall include the following:

(g) *Detectable Warnings for curbs ramps.*

1. Pavers. Pre-fabricated pavers for detectable warnings shall be brought to the site in steel banded, plastic banded or plastic wrapped cubes capable of being transported by a fork lift or clamp lift. Pavers shall be carefully removed and stacked in a manner which results in the least amount of damage. All pavers that are damaged during transport or delivery will be rejected and shall be replaced at the Contractor's expense. Minor cracks or chipping due to transport and handling that do not interfere with the structural integrity of the paver or the overall pattern of truncated domes will not be deemed as grounds for rejection.

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**REVISION OF SECTION 608
DETECTABLE WARNINGS**

The Contractor shall spread the bedding sand evenly in the area shown on the plans and shall screed the sand to an appropriate embedment depth as shown on the plans or as directed by the Engineer. Sufficient sand shall be placed to stay ahead of laid pavers

Pavers shall be placed in a running bond pattern. Pavers shall be installed such that the base of the truncated dome is at the same elevation as the adjoining surface, allowing for a smooth transition between the curb ramp and the detectable warning.

When cut pavers are required to fill gaps between the pavers and the edge of concrete, the Contractor shall bevel portions of the truncated domes at a 45-degree angle to create a smooth transition between the partial dome and the curb ramp surface. Unless otherwise directed by the Engineer, pavers shall be cut and installed in such a manner that the domes on the cut sections will not significantly impact the overall pattern of the truncated domes.

The Contractor shall use a plate vibrator to embed the pavers into the sand. The size and type of plate vibrator shall be in accordance with manufacturer's recommendations, or as directed by the Engineer. All pavers that are damaged during embedment shall be replaced at the Contractor's expense.

Joint spacing between paver units shall be in accordance with the manufacturer's recommendations, or as approved by the Engineer. Joints shall be filled completely with joint sand. Excess sand shall be removed by sweeping.

2. Plates. Prior to installation of the plates, concrete conforming to subsection 608.02 shall be installed and consolidated as a base for the plates. The concrete shall be placed to a thickness that will allow the base surface of the plates to be at the same elevation as the adjacent concrete. The plates shall be embedded into the plastic concrete in accordance with the manufacturer's specifications.

Subsection 608.05 shall include the following:

Detectable warnings on curb ramps, including sand, pavers, plates, and all other work and materials necessary for fabrication, transport, and installation will not be measured and paid for separately, but shall be included in the work.

**REVISION OF SECTION 613
WIRING**

Section 613 of the Standard Specifications is hereby revised for this project as follows:

Subsection 613.08 shall include the following:

A continuous 21-conductor shall be run from the controller cabinet to the hand hole of each signal pole, no splices shall be allowed. A 7-conductor shall be run for each signal head from each head to the hand hole of the pole base. A 10-conductor shall be run from the farthest signal head on the mast arm to the hand hole of the pole base. A 3-conductor shall be run for all pedestrian heads from the head to the hand hole of the pole base. All pedestrian push buttons shall be wired continuously from the button to the controller cabinet with a 2-conductor wire. A 3-conductor 10 gauge wire shall be run from the controller cabinet to interconnected advance flashing beacons. Contractor shall wire according to CDOT color code.

Electric service for the controller cabinet and Luminaire service shall be pole mounted with a meter and 240 volt (minimum 100 amps) service panel. There shall be a dedicated 240V/50A circuit wired directly to the luminaires and a dedicated 120V/50A service wired to the signal cabinet. Contractor shall coordinate with the electric company to provide the signal electric service. Contractor shall furnish and install the wire and conduit from the controller to the appropriate power pole, with meter and weather head or any necessary appurtenances and the utility company shall connect to Transformer. The controller cabinet shall be supplied with a dedicated 120V/50A circuit. Luminaires shall be wired with a dedicated 240V/50A circuit from the pedestal.

Subsection 613.09 shall include the following:

The flasher unit for interconnected flashing beacons shall be housed in a suitable enclosure on the beacon pipe or the device may be contained within the signal head itself.

Subsection 613.11 shall include the following:

The work shall include the dismantling and removal of existing wires for components of existing signal poles and cabinet and components connected to the signal poles and cabinet. The work shall include the dismantling and removal or modification of the existing electric service, phone service, wire, conduit, weather head, and meter.

The work shall include all necessary equipment, materials, or personnel to assemble the proposed signal components and cabinet components to achieve a fully functional traffic control system.

The work shall include the wiring for the VMS sign, intersection detection system (camera) and the flashing beacons per manufacturer's recommendations.

All signal cable shall be continuous from connections made in the hand hole compartment of the signal pole base to the terminal compartment in the controller cabinet. For interconnected flashing beacons, cable shall be continuous from the cabinet to the flasher enclosure. Splicing shall not be permitted unless specifically approved by the Engineer.

Subsection 613.12 shall include the following:

All labor, materials, equipment, and permits necessary for the wiring of proposed or removal of electric and phone service(s), signal heads, signal poles, pedestrian heads, pedestrian push buttons, pedestrian poles, controller cabinets, video cameras, telemetry, and luminaires are part of the wiring item and will not be measured and paid for separately.

**REVISION OF SECTION 613 and 715
ELECTRICAL CONDUIT & PULL BOXES**

Section 613 of the Standard Specifications is hereby revised for this project as follows:

Subsection 613.01 shall include the following:

This work includes furnishing and installing (HDPE) High Density Polyurethane, PVC electrical conduit, or metallic electrical conduit.

Subsection 613.02 shall include the following:

All materials furnished assembled, fabricated, or installed under this item shall be new, corrosion resistant and in accordance with this contract.

All Conduits shall be schedule 80 or equivalent and shall be fully compatible with signal wiring and fiber optic cable. Pipe connections shall be made with manufacturer approved fittings and/or butt fusing.

HDPE conduit shall be certified by the manufacturer as meeting ASTM D3350.

PVC conduit shall be certified by the manufacturer as meeting ANSI/UL 6 and 651. The manufacturer shall be ISO 9000 compliant.

Transitions between polyurethane to metallic to PVC, if applicable, shall be made with manufacturer's approved couplers.

Delete the twenty-first paragraph of Subsection 613.07 and replace with the following:

Electrical Conduit shall be metallic and installed at building, VMS, or structure penetrations.

Electrical Conduit (Bored) shall be HDPE and installed using a trenchless technology of either jacked conduit or directional boring. Partial or unsuccessful bores shall be filled with a preapproved cement grout. Surface damage due to boring processes or procedures between bore pits or splice pits shall be repaired to original condition.

Electrical Conduit (Plastic) shall be PVC or HDPE and installed by direct burial methods such as plowing, open trenching, or other excavation methods. When PVC is used, expansion fittings shall be installed at 100-ft intervals. Surface damage due to direct burial methods between pull boxes shall be repaired to original condition.

Each individual conduit shall be equipped with a pull rope or tape of 1250 pounds tensile strength and be of a design to prevent cutting or burning of conduit walls during cable installation.

One conduit per bundle shall have a copper tracer wire of at least 12-gauge in a single conduit. In trenches containing multiple conduits, the tracer wire shall not be installed in the same conduit as the fiber.

The installation of conduit shall be performed in such a manner as to avoid unnecessary damage to streets, sidewalks, utilities, landscaping, and sprinkler systems. Excavations and conduit installation shall be performed in a continuous operation. All trenches shall be backfilled by the end work day. The material from trenching operations shall be placed in a location that will not cause damage or obstruction to vehicular or pedestrian traffic or interfere with surface drainage.

Conduit installed under existing concrete or asphalt surfaces, particularly roadways shall be bored or jacked. Conduit installed under or near wetlands shall be bored. No open cutting in these locations will be allowed unless otherwise approved by the Engineer.

The Contractor shall take all necessary precautions to avoid heaving any existing asphalt/concrete mat or over-

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**REVISION OF SECTION 613 and 715
ELECTRICAL CONDUIT & PULL BOXES**

excavating a trench, whether caused by equipment directly or by dislodging rocks and boulders. Any such heaving or over-excavation shall be repaired or replaced at the Contractor's expense. The Contractor shall bear the cost of backfilling all over-excavated areas with the appropriate backfill material as approved by the project engineer.

The Contractor shall restore all surface materials to their preconstruction condition, including but not limited to pavement, sidewalks, sprinkler systems, landscaping, shrubs, sod, or native vegetation that is disturbed by the conduit installation operation. All repairs shall be included in the cost of the conduit.

If the Contractor is unable to bore the conduit at the lengths shown on the plans from access point to access point, all splice couplings and associated work to splice conduit shall be included in the cost of this item. The coupling technology shall allow the conduit to be connected, form a watertight, airtight seal, and meet NEC standards. Breaking force between segments shall exceed 250 pounds of force. No metal fittings shall be allowed. No elevation difference between the conduit run and the splice location will be allowed. Conduit splices shall be kept to a minimum and all locations shall be approved by the project engineer. Additional pull boxes shall not be substituted for splices.

Conduit plugs shall be supplied and installed in all conduit ends as soon as the conduit is installed. Conduit shall be plugged at all termination points such as pull boxes, manholes, controller cabinets, and node buildings. Conduits containing cable shall be plugged with durable and reusable split type plugs, fabricated without metallic parts, and allow easy removal and reinstallation around in-place cables. Split type plugs shall provide a water and air-tight seal of at least 50 psi and shall be installable by hand without using special tools and without damaging the cable. All plugs shall be correctly sized to fit the conduit being plugged. Empty conduits shall be sealed with removable type duct plugs that provide a watertight barrier.

All conduits shall use sweeps to elevate the buried conduits to within 4 inches of the bottom of the pull box or manhole, as shown in project details. The sweeps shall be terminated within the pull boxes and manholes to allow for easy installation and removal of the conduit plugs. The sweeps shall be set above the ground surface within the pull box at a height that does not interfere with the coiling of the fiber optic cable.

All conduit runs containing fiber optic cable shall have a limited number of bends. The sum of the individual conduit bends on a single conduit run between two pull boxes shall not exceed 360°. The preferred limit is 270°. No individual bend shall be greater than 90°. All conduit bends shall have a minimum acceptable radius. The minimum radius for 90° bends is 48 inches, and the minimum radius for all other bends is 24 inches.

The Contractor shall place pull or splice boxes at conduit ends, at all wiring splices, at all conduit angle points, and at all other locations shown on the plans.

Excavations for placement of pull boxes or conduit splices shall be back filled with class 6 aggregate base course. Compaction for class 6 material shall be in accordance with AASHTO T-99. All excess and demolition materials shall become the property of the Contractor and shall be disposed of in compliance with all applicable laws.

Pull boxes installed in non-surfaced areas shall have a concrete apron 12 inch wide by 6 inch deep. Pull boxes shall not be installed above the grade of the apron. Concrete apron shall have a 1% slope away from the top of pull box. All concrete aprons shall be Class B and shall be in accordance with Section 601.

Pull boxes installed adjacent to traveled ways shall have a special concrete footing extending 6 inches around the outside and 3 inches around inside of the pull box bottom. Depth of footing shall be at least 3½ inches. Pull boxes shall be grounded with a 5 foot x 5/8 inch copper ground rod.

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**REVISION OF SECTION 613 and 715
ELECTRICAL CONDUIT & PULL BOXES**

A minimum of 18 inches of 3/8 inch gravel shall be installed as a base for the pull box to aide in drainage. The gravel shall be free of dirt and debris and spread evenly to facilitate a level base for the pull box. The Contractor shall ensure that sufficient compacting is made prior to the installation of gravel to help alleviate future settling.

Wire mesh shall be installed in a manor to completely surround fiber optic pull boxes. The wire mesh shall be installed prior to the installation of the pull box above the bed of gravel and extending one foot past the outer edges of the concrete apron. The wire mesh shall be gently cut to allow only the entrance of the conduit at the bottom of the box. Any openings cut in the wire mesh larger than the diameter of the conduit shall be remedied by the installation of additional wire mesh to obtain a completely sealed pull box enclosure.

If new conduits are installed in existing pull boxes, manholes or cabinet bases the Contractor shall carefully excavate around the pull box or manhole and install the new conduit as shown in the plans. The Contractor shall not damage the existing pull box, manhole or their contents. If the existing pull box, lid, or the concrete collars are cracked or damaged during conduit installation, the Contractor shall restore the damaged section to preconstruction condition at no additional cost.

Section 613.11 shall include the following:

Pull boxes will be measured as each complete in place.

Section 613.12 shall include the following:

Payment will be made under:

Pay Item	Pay Unit
2 Inch Electrical Conduit	Linear Foot
2 Inch Electrical Conduit (Bored)	Linear Foot
3 Inch Electrical Conduit (Bored)	Linear Foot
Pull Box (24" x36" x24")	Each
Pull Box (30" x48" x18")	Each

The following items will not be measured and paid for separately, but shall be included in the work:

- (8) Partial or unsuccessful bores and any work necessary to abandonment
- (9) Restoring the ground to original grade and condition, including topsoil, seeding, mulching, mulch tackifier, soil retention blanket, sod, or turf reinforcement mat
- (10) The disposal of excess and demolition materials
- (11)Material required for pull box installations including gravel bedding, grounding rod, or concrete apron.

Section 715 of the Standard Specifications is hereby revised for this project as follows:

Subsection 715.06 shall include the following:

Pull boxes and splice boxes shall be made of fiberglass reinforced polymer concrete. Pull boxes shall have pre-formed knockouts located in the short ends of the box to allow entry of the conduit.

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**REVISION OF SECTION 613 and 715
ELECTRICAL CONDUIT & PULL BOXES**

The Contractor shall submit test results documenting the minimum lateral pressure capacity of 1200 pounds per square foot distributed can be accommodated over the sidewall of the box. The Contractor shall submit test results documenting the minimum vertical load capacity of 18000 lbs over 10 inches x 10 inches square over both the side wall and cover.

Pull boxes shall have a detachable cover with a skid-resistant surface and have the words "TRAFFIC" cast into the surface for traffic signal boxes or "CDOT COMM" cast into the surface for communication boxes. Painting of words shall not be accepted. The cover shall be attached to the pull box body by means of 3/8 inch lag head stainless steel hex head bolts and shall have two (2) lift slots to aid in the removal of the lid.

Each fiber optic pull box shall have a locator disk manufactured into the lid that operates at the frequency of 101.4 kHz for communication line locating. The locator disk shall be compatible with a Dynatel cable locator.

Wire mesh shall be installed in a manor to completely surround the box. The wire mesh shall meet the material standard ANSI/ASTM A555-79 and made of T-304 stainless steel, 0.025 inch wire diameter minimum and shall have a spacing of 12 mesh per inch.

Pull boxes shall be verified by a 3rd Party Nationally Recognized Independent Testing Laboratory as meeting all test provisions of ANSI/SCTE 77 2007 Specification for Underground Enclosure Integrity, Tier 22 rating. Pull boxes shall be UL listed. Certification documents shall be submitted with material submittals.

**REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)**

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of furnishing and installing a Light Emitting Diode Variable Message Sign (LED VMS) and associated equipment cabinets at locations as shown in the plans. The sign shall be fully compatible with the mounting hardware and support structure shown on the plans. The LED VMS shall be equipped with the ability to display 3 lines of text at a height of 18-inch tall characters and shall have a display made up of a full matrix configuration. The matrix shall be a minimum of 27 pixels high by 70 pixels wide. The sign shall include a power shut off mounted to the sign structure near the controller interface cabinet. The sign shall be capable of operating without any decrease in performance over a temperature range of -40° F to +158° F with a relative humidity of 0 to 100 percent, condensing. The sign shall have a minimum design life of 20 years.

MATERIALS

- a) *Certifications:* Prior to start of the installation of the LED VMS the Contractor shall provide the following certifications to the Engineer for review and approval:
- (1) Certification showing that the manufacturer of the LED VMS is fully compliant with ISO 9001 as of the bid date for this project. The ISO 9001 Certification shall apply to the facility, and to the design, fabrication, installation, and maintenance of the LED VMS. The facility where this company actually designs and manufactures the LED VMS shall be ISO 9001:2000 certified a minimum of one year prior to the bid date for this project.
 - (2) Working drawings showing the sign housing and tilting brackets shall be sealed by an Engineer registered in the State of Colorado and shall be submitted in accordance with subsection 105.02.
 - (3) Certification showing that welding of the LED VMS housing is in accordance with the American Welding Society (AWS) Standards, ANSI/AWS D1.2-97. The LED VMS manufacturer's welders and welding procedures shall be certified by an ANSI/AWS Certified Welding Inspector to the ANSI/AWS D1.2-97 Structural Welding Code for Aluminum.
 - (4) Certification that all aluminum face materials have a coating that meets or exceeds the requirements of the American Architectural Manufacturers Association (AAMA) Specifications Publication No. 2605.
 - (5) Certification that the LEDs were tested and binned in accordance with the CIE Test Method A.
 - (6) Documentation and information on software as described in Appendix A of this document.
 - (7) Documentation verifying the VMS is listed by an accredited 3rd party testing organization for conformance to UL48 and UL 1433.
 - (8) All workmanship shall comply with IPC-A-610C, Class 2 titled "Acceptability of Electronic Assemblies",
 - (9) Documentation providing proof PCB silicon conformal coating conformance to MIL-I-46058C Type SR and IPC-CC-830.
 - (10) Documentation that the sign's structural integrity is in Conformance to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals (Third Draft).
 - (11) Documentation that the VMS conforms to the Transient Protection and Vibration of the NEMA Standard TS4, Section2.
- b) *Sign Housing:* All component parts shall be easily and readily accessible by a single person for inspection and maintenance. There shall be room for a technician to work. Access shall be made by entering the side of the housing. The housing shall be weather tight, and compliant to the NEMA 3R Standard. The bottom panel of the housing shall have a minimum of four drain holes, with snap-in, drain filter plug inserts.
- The sign housing shall be capable of withstanding a wind loading of 120 mph without permanent deformation or other damages. The sign housing shall also be designed, stamped and signed by a Professional Engineer

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**REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)**

Licensed in Colorado to withstand current AASHTO specified group loading combinations including: sign weight, repair personnel and equipment, ice and wind loads. It shall also meet strength requirements for truck-induced gusts as specified in NCHRP Report 412. The sign housing shall be engineered to withstand snow loading of 40 pounds per square foot, as well as the ability to be mounted in a manner that prevents the buildup of snow and creates a natural means by which snow can run off without impeding flow of traffic. The performance of the sign, including the visibility and legibility of the display, shall not be impaired due to continuous vibration caused by wind, traffic or other factors. The housing shall be designed to accommodate mounting on the rear vertical plane and shall be structurally sufficient to be mounted to the sign support structure. The sign housing and structural components for the tilting system including bolts and welds, shall be structurally sufficient to perform under all applicable loading conditions including gravity, wind, traffic, weather, roadway deicers, maintenance, and other environmental factors. Working drawings showing the sign housing and tilting brackets shall be submitted in accordance with subsection 105.02. Working drawings shall be sealed and signed by an Engineer registered in the State of Colorado.

All parts shall be made of corrosion resistant materials, such as plastic, stainless steel or aluminum. Painted steel is not acceptable. No self-tapping screws shall be used. The exterior front face surfaces shall be finish coated by a system that meets or exceeds the AAMA Specification No. 2605. The finish shall be matte black. The main body of the sign housing shall be constructed of aluminum with a natural mill finish. All exterior seams shall be continuously welded by an inert gas process, except for the coated fascia material.

The glazing shall be constructed of 0.25 inch thick clear GE LEXAN XL10 or pre-approved equivalent polycarbonate sheets with surfaces that resist hazing from UV light. The glazing shall be protected by a coated 0.090 inch aluminum mask with apertures punched directly in front of each pixel. The coating shall meet or exceed the AAMA Specification No. 2605.

The external front face panels shall have the following minimum dimensions: The perimeter panels shall be a minimum of 12 inches wide. The external front face panels shall be thermally insulated from the rest of the sign housing. The glazing, aluminum mask and the external front face panels shall be easily replaceable from within the sign housing.

The ventilation system shall be forced air. The system shall be designed to adequately cool the pixels from all sides along with the front and rear of the display module and all other internal components. The ventilation system shall have the following properties:

- (1) Positive pressure (exhaust fans are not acceptable).
- (2) The fans shall have ball or roller bearings, shall be permanently lubricated and shall require no periodic maintenance. The fans are to be positioned in such a manner so as to provide a balanced air flow to the ventilation system in the event of failure of any fan.
- (3) The sign housing shall be provided with a flush-mounted, 150 degree swing, right hinge, heavy-duty, personnel access door with hoisting hardware on door frame that will provide easy access for a single maintenance person. The door shall be constructed of aluminum with a welded aluminum frame and equipped with two closed cell neoprene gaskets. One gasket shall be attached to the door and one gasket shall be attached to the housing door jamb. The housing door shall be attached to the housing with a stainless steel piano hinge with a stainless steel pin spot welded at the top. The hinge shall be mounted so that it is not possible to remove it from the door or cabinet without first opening the door. The door and hinges shall be braced to withstand a 100 pound per vertical foot of door height load applied vertically to the outer edge of the door when standing open. There shall be no permanent deformation or impairment of any part of the door or cabinet body when the load is removed. The door opening shall be double flanged on all four sides. The

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**REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)**

cabinet door shall also be pad-lockable. It shall include a three-point locking mechanism with two operating handles, and a dead bolt center-case lock. The lock mechanism and handles shall be corrosion resistant. The door operating handles shall be on both the inside and outside of the door. The door assembly shall also include a device to hold the door open from 90 to 150 degrees. The door shall be provided with a door alarm that is controlled by the sign controller and notifies the Central system control software whenever the door is accessed.

The sign housing shall have a continuous, interior walkway (minimum 24" width) extending the full length of the sign. The internal structural members shall be extruded aluminum and shall accommodate both the display module mountings while allowing air distribution. The display modules shall be removed and replaced without the use of tools and without disturbing adjacent modules. A fold down aluminum shelf shall be provided in the sign housing next to the 2070 controller and in the controller interface cabinet. The sign shall have baseboard heaters that are sufficient to elevate the temperature within the sign to 30° F above the temperature outside the sign. These heaters shall be controlled by a wind up timer in the sign and remotely from the controller interface cabinet and central computers. The angular alignment of the sign housing shall be adjustable in the vertical direction from (0 to 10 degrees) down in one-degree increments to optimize the viewing angle. For surge protection, the system power shall be protected by two stages of transient voltage suppression devices. Also, communication lines shall be protected by two stages of transient voltage suppression devices as required in the Sign Controller Communication Interface section of this specification. In both cases, tripping of each stage (or both if tripped simultaneously) of the surge protection shall cause the sign controller to call central and report the error condition (for dialup operation) or report the error condition to central on the next poll (for multi-drop operation). There shall be an option that is either enabled or disabled and is selected and downloaded from the central system control software to the sign controller. When this option is enabled, tripping of the second stage of surge protection shall prevent power from reaching any components of the sign until the surge protection has been replaced. When this option is disabled, the sign will continue to function normally after the second stage of surge protection is tripped.

- c) *Sign controller:* The sign controller shall be mounted in the sign housing. The sign controller shall be a multiple-sourced, non-proprietary, NTCIP compliant, 19 inch rack mountable, 2070 ATC (Lite) traffic controller, and shall be provided with resident software stored in non-volatile memory. The 2070 ATC controller shall have the capability of upgrading to ATC 5.2b (Linux) specifications.

The 2070 ATC (Lite) shall include a minimum of seven (7) serial communications I/O ports, including three (3) RS-232 ports and one (1) Ethernet port, 2070 accessories 2070-7A serial communication module, 2070-2B field I/O module, 2070-1B CPU Module, and a 2070-4A power supply module shall be supplied as the minimum. The 2070 ATC (Lite) shall have the latest OS-9 (or Linux) operating system.

The sign controller shall be programmed to receive and transmit NTCIP compliant sign control commands from the central system control software or laptop computer. The controller shall have power-up and auto-restart capabilities with programmable default actions when recovering from a power off condition. A hardware watch dog circuit shall provide automatic reset of the controller and modem device.

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**REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)**

Central control shall have ability to perform a remote command for the controller and modem device reset. The Controller shall perform all communication, control and feedback functions and shall not require an intermediate control device and be the only sign controller. Communication and control lines between the sign controller and the system interface circuits shall be opto-coupled.

The following shall be mounted inside the main sign housing:

- (1) NTCIP compliant 2070 ATC (Lite) sign controller
- (2) Fold-down laptop shelf and document holder for maintaining sign.
- (3) Modem/or communication device
- (4) Display system interface circuits
- (5) Local/remote control switch
- (6) **Sign to ground voice communication RJ-11 jack**
- (7) USB plug-in connection or a serial connection with a USB converter cable for the controller interface.
- (8) RS-232 cable (a minimum of 4 feet long to connect the controller interface to a laptop computer)
- (9) A.C. surge protection and communication surge protection

There shall be an outside controller interface box that shall be made of aluminum or stainless steel, be weather tight, corrosion resistant, and meet NEMA 3R standards. The separate controller interface box shall be mounted as indicated on the plans. This typically will be on the sign support structure pole furthest from traffic.

The controller interface cabinet shall contain the following assemblies:

- (1) Power-on indicator
- (2) Waterproof local/remote switch
- (3) Local control LED indicator
- (4) RS-232 cable a minimum of 4 feet long to connect the controller interface to a laptop computer.
- (5) 120 VAC GFI outlet
- (6) For dialup installations, an RJ-11 jack for connecting the dialup phone line shall be installed with in-line surge protection.

d) *Electronics:* All electronic components, except printed circuit boards, shall be commercially available, easily accessible, replaceable and individually removable using conventional electronics repair methods.

All Printed Circuit Boards (PCBs) shall be completely conformal coated with a silicone resin that meets the IPC CC-830 standard. The exception for this coating shall be the pixels on the front of the PCB of the LED motherboards and any components in sockets.

All discrete components, such as resistors, capacitors, diodes, transistors, and integrated circuits shall be individually replaceable. Components shall be arranged so they are easily accessible for testing and replacement. All circuit designs shall utilize high quality electronic components and shall provide a meantime before failure of at least 3 years.

Provisions shall be made to prevent face fogging and condensation. The sign controller shall read the internal temperature sensors, external ambient temperature sensor and the humidity sensor. The sign controller shall use these readings in an algorithm that turns on the heat tape to reduce both frost on the face of the sign and condensation on the display modules and other electronic circuitry.

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**REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)**

The sign and the controller shall be capable of operating with 120/240 VAC, 50 amp per leg, 60 Hz, single phase power. The sign shall have a 50-amp two-pole breaker (common trip) main, 120/240 VAC, single phase, four wire load center with 20 circuit capability. Each circuit in the sign shall be powered from a circuit breaker. Inside the sign housing, all 120 VAC service lines shall be independently protected by a thermo magnetic circuit breaker at the sign housing entry point. All 120 VAC wiring shall be located in conduit, pull boxes, raceways, or control cabinets as required by the National Electrical Code (NEC). No 120 VAC wiring shall be exposed within or outside of the sign housing. The sign housing shall not be considered as a raceway or control cabinet. There shall be a minimum of three GFI Duplex outlets installed inside the sign housing.

Lighting shall be provided to illuminate the interior of the sign. The lights shall be enclosed in die cast aluminum safety fixtures with twist-on bulb guards secured by four set- screws. The light bulbs shall be clear incandescent light bulbs that may be controlled by an adjustable timer.

The pixels shall be amber in color and utilize precision optical performance AlInGaP II LEDs constructed of aluminum indium gallium phosphide. The brightness and color of each pixel shall be uniform over the entire face of the sign within the 15-degree cone of vision from minimum of 200 feet up to and including 1100 feet in all lighting conditions. Each pixel shall be 40 candelas at 20mA as measured by the sum of the brightness of the individual LEDs in each pixel. The brightness of each LED shall be measured in accordance with CIE Test Method A, as described in CIE 127-1997, Technical Report: Measurement of LEDs.

Each pixel shall contain two strings of LEDs. The pixel strings shall be powered from a regulated DC power source and the LED current shall be maintained at 25 plus or minus three milliamperes per string to maximize life of the pixel. The failure of an LED in one string within a pixel shall not affect the operation of any other string or pixel. The LEDs shall be capable of operating in a temperature range of -40 degrees to +100 degrees C. The LEDs shall be moisture resistant epoxy with UV-A and UV-B inhibitors.

Pixel power drawn from the DC supplies shall not exceed 1.5 watts per pixel, including the driving circuitry. A minimum of three photocells shall be installed on the sign. These devices shall permit automatic light intensity measurement of light conditions at each sign location. These photocells shall be mounted in a manner to measure front, rear and ambient light conditions.

Provisions shall be made to prevent perceivable brightening of the sign due to stray headlights shining upon the photo sensors at night.

The power supplies shall be paralleled in a diode OR configuration such that one supply may completely fail and the sign will still be supplied with enough power to run 40% of all pixels.

All cables shall be securely clamped/tied in the sign housing. No adhesive attachments will be allowed.

The signs shall be capable of displaying ASCII characters 32 through 126 (including all upper and lower case letters and digits from 0 to 9) at any location in a message line.

The Contractor shall be responsible for locating the nearest electrical power, fiber splice point, telephone sources and connecting those sources to the appropriate terminations with the LED VMS. The Contractor shall cooperate with the local electrical, ITS and telephone utilities to establish a service accounts at the direction of the Engineer.

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**REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)**

e) *Communication:* The sign controller shall be capable of being controlled from the central system control software and the controller interface cabinet via RS-232 serial and Ethernet communications.

The sign controller shall include separate interfaces for communication with the central system control software and the controller interface cabinet.

The communications between the sign controller and the central system control software and controller interface cabinet shall comply with the NEMA National Transportation Communications for ITS Protocol (NTCIP). The sign controller shall support all NTCIP conformance levels, conformance groups, objects, and minimum storage sizes and ranges as specified in APPENDIX A.

In addition to the standard Management Information Base (MIB) objects, the sign shall include any additional manufacturer-specific MIB objects required to support all of the sign and central software functionality defined in this specification and in APPENDIX A.

Dial-up or hardwire multi-drop communication lines shall be protected by two stages of transient voltage suppression devices including MOVs and spark gap arrestor.

The sign controller shall be capable of being remotely reset from the central system control software.

The sign shall provide a minimum of four (4) input and four (4) output contact closures able to receive digital and or analog signals that will allow up to 15 message activations upon contact closure events. These message activations shall permit standard NTCIP operations to occur and also permit contact closure messages to occur without message activation collisions and or message activation errors. Contact closures shall be remotely accessible using standard NTCIP MIB objects. Contact closures shall be capable of issuing NTCIP traps. The sign controller shall provide software modules that will allow integration with CDOT WIM systems and shall allow user-configuration of maximum and minimum temperature in which to turn fans on and off.

The sign shall have polling capability and at a minimum shall be capable of reporting the status of the following:

- (1) Pixel operational status that includes every string of every pixel
- (2) Sign and ambient temperature
- (3) DC power supply status
- (4) The current state (on or off) of each pixel, including any pixel errors, in the actual, currently displayed message without disturbing the message in any way. This shall be real time and shall not be based on a previous pixel test.
- (5) Cooling fan status
- (6) Access door alarm
- (7) Communication failure log
- (8) Heat tape status
- (9) UPS status
- (10) AC surge protector status

The controller software shall be capable of displaying the following types of messages:

- (1) Static messages capable of displaying any character or set of characters
- (2) Full Graphic capabilities.

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**REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)**

- (3) Flashing messages with the following ranges of adjustable timing:
 - (a) Message time on from 0.5 to 5.0 seconds in 0.1 second increments.
 - (b) Message time off from 0.5 to 5.0 seconds in 0.1 second increments.
- (4) Alternating messages capable with the following ranges of adjustable timing:
 - (a) Primary message time on from 0.5 to 5.0 seconds in 0.1 second increments.
 - (b) Primary message time off from 0 to 5.0 seconds in 0.1 second increments.
 - (c) Alternate message time on from 0.5 to 5.0 seconds in 0.1 second increments.
 - (d) Alternate message time off from 0 to 5.0 seconds in 0.1 second increments.

It shall be possible to flash any character or set of characters in an alternating message at the adjustable frequencies listed above for flashing messages. The flashing period shall be a sub-multiple of the associated alternating on time. It shall also be possible to flash any character or set of characters in a static message.

The sign controller shall monitor the photo cell circuits in the sign and convert the measured light intensity into the desired pixel brightness.

A transceiver is required for each VMS controller to communicate with the nearest CDOT node complex. The Contractor is required to provide and install a transceiver in each VMS as well as each node complex sending or receiving communications from that VMS. Termination panels along with jumpers will be required in each VMS. Terminal panels exist in each node complex; the Contractor will only provide and install the transceiver and jumpers.

If the VMS's communication is via a telephone service, each VMS shall contain the appropriate modem for interface with the controller.

MANUFACTURER QUALIFICATIONS

The manufacturer shall supply experience documentation showing that the manufacturer has been in business, under the current corporate name, designing and manufacturing Interstate LED Variable Message Signs for a minimum of 5 years; and that the manufacturer has in operation a minimum of 100 walk-in LED VMSs. These 100 VMS shall be from 5 separate projects and operational for a minimum of 5 years.

CONSTRUCTION REQUIREMENTS

Contractor shall be fully responsible for the delivery of the sign to the installation site and any damages that occur in the installation or delivery process.

The LED VMS shall be installed in accordance with manufacturer's recommendations. A qualified factory representative shall be available on site to ensure proper installation and testing.

The Contractor shall perform a VMS acceptance test procedure for approval and acceptance by the Department in the presence of the Engineer, a representative of the CDOT Colorado Transportation Management Center, and the manufacturer's representative. The test shall include all items addressed in these specifications and any other requirements from the project plans or Engineer. The test shall also include the use of the latest version of the NTCIP Exerciser, or equivalent, to demonstrate that no proprietary protocols have been used and that the local and central software are NTCIP compliant. The Contractor shall notify the Engineer at least two weeks prior to the test date.

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**REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)**

A minimum of five copies of the operations manual detailing the electrical schematics, operation and maintenance of the VMS system, including spare software copies, shall be provided. Additional copies may be requested by the Engineer. One copy of the manual shall remain inside the sign housing or control cabinet. One copy shall be mailed to the Colorado Transportation Management Center at 425 C Corporate Circle, Golden, Colorado 80401.

WARRANTY

- a) *Standard Warranty.* The Contractor shall ensure that the manufacturer can warranty the product for a minimum of 3 years for all parts returned to the factory, and full telephone technical support at no additional charge to the Department. The technical support shall include access to a trained service representative who can respond within 24 hours to questions related to all VMS related equipment problems and maintenance issues.

METHOD OF MEASUREMENT

The LED VMS will be measured by the actual number that are installed and accepted, and shall include all labor, materials, and equipment necessary to complete the work, including the sign controller, controller interface box, sign housing, electronics, communications equipment, brackets, Z-bars, hardware, delivery to the installation site and standard warranty.

All equipment, materials, and personnel for fiber optic termination panels, jumpers, connectors, modems, transceivers, etc. needed for the VMS to send and receive communications via fiber optic cable shall be included in the unit price of the VMS. Contractor shall submit material COC for all equipment installed for or on the fiber optic network.

All equipment, materials, and personnel for telephone line wiring, panels, jumpers, connectors, modems, etc. needed for the VMS to send and receive communications via telephone service shall be included in the unit price of the VMS.

The redundant communication method via field telemetry will be measured and paid using the field telemetry and wiring pay items.

BASIS OF PAYMENT

Payment will be made in accordance with the following: 100% payment shall be made upon completion of the installation, provision of all certifications, and completion of the testing and full operation.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Variable Message Sign (LED) (Overhead)	Each

All costs associated with having a manufacturer's representative on-site, training and the purchasing of manuals, and the delivery of the sign to the installation site will not be measured and paid for separately, but shall be included in the work.

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**REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)**

Electrical and telephone demark service connections from the power and telephone sources to the appropriate terminations with the LED VMS will be paid for by Force Account or the Wiring pay items.

Appendix A

NTCIP Requirements

This portion of the specification defines the detailed NTCIP requirements for the Dynamic Message Signs covered by the project specifications.

This specification references several standards through their NTCIP designated names. The following list provides the full reference to the current version of each of these standards. In many cases, the standard is more widely known by its original NEMA assigned number, in these cases, the NEMA number is also identified. The content of the NEMA standard is identical to that of the NTCIP standard.

Each NTCIP Component covered by these project specifications shall implement the most recent version of the standard that is at the stage of Recommended or higher as of Sunday, April 03, 2001, including any and all Approved or Recommended Amendments to these standards as of the same date. It is the ultimate responsibility of the vendor to monitor NTCIP activities to discover any more recent documents.

General Requirements:

Each NTCIP Component shall support NTCIP 2103 v01.05 over both a null-modem connection and a Contractor-provided external dial-up modem connection. The dial-up modem shall support data rates of 14.4 kbps, 9600 bps, 4800 bps, 2400 bps, 1200 bps, 600 bps, and 300 bps. The null-modem shall support the same speeds with a maximum of 19.2 kbps. Additionally, the NTCIP Component shall be able to make outgoing and receive incoming calls as necessary and support the following modem command sets:

- Hayes AT Command Set
- MNP5
- MNP10
- V.42bis

NTCIP Components may support additional Subnet Profiles at the vendor's option. At any one time, only one Subnet Profiles shall be active on a given serial port of the NTCIP Component. If the NTCIP Component has a serial port that supports multiple Subnet Profiles, the NTCIP Component shall be configurable to allow the field technician to activate the desired Subnet Profile and shall provide a visual indication of the currently selected Subnet Profile.

Each NTCIP Component shall comply with NTCIP 2202, (NEMA TS 3.Internet). NTCIP Components may support additional Transport Profiles at the manufacturer's option. Response datagrams shall use the same Transport Profile used in the request. Each NTCIP Component shall support the receipt of datagrams conforming to any of the identified Transport Profiles at any time.

Each DMS shall comply with NTCIP 2301, (NEMA TS 3.AP-STMF), as a Managed Agent and shall meet the requirements for Conformance Level 1 (NOTE – See Amendment to standard). SNMP shall be required and STMP shall not be required. An NTCIP Component may support additional Application Profiles at the manufacturer's option. Responses shall use the same Application Profile used by the request. Each NTCIP Component shall support the receipt of Application data packets at any time allowed by the subject standards.

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**REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)**

Each NTCIP Component shall provide Full, Standardized Object Range Support of all objects required by these procurement specifications, unless otherwise indicated below or approved by the Project Engineer. The maximum Response Time for any object or group of objects shall be 200 milliseconds.

The vendor's software shall implement all mandatory objects of the mandatory conformance group defined in NTCIP 1201, (NEMA TS 3.4) Global Object Definitions:

- Configuration Conformance Group – Section 3.1
- Security Conformance Group (new in Amendment 1)

The vendor's software shall implement the mandatory objects of the optional conformance groups defined in NTCIP 1201, (NEMA TS 3.4), Global Object Definitions:

- Time Management Conformance Group – Section 3.3
- Time Base Event Schedule Conformance Group – Section 3.4
- Report Conformance Group – Section 3.5

The vendor's software shall implement all mandatory objects of all mandatory conformance groups defined in NTCIP 1203, (NEMA TS 3.6) Object Definitions for Dynamic Message Signs:

- Sign Configuration Conformance Group – Section 4.1
- Message Table Conformance Group – Section 4.6
- Sign Control Conformance Group – Section 4.7

The vendor's software shall implement all mandatory objects of the optional conformance groups defined in NTCIP 1203, (NEMA TS 3.6), Object Definitions for Dynamic Message Signs:

- GUI Appearance – Section 4.2
- Font Definition – Section 4.3
- DMS Sign Configuration – Section 4.4
- MULTI Configuration – Section 4.5
- Default Message – Section 4.8
- MULTI Error – Section 4.10
- Illumination/Brightness – Section 4.11
- Scheduling – Section 4.12
- Auxiliary I/O – Section 4.13
- Sign Status – Section 4.14
- Status Error – Section 4.15
- Pixel Error Status – Section 4.16
- Fan Error Status – Section 4.18
- Temperature Status – Section 4.17

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**REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)**

The vendor's software shall implement the following optional objects defined in NTCIP 1203, (NEMA TS 3.6):

- dmsMessageBeacon – Section 2.6.1.1.1.8.6
- dmsSWReset – Section 2.7.1.1.1.1
- dmsMessageTimeRemaining – Section 2.7.1.1.1.4
- dmsShortPowerRecoveryMessage – Section 2.7.1.1.1.8
- dmsLongPowerRecoveryMessage – Section 2.7.1.1.1.9
- dmsShortPowerLossTime – Section 2.7.1.1.1.10
- dmsResetMessage – Section 2.7.1.1.1.11
- dmsCommunicationsLossMessage – Section 2.7.1.1.1.12
- dmsTimeCommLoss – Section 2.7.1.1.1.13
- dmsPowerLossMessage – Section 2.7.1.1.1.14
- dmsEndDurationMessage – Section 2.7.1.1.1.15
- dmsMultiOtherErrorDescription – Section 2.7.1.1.1.20
- dmsStatDoorOpen – Section 2.11.1.1.1.6
- fanFailures – Section 2.11.2.1.1.8
- fanTestActivation – Section 2.11.2.1.1.9
- tempMinCtrlCabinet – Section 2.11.4.1.1.1
- tempMaxCtrlCabinet – Section 2.11.4.1.1.2
- tempMinAmbient – Section 2.11.4.1.1.3
- tempMaxAmbient – Section 2.11.4.1.1.4
- tempMinSignHousing – Section 2.11.4.1.1.5
- tempMaxSignHousing – Section 2.11.4.1.1.6

The vendor's software shall implement the following tags (opening and closing where defined) of MULTI as defined in NTCIP 1203, (NEMA TS 3.6), Object Definitions for Dynamic Message Signs:

<u>MULTI Tag</u>	
1	Field
2	Flash
3	Font
4	Hexadecimal Character
5	Justification Line
6	Justification Page
7	Moving Text
8	New Line
9	New Page
10	Page Time
11	Spacing – Character

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REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)

The Field Tag shall support the following field ID's:

Field Tag ID **Description**

- 1 Time, 12-hour format (no AM/PM indicator)
- 2 Time, 24-hour format
- 3 Temperature in degrees Celsius
- 4 Temperature in degrees Fahrenheit
- 7 Day of week
- 8 Day of month
- 9 Month of year
- 10 Year, 2-digits
- 11 Year, 4-digits

All objects required by these procurement specifications shall support all values within its standardized range, unless otherwise approved by the Project Engineer. The standardized range is defined by a size, range, or enumerated listing indicated in the object's SYNTAX field and/or through descriptive text in the object's DESCRIPTION field of the relevant standard. The following provides the current listing of known variances for this project:

NTCIP 1201 (TS 3.4)

ModuleTableEntry	2.2.3	Shall contain at least one row with module Type equal to 3 (software). The module Make shall specify the name of the manufacturer, the module Model shall specify the manufacturer's name of the component and the model Version shall indicate the model version number of the component.
communityNamesMax	2.8.2	Shall be at least 4.
maxTimeBaseScheduleEntries	2.4.3.1	7
maxDayPlans	2.4.4.1	7
maxDayPlanEvents	2.4.4.2	7
maxEventLogConfigs	2.5.1	50
eventConfigMode	2.5.2.3	2,3,and 4
maxEventLogSize	2.5.3	200
maxEventClasses	2.5.5	7
maxGroupAddress	2.7.1	1

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REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)

NTCIP 1203 (TS 3.6)

dmsNumPermanentMsg	2.6.1.1.1.1	50
dmsMaxChangeableMsg	2.6.1.1.1.3	50
dmsFreeChangeableMemory	2.6.1.1.1.4	50KB
dmsMaxVolatileMsg	2.6.1.1.1.6	50
dmsFreeVolatileMemory	2.6.1.1.1.7	50KB
dmsMsgMultiString	2.6.1.1.1.8.3	See attached table
dmsControlMode	2.7.1.1.1.1	2,4,5
numFonts	2.4.1.1.1.1	4
maxFontCharacters	2.4.1.1.1.3	127
vmsCharacterHeightPixels	2.3.1.1.1.1	5
vmsCharacterWidthPixels	2.3.1.1.1.2	7
vmsSignHeightPixels	2.3.1.1.1.3	3
vmsSignWidthPixels	2.3.1.1.1.4	10
vmsHorizontalPitch	2.3.1.1.1.5	70mm
vmsVerticalPitch	2.3.1.1.1.6	70mm
defaultBackgroundColor	2.5.1.1.1.1	0 (black)
defaultForegroundColor	2.5.1.1.1.2	9 (amber)
defaultJustificationLine	2.5.1.1.1.6	2,3,4
defaultJustificationPage	2.5.1.1.1.7	2,3,4
defaultFlashOn	2.5.1.1.1.3	0.5 to 5.0
defaultFlashOff	2.5.1.1.1.4	0.5 to 5.0
defaultPageOnTime	2.5.1.1.1.8	0.5 to 5.0
defaultPageOffTime	2.5.1.1.1.9	0.5 to 5.0
defaultCharacterSet	2.5.1.1.1.10	eightBit (2)
numActionTableEntries	2.9.1.1.1.1	15

Documentation

Software shall be supplied with full documentation, including 3.5" floppy disk(s) and a CD-Rom containing ASCII versions of the following Management Information Base (MIB) files in Abstract Syntax Notation 1 (ASN.1) format:

- The relevant version of each official standard MIB Module referenced by the device functionality.
- If the device does not support the full range of any given object within a Standard MIB Module, a vendor specific version of the official Standard MIB Module with the supported range indicated in ASN.1 format in the SYNTAX and/or DESCRIPTION fields of the associated
- OBJECT TYPE macro. The filename of this file shall be identical to the standard MIB Module, except that it will have the extension ".man".
- A MIB Module in ASN.1 format containing any and all manufacturer-specific objects supported by the device with accurate and meaningful DESCRIPTION fields and supported ranges indicated in the SYNTAX field of the OBJECT-TYPE macros.
- A MIB containing any other objects supported by the device.

The vendor shall allow the use of any and all of this documentation by any party authorized by CDOT for systems integration purposes at any time initially or in the future, regardless of what parties are involved in the systems integration effort.

**REVISION OF SECTION 614
INTERSECTION DETECTION SYSTEM (CAMERA RESET)**

Section 614 of the Standard Specifications is hereby revised for this project as follows:

Subsection 614.01 shall include the following:

The Contractor shall carefully remove the existing cameras from the existing master arms and reset them to the new signal master arms. Wiring from individual cameras to the controller cabinet VDP shall be included in the cost of Wiring. The VDP shall be provided by CDOT in the Controller Cabinet.

Subsection 614.08 shall include the following:

The camera shall be powered by 120 VAC 60 Hz. Power consumption shall be less than 40 watts under all conditions.

Recommended camera placement shall be 33 feet (or 10 meters) above the roadway, and over the traveled way on which vehicles are to be detected. The camera shall view approaching vehicles at a distance not to exceed 350 feet for reliable detection.

The camera enclosure shall be equipped with separate, weather-tight connections for power and video cables at the rear of the enclosure to allow diagnostic testing and viewing of video at the camera while the camera is installed on a mast arm or pole. Video and power shall not be connected with the same connector.

The video signal output by the camera shall be in RS170 format.

The video signal shall be fully isolated from the camera enclosure and power cabling.

Subsection 614.10 shall include the following:

INSTALLATION

Coaxial cable for transmission of video signals shall be Belden #8281 or equivalent. This cable shall be suitable for installation in conduit or overhead with appropriate span wire.

BNC plug connectors should be used at both the Camera and Cabinet ends. The coaxial cable, BNC connector and crimping tool shall be approved by the supplier of the video detection system and the manufacturer's instructions must be followed to ensure proper connection.

The power cabling shall be 16 AWG minimum three conductor cable. The cabling shall comply with the National Electric Code, as well as local electrical codes.

The video detection system shall be installed as recommended by the supplier and as documented in installation materials provided by the supplier.

Subsection 614.13 shall include the following:

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**REVISION OF SECTION 614
INTERSECTION DETECTION SYSTEM (CAMERA RESET)**

Intersection Detection System (Camera reset) shall be measured as each assembly which includes the cable, connections, mounting hardware, extension pole, and all other material necessary and the installation of these components on the proposed signal poles and cabinet. Cameras shall be mounted on a 10 foot extension pole approved which can be reset from the existing master arms. Intersection Detection System (Camera Reset) will be paid for at the unit contract price for each camera installed.

Subsection 614.14 shall include the following:

<u>Pay Item</u>	<u>Pay Unit</u>
Intersection Detection System (Camera Reset)	Each

**REVISION OF SECTION 614
TRAFFIC SIGNAL CONTROLLER - OPERATIONS**

Section 614 of the Standard Specifications is hereby revised for this project as follows:

Subsection 614.10 (i) shall include the following:

The Contractor shall be responsible for the 24 hour a day operation and maintenance of a traffic signal system from the time the Contractor changes any wire or cable connection, moves, adds, or removes a signal head, makes any connection modifications/changes to the controller cabinet, changes lane configuration that requires vehicle detection modification, or fiber optic equipment installation, testing, or splicing in the cabinet, any other work that might alter the operation of the signal until the Contractor has obtained final acceptance for that signal from the Department. The successful completion of the Turn On functional test does not constitute Department's final acceptance of the signal. If existing signal equipment fails or breaks and the Engineer determines the failure or break is not the fault of the Contractor, then the Department shall supply the replacement equipment to the Contractor. If the engineer determines that the fault is the Contractor's, the repair or replacement of the equipment shall be at the Contractor's expense.

The Contractor shall supply the name, office phone, cell phone, and home phone numbers of their primary and secondary emergency responsible people that will respond to signal operational problems when signal is under the Contractors responsibility. These emergency contacts shall respond to signal operational problems within one-half hour of notification from CDOT or law enforcement personnel. The work described above will not be measured and paid for separately but shall be included in the unit cost of the work.

In Subsection 614.10 (j), delete 4 and replace with the following:

4. A functional test shall be made in which it is demonstrated that each and every part of the system functions as specified or intended herein. The functional test for each traffic signal system shall consist of not less than 15 days of continuous satisfactory operation. If unsatisfactory performance of the system develops, the condition shall be corrected and the test shall be repeated until the 15 days of continuous, satisfactory operation is obtained.

Subsection 614.11 shall include the following:

The process for final acceptance of the signal shall be as follows:

- 1) Complete work as described in the plans and any work described in any change orders or any work directed by the Engineer.
- 2) Contact the Engineer to request a preliminary walk through by CDOT Operations personnel. Allow at least 1 week from the request to the day of the actual walk through.
- 3) Complete preliminary punch list items generated through the preliminary walk through.
- 4) Turn on signal and operate in flash for a minimum of 5 days if intersection has never operated under signal control.
- 5) Contact the Engineer to request a final walk through by CDOT Operations personnel. Allow at least 1 week from the request to the day of the actual walk through.
- 6) Complete final punch list items generated through the final walk through meeting.
- 7) Turn on signal and operate with existing plan or CDOT provided plan for a minimum of 15 days.
- 8) Complete all other work required in the construction documents.
- 9) Request Engineer to issue final acceptance of project. The department will not issue a final acceptance of a signal separate from final acceptance of the project.

**REVISION OF SECTION 614
FIBER OPTIC CABLE (SINGLE MODE)**

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

Subsection 614.02 shall include the following:

This work consists of furnishing and installing single mode fiber optic cable.

Fiber optic cable shall be used for either main backbone cable or lateral cables that connect to equipment field cabinets. The main backbone cable shall be terminated in a Communications Node or Regeneration Building. Lateral fiber cables shall be terminated using fan-out kits in a termination patch panel in the field equipment cabinet.

All fiber optic cables shall be suitable for outdoor conduit installation.

Subsection 614.02 shall include the following:

Fiber Optic. All fiber optic cable shall have compatible chromaticistics with proposed and existing cables.

All optical cables furnished on this project shall meet the following fiber optic industry standards:

1. Electronic Industries Alliance (EIA) Telecommunications Industry Association (TIA)
2. International Organization for Standardization (ISO)
3. International Electronics Commission (IEC)
4. Telecommunication industry Association (TIA)
5. International Telecommunications Union (ITU)
6. Insulated Cable Engineers Association (ICEA)

All cables shall be new and unused armored outdoor cable consisting of dispersion-unshifted, low water peak single-mode fiber strands free of surface imperfections and inclusions. Each single mode fiber shall consist of a doped silica core surrounded by a concentric silica cladding. The fiber shall be of matched clad design.

Fiber Strands shall meet the following requirements:

1. Typical core diameter of $8.2 \mu\text{m} \pm 0.2 \mu\text{m}$
2. Cladding Diameter of $125.0\mu\text{m} \pm 0.7 \mu\text{m}$.
3. Core-to-Cladding Offset: $\leq 0.5 \mu\text{m}$
4. Cladding Non-Circularity: $\leq 0.7 \%$
5. Coating Diameter (Colored): $245 \pm 5 \mu\text{m}$.
6. Maximum Attenuation (Loose Tube): 0.35 dB//km at 1310 nm wavelength and 0.22 dB/km at 1550 nm wavelength
7. Mode-Field Diameter: $9.20 \pm 0.30 \mu\text{m}$ at 1310 nm wavelength and $10.40 \pm 0.50 \mu\text{m}$ at 1550 nm wavelength
8. Attenuation Uniformity: No point discontinuity greater than 0.10 dB at either 1310 nm or 1550 nm
9. Attenuation at the Water Peak: 0.32 to 0.34 dB/km at $1383 \pm 3 \text{ nm}$ wavelength
10. Cutoff Wavelength: $\leq 1260 \text{ nm}$.

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**REVISION OF SECTION 614
FIBER OPTIC CABLE (SINGLE MODE)**

11. Zero Dispersion Wavelength: 1300nm to 1322 nm
12. Zero Dispersion Slope: $0.090 \text{ ps} / (\text{nm}^2 \bullet \text{km})$
13. Polarization Mode Dispersion: $0.06 \text{ ps} / \sqrt{\text{km}}$
14. Maximum Fiber Dispersion: $3.2 \text{ ps}/(\text{nm} \bullet \text{km})$ for 1285 nm through 1330 nm and shall be $\leq 18 \text{ ps}/(\text{nm} \bullet \text{km})$ at 1550 nm.
15. Fiber Curl: $\geq 4.0 \text{ m}$
16. All optical fibers shall be proof tested by the manufacturer to a minimum load of $0.7 \text{ GN}/\text{m}^2$ (100 ksi).
17. The coating shall be a dual layered, UV cured acrylate applied by the fiber manufacturer. The coating shall be capable of being mechanically stripped with a force of 0.3 – 2.0 lbf (1.3 – 8.0 N).
18. The fibers shall not adhere to the inside of the buffer tube.
19. Each single mode fiber strand shall be color coded with distinct and recognizable colors in accordance with the most recent version of EIA/TIA-598, Optical Fiber Cable Color, as shown in the plans.

Buffer Tubes shall meet the following requirements:

1. Each buffer tube shall contain 12 fibers as appropriate for the respective size cable.
2. Optical fibers shall be placed inside a loose buffer tube. The nominal outer diameter of the buffer tube shall be 3.0 mm
3. Each buffer tube shall be color coded with distinct and recognizable colors in accordance with the most recent version of EIA/TIA-598, Optical Fiber Cable Color, as shown in the plans. Coding shall be colored with ultraviolet (UV) curable inks.
4. In buffer tubes containing multiple fibers, the coloring shall be stable during temperature cycling as stated under Fiber Cable requirements and shall not be subjected to fading or smearing onto each other or into the buffer tube gel filling material. Colorings shall not cause fibers to stick together.
5. Buffer tubes shall be of a dual-layer construction with the inner layer made of polycarbonate and the outer layer made of polyester.
6. Each buffer tube shall be filled with a non-hygroscopic, non-nutritive to fungus, electrically non-conductive, homogenous gel. The gel shall be free from dirt and foreign matter. The gel shall be readily removable with conventional nontoxic solvents.
7. Each buffer tube shall contain water blocking moisture absorbent-wicking yarn or cloth that satisfies ANSI/ICEA requirements.
8. Buffer tubes shall be stranded around a central member of the cable using a reverse oscillation stranding process.

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**REVISION OF SECTION 614
FIBER OPTIC CABLE (SINGLE MODE)**

9. The buffer tubes shall be resistant to external forces and shall meet the buffer tube cold bend and shrink requirements of EIA/TIA standards.

Fiber Cable shall meet the following requirements:

1. Fillers may be included in the cable core to lend symmetry to the cable cross-section where needed.
2. The central anti-buckling member of the cable shall consist of a glass reinforced plastic rod. The purpose of the central member shall be to prevent buckling.
3. For single layer cables, a water blocking tape shall be applied longitudinally around the outside of the strand tubes/fillers. The tape shall be held in place by a single polyester binder yarn. The water blocking tape shall be non-nutritive to fungus, electrically non-conductive homogenous. It shall also be free from dirt and foreign matter. Gel filled water-blocking compound shall not be allowed in the cable core interstices in either the backbone cable or the lateral cables.
4. Binders shall be applied with sufficient tension to secure the buffer tubes to the central member without crushing the buffer tubes. The binders shall be non-hygroscopic, non-wicking (or rendered so by the flooding compound), and dielectric with low shrinkage.
5. The cable shall contain at least one ripcord under the sheath for easy sheath removal.
6. Tensile strength shall be provided by high tensile strength dielectric yarns and shall be helically stranded evenly around the cable core.
7. Outer cable jacket shall have a consistent thickness throughout the entire cable length and shall be sheathed with medium density polyethylene, (MDPE). The minimum nominal jacket thickness shall be 1.4 mm. Jacketing material shall be applied directly over the tensile strength members and water blocking tape. The MDPE shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus.
8. The cable jacket shall be free of holes, splits, blisters, and metal elements.
9. Cable jackets shall be marked with sequential foot markings, year of manufacture and a telecommunication handset symbol, as required by Section 350G of the National Electrical Safety Code (NESC). The actual length of the cable shall be within 0 to 1% of the length markings. The marking shall be in contrasting color to the cable jacket. The height of the marking shall be easily readable.
10. Cable armor shall be a co-polymer coated corrugated steel tape layer inside the MDPE jacket.
11. Shipping, storage and operating temperature range of the cable as defined by Bellcore GR-12 shall be -40°C to +75°C (-40°F to +167°F)
12. Operating temperature range of the cable as defined by Bellcore GR-12 shall be -40°C to +70°C (-40°F to 158°F)
13. Installation temperature range of the cable as defined by Bellcore GR-12 shall be -30°C to +60°C (-22°F to +140°F)

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**REVISION OF SECTION 614
FIBER OPTIC CABLE (SINGLE MODE)**

Quality Assurance shall include the following requirements:

1. All optical fibers shall be 100% attenuation tested. The attenuation of each fiber shall be provided with each cable reel.
2. The cable manufacturer shall be ISO 9001 registered.
3. Manufacture specifications indicating compliance with this special provision shall be included as part of the Certificate of Compliance.

When furnishing to the department, packaging shall meet the following requirements:

1. The complete cable shall be packaged for shipment on non-returnable wooden reels.
2. Top and bottom ends of the cable shall be available for testing.
3. Both ends of the cable shall be sealed to prevent the ingress of moisture.
4. Each reel shall have a weatherproof reel tag attached identifying the reel and cable.
5. Each cable shall be accompanied by a cable data sheet that contains significant information on the cable.

Add Subsection 614.091 immediately following subsection 614.09 as follows:

The Contractor shall provide the Engineer with two copies of the cable manufacturer's installation instructions for all fiber optic cable. All installations shall be in accordance with the manufacturer's recommendations except as otherwise directed by the Engineer. All additional costs including fiber optic cable associated to damages caused by the Contractor's neglect of recommended procedures shall be the Contractor's responsibility.

The Contractor shall submit a Method Statement to the Engineer indicating cable routing, splice points and cable end splicing locations. Installation of the cable will not be permitted until the schematic diagram has been approved by the Engineer.

Installation of proposed fiber optic cable in existing conduits shall require the Contractor to locate, clean, and verify continuity as necessary of existing conduits and pull boxes as a suitable conduit system prior to fiber optic cable installation.

Fiber optic cable including both backbone cables and lateral cables shall be installed in continuous runs. Under no conditions shall fiber optic cable be cut or spliced at intermediate points without express written direction from the Engineer.

Blowing cable is an acceptable alternative to pulling cable. If the Contractor chooses to use this method, submittals for cable installation shall be submitted along with complete information on fiber installation equipment.

The maximum pulling tension shall be 2700 N (600 lbs) during installation (short term) and 890 N (200 lbs) long term installed.

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**REVISION OF SECTION 614
FIBER OPTIC CABLE (SINGLE MODE)**

All cables shall have a minimum bending radius based on the diameter of the cable and shall meet the following;

- (1) Pulled under tension, (Short Term) – 20 (Twenty times the cable diameter)
- (2) Pulled not under tension, (Long Term) – 10 (Ten times the cable diameter)

The fiber optic cable shall be installed in the conduit with a split-mesh cable grip to provide a firm hold on the exterior covering of the cable.

The manufacturer's recommended limits for cable pull lengths shall not be exceeded. The Contractor shall use a pulley system with a numerical readout indicating the cable tension. The pulley system shall be capable of alerting the installer when the cable pulling tension approaches the manufacturer's maximum allowable tension. The Contractor may supplement this procedure with a breakaway tension limiter set below the lowest recommended tensile limit of the cables being pulled. Intermediate pulleys shall be used at all pull boxes or manholes along the installation run to prevent cable damage.

If cable installation limits are met and the entire length cannot be installed completely from the shipping reel, installation shall be continued from the mid-point of the run. The Contractor shall first pull one-half of the cable from the reel at the mid-point through the conduit to one end of the run. The other half of the cable shall be removed from the reel and carefully placed on the ground in a figure eight pattern with a minimum loop diameter of 10 feet. While installing the remaining cable, care shall be taken to avoid any dragging against the ground resulting in damage or excess bending of the cable. The Contractor shall not kink, twist or bend the cable during installation coiling or uncoiling.

The cable shall be continuously lubricated as it enters the conduit. The Contractor shall only use pulling lubricants recommended by the cable manufacturer. Liquid detergent shall not be used.

If the Contractor must install new cable in conduits which contain existing fiber or electrical wiring, the Contractor shall be responsible for any damage to the existing cables or wires. After this installation the Contractor shall perform a functional test of all the equipment connected by the existing fiber cables or electrical wiring to ensure proper working conditions.

If an existing fiber optic cable is damaged during construction, it shall be removed from both points of termination and replaced, at no cost to the project. In no case shall the fill of any new conduit exceed the requirements of the National Electrical Code. The Contractor shall provide documentation to the Engineer supporting the conduit fill. All costs associated with equipment testing and repairs shall be included in the cost of the Fiber Optic Cable.

Lateral cables shall be installed in continuous runs from the backbone splice location to the field equipment cabinet. Odd length cables and reel ends are acceptable for lateral cables provided they are pre-tested and free of defects and are of sufficient lengths to archive continuous runs.

Lateral cables shall have slack and include a maximum of three locations of appropriate strain relief within all field equipment cabinets.

All fiber optic cables shall include identification labels attached to the cable in each pull box, manhole or field equipment cabinet. The label shall be provided with information as shown on the Project Detail Sheet.

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**REVISION OF SECTION 614
FIBER OPTIC CABLE (SINGLE MODE)**

The Contractor shall splice fiber cables at locations shown on the plans. All splices shall be enclosed within a splice closure as approved by the Engineer. All unused buffer tubes shall remain uncut and neatly coiled along with the buffer tubes used for splicing in appropriate location in the splice closure. Following successful splicing, the splice closure shall be placed inside the pull box or manhole. The Contractor shall use tools and hardware recommended by the cable manufacturer.

Backbone and lateral buffer tubes and fiber strands shall be labeled on the splice tray prior to sealing of the closure as shown on the Project Detail Sheet.

The Contractor shall coil 100 feet of backbone cable in the manholes or as shown in the plans. The Contractor shall coil at least 50 feet of backbone cable in pull boxes or as shown in the plans

The Contractor shall coil 50 feet of lateral cable in the manholes or as shown in the plans. The Contractor shall coil 25 feet of Lateral cable in pull boxes and signal cabinets or as shown in the plans.

The Contractor shall ensure that all cable coils and splice canisters are attached to the cable management hardware in all pull boxes and manholes.

The Contractor shall terminate the lateral cable at the field equipment cabinet using a buffer tube fan-out kit. Fanned-out fiber strands shall be terminated in a termination block with ST connectors.

The Contractor shall submit a final documentation package. The final documentation package shall include the cable manufacturer's installation procedures, technical support documentation and material documentation. These documents shall match the original submittals provided to the Engineer.

Subsection 614.13 shall include the following:

Fiber Optic Cable shall be measured by the Linear Foot for both backbone and lateral cable and shall include all labor and materials required to install the cable to make a complete and operational system and shall include the following items unless otherwise provided for in the contract:

- (1) All required splicing, splice closures, splice kits, hardware, splicing tools and labor to accomplish the splices.
- (2) All required termination panels in the VMS's and the nodes.
- (3) All required fan-out kits, hardware and labor to accomplish fan-out.
- (4) All required termination connectors, adapters, jumpers, pigtails, hardware and labor required to accomplish lateral cable terminations.
- (5) Identification labels for both backbone and lateral fiber cables in each pull box, manhole and field equipment cabinet.
- (6) All required As Built Documentation

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**REVISION OF SECTION 614
FIBER OPTIC CABLE (SINGLE MODE)**

Subsection 614.14 shall include the following:

Fiber Optic Cable will be made as follows: 50 percent upon completion of cable installation, and the remaining 50 percent upon the review and acceptance of all fiber test results showing conformance to this specification and the 614 Test Fiber Optic Cable Specification included in this contract.

Payment will be made under:

(1) Pay Item	Pay Unit
Fiber Optic Cable (Special)	Linear Foot
Fiber Optic Cable (Single-Mode) (___ Strands)	Linear Foot

Testing Fiber Optic Cable will be measured and paid for separately. See 614 Test Fiber Optic Cable specification included in this plan package

**REVISION OF SECTION 620
FIELD FACILITIES**

Section 620 of the Standard Specifications is hereby revised for this project as follows:

Delete subsection 620.02 replace with the following:

620.02 Field Offices. Field offices, either Class 1 or Class 2 as designated on the plans, shall substantially conform to the details shown on the plans, and to the requirements of this section.

The minimum height for a field office shall be 7 feet if the facility is certified as having been manufactured prior to November 1, 1992.

The field office shall be equipped with a facsimile machine, copy machine, and telephone service and conform to the following:

(1) Electrical Grounding.

Proper grounding is important to protect occupants using computer equipment and phones in the event of electrical storms and also for the protection of the equipment itself.

If the site will have two field trailers, where one Trailer will serve as the office and the other will serve as the lab, the two trailers will set together and share a common electrical ground so computer cabling can installed without spanning driveways.

(2) Telephones/answering machine & Cabling.

Telephone lines shall be of type full business (1FB).

The number of lines shall be 4.

Of these lines:

One line will be dedicated for the facsimile machine and is to be located in the office trailer. If DSL is available, this line will also carry the single High Speed DSL line (see High Speed Internet section for more information). When ordering the DSL, specify that it is to be located on the fax 1FB.

One line will serve the office phone and will be located in the office trailer.

If a Lab trailer exists, one line will serve the Lab phone and shall be located in the lab.

Order phone lines through the Telco provider's (CenturyTel, etc.) business office to optimize cost efficiencies with regard to basic, local and long distance plans and charges.

All phones will be speakerphones.

At the discretion of the CDOT project Manager and dependent on the number of phone circuits installed, the

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**REVISION OF SECTION 620
FIELD FACILITIES**

type of phones may be of the multi-line type to fully utilize the phone service.

Cabling of phones must be industry standard.

Labeling must be completed on all wall jacks, ports, and phones with the actual phone numbers. This cabling is to be performed by the Telco or other certified technicians, past the demark to the wall jacks. The phone wall jacks will be located by the Project Manager.

The Contractor shall be responsible for maintaining all phones and circuits in good operating condition at all times during this project.

(1) High Speed Internet.

Note: The Contractor shall contact CDOT Regional Network Analyst (Mike Vencius 719-546-5737) for most recent specifications of required network equipment (see Network Equipment section below) and of high-speed provider restrictions and limitations.

The Contractor shall provide the field location with high-speed internet connection and equipment. Important note: High Speed Internet access can be difficult to achieve in rural areas. It is strongly recommended that site selection for the trailer be made with consideration of the availability of High Speed Internet access. If none is available, the CDOT project manager will be notified immediately in case site relocation is necessary.

The type of High Speed Connection shall preferably be of DSL type. The throughput shall be a minimum of 1.5 Mbps download /896 Kbps upload or better speed. IP addressing shall be DHCP.

If DSL is not available, Cable or wDSL (Wireless DSL) may suffice if above specified throughput speeds are achieved.

A UPS (battery Backup) of a minimum rating of 500va (volt amp) needs to be provided to protect the DSL router.

As a last resort Aircards for each computer perhaps augmented with a cellular signal booster equipment may suffice.

Note that satellite type broadband will NOT work for CDOT purposes.

(2) Network Equipment.

If there are multiple trailers or buildings on site the Contractor will need to provide the cabling and surge suppression equipment necessary.

The Contractor MAY also need to provide additional equipment needed for CDOT network security. Note that this equipment is in addition to the DSL modem provided by the internet provider.

If CDOT computers will reside in more than one trailer, as with a MAT lab, then fiber and transceivers or cat

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**REVISION OF SECTION 620
FIELD FACILITIES**

Se cooper cabling with surge suppressors will need to be purchased and installed as per CDOT IT.

Contact the CDOT Regional Network Analyst for current specifications for this network equipment. Procuring this equipment may take time, so haste in contacting the CDOT Regional Network Analyst is recommended. It is not unusual for this equipment to take over a month to procure due to back orders.

Contact CDOT Regional Network Analyst (Mike Vencius 719-546-5737).

Note: If Cisco network equipment is deemed required by CDOT IT then the current cost of this specialized equipment is approximately \$800.00 to \$1300.00 depending on site requirements. If Cisco equipment is not needed the cost will be determined on whether additional buildings are needed to be connected. The cost here may range from \$100 to \$500. If No Cisco equipment is needed and no additional buildings need to be connected and if the Wifi is available, there may be no additional cost for Network Equipment.

Important Cyber Security issue: At project conclusion, all network equipment will be returned to CDOT Regional Network Analyst for removal of CDOT confidential data and network configuration.

(3) Facsimile Machine:

The Project Engineer must approve this machine. The facsimile machine shall print on plain paper and shall be capable of sending documents of all sizes up to and including 11"x17". It must be able to perform sequential broadcast, polling and delayed transmissions with a minimum ten-page memory. The Contractor shall install and maintain the fax machine in the Engineer's field office. Should the fax machine require repair and be out of service for more than twenty-four hours, a replacement is to be provided and installed by Contractor within twenty-four hours. The Contractor shall provide a roll around stand for the fax machine paper and supplies.

Contractor will provide and maintain stock of printer paper and toner.

- (4) Copy Machine. The Contractor shall provide a self-feeding plain paper photo copying machine, which is capable of making at least eight copies per minute. Copier shall also be capable of reproducing copies at standard sizes up to and including 11"x17". The copier shall be capable of reducing 11"x17" plan sheets to 8½"x14" legal size and to 8½"x11" letter size. The Contractor shall maintain all furnished equipment in good working condition and shall provide replacement equipment due to breakage, damage, or theft within five working days. The Contractor shall provide a roll around stand for the copy machine, paper and supplies.
- (5) Computer Printer. The Contractor shall provide and maintain one wide format color printer/scanner capable of printing and scanning documents up to and including 11"x17", compatible with CDOT network computers as approved by the Project Engineer.

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**REVISION OF SECTION 620
FIELD FACILITIES**

(6) Computer Accessories.

CDOT has restrictions and limitations with regard to the type of equipment permitted to be connected and supported on its computers and network. Due to the constantly changing nature of the computer field, contact the CDOT Regional Network Analyst for latest recommendations and cautions before purchasing any requested equipment such as printers, scanners, cameras, etc.

It is imperative that any accessories be compatible with the CDOT standard computer operation system:
Windows 7 64 bit.

Warning: Many devices will not work on the required 64 bit version, but only on the more common consumer Windows 32 bit version. Make sure the product states Windows 7, 64bit compatible.

Also, Printers, if requested, may not be networked or shared across networks for example between the CDOT network and non-CDOT computer network. The printer must be directly connected to a CDOT computer and can then be shared for use by other CDOT computers.

Copy/Fax/Scanner/Network Printer units that create PDF files and rely on connectivity across the CDOT IP network violate CDOT cyber security policies and are not permitted to be installed on the CDOT network.

All equipment is to be new with warranties.

Contractor will provide and maintain stock of printer paper and toner for any provided printers, scanners, fax machines.

The field office shall be established and functional prior to starting any work on the project.

Subsection 620.08 shall include the following:

Payment will under:

Pay Item	Pay Unit
Field Office (Class 2)	Each

Maintenance of the Field Office will not be paid for separately but shall be included in the bid price for Field Office (Class 2).

**REVISION OF SECTION 621
DETOUR PAVEMENT**

Section 621 is hereby added to the Standard Specifications for this project as follows:

DESCRIPTION

621.01 This work consists of constructing detour pavement as shown in the plans.

MATERIALS

621.02 The Contractor shall be responsible for quality control required to assure adequate quality of hot bituminous pavement used in the pavement.

CONSTRUCTION REQUIREMENTS

621.03 The detour location(s) and dimensions shall be determined by the Contractor. The Contractor shall submit for approval, 7 days prior to beginning detour construction, a Detour Alignment Plan which meets the design criteria included in the plans. The Detour Alignment Plan shall include beginning and ending stationing, detour pavement width, cross slope, design speed, lane and shoulder widths, taper rates and radii and all other information to fully describe the detour.

The Contractor shall provide the hot mix asphalt mix design and detour pavement thickness design. The minimum pavement thickness shall be 6 inches. These designs shall be submitted to the Engineer 7 days prior to starting construction on the detour. Review of the hot mix asphalt mix design and detour pavement thickness design does not constitute acceptance of the designs. Acceptance will be based solely on providing the detour in a satisfactory condition. If the material and thickness furnished result in an inadequate detour structure, the Contractor will provide additional thickness, materials, or other measures necessary to provide a satisfactory pavement for the life of the detour. These additional improvements shall be furnished at no additional cost to the project. All necessary signs, pavement markings and other traffic control devices shall be provided in accordance with the traffic control plan. The Contractor shall remove and dispose of the detour pavement when it is no longer needed to maintain traffic.

All earthwork necessary to construct the detours will be provided by the Contractor at no additional cost to the State. Earthwork that is to remain in place as part of the permanent roadway prism shall be in accordance to Section 203 of the Standard Specifications. The Contractor shall notify the Engineer of Earthwork that is to remain in place as part of the permanent roadway prism prior to starting construction on the detour.

Temporary striping required for the detour will not be paid for separately but shall be included in the cost of the detour pavement.

The Contractor shall maintain the detour for the entire period that it is open to traffic. Any distress that affects the ride, safety, or serviceability of the detour roadway shall be corrected to the satisfaction of the Engineer at no additional cost to the project.

METHOD OF MEASUREMENT

621.04 The quantity of Detour Pavement to be paid will be measured by the number of square yards completed and accepted for Detour Pavement shown in the approved Detour Alignment Plan.

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**REVISION OF SECTION 621
DETOUR PAVEMENT**

BASIS OF PAYMENT

621.05 The detour shall be paid for at the square yard price bid for the item. Payment shall be made under:

Pay Item	Pay Unit
Detour Pavement	Square Yard

Payment will be full compensation for all work and materials required to complete the item, including hot bituminous pavement, required earthwork, temporary striping, maintenance, removal, and disposal of all materials required to construct detours.

**REVISION OF SECTION 625
CONSTRUCTION SURVEYING**

Section 625 of the Standard Specifications is hereby revised for this project as follows:

Subsection 625.03 shall include the following:

Prior to installation of any culvert, the Contractor shall provide to the Engineer survey notes for ditch and culvert verification that include the following:

1. Separate stationing and elevations at 100' intervals, and at inlets and outlets of culverts, along the centerline/flowline of the existing ditches.
2. For side culverts and cross culverts that are not related to continuous ditches, flowline elevations and stations along the ditch or waterway centerline shall be provided 200' upstream and 200' downstream of the centerline of the culvert.

The Engineer shall be notified immediately in the event that actual conditions are not as described above in order to make necessary plan modifications.

**REVISION OF SECTION 626
PUBLIC INFORMATION SERVICES**

Section 626 of the Standard Specifications is hereby revised for this project as follows:

Subsection 626.01 shall include the following:

The Contractor shall provide the following public information services on an ongoing basis throughout the duration of the project:

At the preconstruction conference the Contractor shall introduce the Public Information Manager (PIM) for the project and present a public information plan and strategies or methods for communicating project activities. The Contractor shall prepare and submit a preliminary list of stakeholder groups and specific stakeholders that need to receive ongoing communication about the project.

The Contractor's PIM shall be a professional, having graduated from an accredited college or university with a bachelor's degree in Public Relations, Communications, or a closely related field of study. In addition, the PIM shall have two years experience in community outreach and partnership development or a comparable field. Related work experience may be substitute for the type of degree. The Engineer, after consulting with the Region Public Relations Manager, will approve the Contractor's PIM prior to the preconstruction conference. The identity of the PIM and the PIM'S qualifications shall be submitted to the Engineer five days in advance of the preconstruction conference.

The PIM shall be available on every working day, accessible and on call by cell phone or pager at all times and available upon the request of the Engineer at other than normal working hours. The PIM shall communicate with the Engineer daily.

The Contractor shall establish a Public Information Office (PIO) equipped with a telephone and an answering machine or answering device with the capability to record a message from the caller. This may be a cell phone, but must be a local number. The PIO shall be equipped with a computer and an e-mail account. The PIO may or may not be located within the Contractor's regular office provided that the telephone has a local call number. The PIM shall record a friendly greeting on the project's published phone line each week, updating the message throughout the week, as necessary, depending on changes in work schedule, activities and traffic impacts. The recording shall include each week's forthcoming activities including work days, hours and expected traffic delays, posted detours, project completion date, and office hours. The PIM shall check the answering machine at least twice every calendar day, including weekends. The PIM shall respond to callers and e-mail inquiries as soon as possible, but at least within 24 hours. The PIM shall keep a logbook of all calls including the contact name, date of contact, date responded, the contact's comments, and the action the PIM took. A copy of this log shall be submitted to the Engineer and CDOT PR Manager every two weeks or more frequently, as requested by the Engineer.

The PIM shall maintain communications with businesses and individual residences, commuters, local government entities and all other stakeholders that are directly adjacent to and affected by the project. Using a communications method or strategy approved by the Engineer, the Contractor shall notify stakeholders about the project two weeks prior to beginning any lane restrictions or project activities. Depending upon project impacts, contact with stakeholders may be required daily, weekly or monthly throughout the duration of the project. Communications tools could include hand flyers, door hangers, newsletters, mailers, using e-mail distribution lists, etc. All public information correspondence and subsequent updates must be approved by the Engineer and Region Public Relations Manager 48 hours before distribution.

The CDOT Region Public Relations Manager will write and distribute all News Releases to the media and handle all media relations and outreach.

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**REVISION OF SECTION 626
PUBLIC INFORMATION SERVICES**

The Contractor superintendent or PIM shall submit weekly lane closure reports to the Engineer and to the CDOT Region Public Relations Manager, and Tara Galvez (tara.galvez@state.co.us), using the template provided by the Engineer.

Each communication tool shall include contact information, PIM's name, office phone, CDOT Web-site address with CDOT logo. Cell phone numbers and e-mail addresses shall be provided where service is available. The communication shall include the description of work, lane restrictions, a detour map if warranted, the anticipated start and completion dates, hours of operation and work schedule, and a Slow for the Cone Zone message.

The Contractor shall erect construction traffic signs with the dates the Contractor expects to initiate and complete construction and with the Contractor's public information office's or PIM's phone number at each major approach to the project. The signs shall conform to the requirements of Section 630 and shall be erected at least one week prior to the beginning of construction.

Public Information Services Contact Sheet

Colorado Department of Transportation Project Engineer

Name: Dean L. Sandoval
Address: 902 Erie Avenue, Pueblo, CO 81001
Phone: 719-546-5440
Fax: 719-546-5702
Cell: 719-251-6978
Email: dean.sandoval@state.co.us

Colorado Department of Transportation, Region Public Relations Manager

Name: Bob J. Wilson
Address: 4201 E. Arkansas Ave., Room 277, Denver, CO 80222
Phone: 303-757-9431
Fax:
Cell:
Email: bob.j.wilson@state.co.us

Colorado Department of Transportation, Colorado Traffic Management Center

Address: 425-C Corporate Circle, Golden, CO 80401
Phone: (303) 512-5830
Fax: (303) 274-9394

City of Pueblo

Fire Department Public Relations: Woody Percival
Phone: 719-553-2830 Fax: 719-553-2831

Police Department: Sgt. Steve Zittel
Phone: 719-553-2514 Fax: 719-553-2479

Public Works Department: Earl Wilkenson, Director
Phone: 719-553-2295

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**REVISION OF SECTION 626
PUBLIC INFORMATION SERVICES**

Transportation Department - Traffic: Pepper Whittlef, Traffic Engineer
Phone: 719-553-2722 Fax: 719-553-2723

Colorado State Patrol

Captain Brian Lyons
Phone: 719-288-2636 Email: brian.lyons@state.co.us

Pueblo West Metro District:

Dan Centa
Director of Public Works
Phone: 719-547-5061 Email: DCenta@pwmd-co.us

Subsection 626.02 shall include the following:

The Engineer will monitor the PIM and all public information services. When the Contractor provides acceptable public information services in accordance with these specifications, partial payments for the pay item Public Information Services will be made as the work progresses. These partial payments will be made as follows:

When 5 percent of the original Contract amount is earned, 25 percent of the amount bid for this item will be paid.

When 10 percent of the original Contract amount is earned, 40 percent of the amount bid for this item, less all previous payments, will be paid.

When 25 percent of the original Contract amount is earned, 50 percent of the amount bid for this item, less all previous payments, will be paid.

When 75 percent of the original Contract amount is earned, 75 percent of the amount bid for this item, less all previous payments, will be paid.

When 100 percent of the original Contract amount is earned, 100 percent of the amount bid for this item, less all previous payments, will be paid.

Failure to provide acceptable public information services will result in withholding of progress payment for this item. Continued failure to provide the services required will result in non-payment of the corresponding percentage of the original bid item and may result in suspension of the work in those areas affected until acceptable public information services are provided by the Contractor.

For the purpose of public information services, the term "original Contract amount" as used above, shall mean the amount bid for the construction items on this Contract, not including the amounts bid for Public Information Services and Mobilization.

Payment for Public Information Services will be full compensation for all fliers, public information office, telephone lines, and all other labor and materials required to complete the item, except signs. Signs will be measured and paid for in accordance with Section 630.

Payment will be made under:

Pay Item	Pay Unit
Public Information Services	Lump Sum

**REVISION OF SECTION 627 AND 713
EPOXY PAVEMENT MARKING (SPECIAL)**

Section 627 is hereby revised for this project as follows:

CONSTRUCTION REQUIREMENTS

Section 627.05 of the Standard Specifications shall include the following:

- (a) Epoxy Pavement Marking (Special) shall be applied to the road surface according to the epoxy manufacturer's recommended methods at 22 mils \pm 2 mils minimum thickness.

The surface area receiving marking shall be ground prior to placement of the Epoxy Pavement Marking (Special). This applies to new or existing concrete or asphalt pavements. Grinding of the pavement is required so that Epoxy Pavement Marking (Special) is inlaid. The ground surface shall be cleaned with a high pressure air blast to remove loose material prior to placement of the Epoxy Pavement Marking (Special). The grooved width for inlaid pavement marking shall be a max width of 4 ¼ inch and a min width of 4 inch. The depth of the inlaid grooves shall be 100 mils below the surface of the existing pavement. Groove position shall be a minimum of 4 inches from the edge of the pavement marking to the longitudinal pavement joint. The Contractor shall set the spacer width between blades such that there is less than a 5 mil rise in the pavement between the blade grooves.

Grooves shall be clean, dry and free of laitance, oil, dirt, grease, paint or other foreign contaminants. The Contractor shall prevent traffic from traversing the grooves, and shall re-clean grooves, as necessary, prior to application of the preformed plastic pavement markings.

The Contractor shall not perform more inlaid grinds than can be applied by the pavement marking truck during the same working day or working period. Unless approved by the Engineer.

If a rain event occurs during grinding and marking application, temporary raised flexible pavement markers shall be installed on all channelizing, center, and lane lines. Temporary markers shall also be placed on edge lines where lighted curb or other delineation is not provided as directed by the engineer. The frequency of temporary markers shall be according to Section 6F.79 of MUTCD. Marking application may proceed only when pavement is dry and has had no moisture for a minimum of 24 hours.

- (b) *Bead System.* There shall be two types of ceramic beads used for the Epoxy pavement marking (Special) reflective elements, a Primary bead which is a high performance, high reflective all weather bead and a Secondary standard glass bead. The beads shall be applied using a double drop system with the Primary bead dropped first. The beads shall be applied in a manner that the beads shall adhere and embed within the Epoxy binder to produce a high reflective all weather pavement marking.

The primary and secondary beads shall be applied to the Epoxy binder based on the manufacturers recommended application rate. The Primary bead shall be composite, cluster, bonded core beads shall be applied first from the bead dispenser directly behind the Epoxy binder application gun followed immediately by the application of the Secondary beads from a second bead dispenser. If the manufacturer does not provide application rates of the primary and secondary beads, then the following application rates for each of the glass beads shall be used as a starting point: 11 lbs per gallon of Primary composite beads and 7 lbs per gallon of the Secondary beads. The application rates of the primary and secondary beads shall be adjusted from these starting values until the minimum reflectivity values have been consistently achieved.

Primary and Secondary glass beads shall be furnished in fully identified separate containers and shall be free of extraneous materials or clumps.

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**REVISION OF SECTION 627 AND 713
 EPOXY PAVEMENT MARKING (SPECIAL)**

1) Retro reflectivity. The applied finish system must have an initial minimum dry reflectivity reading of 800 mcd·m⁻²·1x-1 for white and 500 mcd·m⁻²·1x-1 for yellow. The Contractor shall use an industry accepted and available Retro-meter for reflectivity readings and it shall be calibrated each day testing occurs. For information: (CDOT will be using a Delta LTL-X Retro-meter for reflectivity readings). Contractor shall provide reflectivity readings from the Contractor for each mile of line placed or fraction thereof. CDOT will determine 4 random testing locations for each 1 mile section of line placed or fraction thereof. At each random testing location three reflectivity readings will be taken on each line. Of the 12 readings per mile the highest and lowest will be disregarded and the remaining 10 readings will be averaged and that average value will represent the reflectivity of that 1 mile section or fraction of line thereof. The Contractor shall remove and replace at their expense each 1 mile of line placed or fraction thereof where the test result from that random location fails the minimum retro reflectivity reading.

The reflectivity readings shall be taken no sooner than 1 hour after the marking is tack free and no later than 2 hours after the marking is tack free. Lane closure and traffic control used for the marking placement shall remain until after the reflectivity readings are taken. Traffic should not be allowed on the marking until after the reflectivity readings are taken. Prior to taking reflectivity readings, the Contractor shall remove at the reflectivity reading locations any excess beads placed during marking application.

Applied markings shall have uniform mil thickness and bead distribution across the entire width of the line. Unless otherwise shown on the plans, typical pavement markings shall conform to the shapes and sizes as shown on Standard Plan S-627-1. Any marking that does not meet specification shall be removed and replaced at the Contractor's expense.

Epoxy Pavement Marking (Special) and beads shall be applied within the following limits:

**Application Rate or Coverage
 Per Gallon of Epoxy Pavement Marking (Special)**

	Minimum	Maximum
20 - 24 mil marking	65 sq. ft.	80 sq. ft.
Beads	16 lbs.	As Needed

BASIS OF PAYMENT

Section 627.05 of the Standard Specifications shall include the following:

<u>Pay Item</u>	<u>Pay Unit</u>
Epoxy Pavement Marking (Special)	Gallon

The work to groove the asphalt or concrete and clean the grooving residual or debris will not be measured and paid for separately but shall be included in the work.

The Primary and Secondary beads will not be measured and paid for separately but shall be included in the work.

The Contractor shall be required to submit to CDOT a certificate of compliance (COC) from the manufacture that the installed Epoxy binder and both the primary and secondary beads have been installed in accordance with this specification and with their recommendations and has achieved the minimal reflectance values stated herein. If the pavement marking system is comprised of multiple manufactures, then all manufactures will be required to affirm to the COC. All the manufacturers shall be onsite at the installation of the epoxy binder, primary bead, and

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**REVISION OF SECTION 627 AND 713
EPOXY PAVEMENT MARKING (SPECIAL)**

secondary bead materials to identify areas of the installation falling below the minimum manufactures recommendations and these specifications to assist in the calibration of equipment set up of equipment and the proper adjustment of equipment during installation to achieve the minimums outlined herein. The cost of the manufacturer(s) representation will not be measured and paid for separately but shall be included in the cost of the work.

Section 713.08 of the Standard Specifications shall include the following:

Subsection 713.08 shall include the following:

Primary glass beads for epoxy pavement marking (special) shall be a composite, cluster, bonded core bead comprised of a core element and contain an outer shell containing elements surrounding it. The shell elements shall be permanently attached to the core element. The core and shell elements shall be manufactured from glass, ceramic, or silica. The primary element shall be coated by manufacturer's recommendations for application within Epoxy binder.

PRIMARY BEAD GRADATION

U.S. Mesh	Microns	% Retained	%Passing
18	1000	20 – 35	65-80
30	600	50 – 70	30-50
50	300	95 – 100	0-5

Roundness Shall be a minimum of 85 % true spheres above the sieve 20 by visual inspection using test method FLH-520. All beads below the 20 sieve, must meet a minimum of 80% true spheres by ASTM Method D 1155.

Color / Clarity Beads shall be colorless / clear and free of carbon residues.

Refractive Index Minimum 1.50 by oil immersion method.

Air Inclusions < 5% by visual count.

Hardness All beads above the 20 sieve shall exhibit an average hardness of C70.5 when measured using the Rockwell C scale method and with a minimum sampling of 100 glass beads.

Crushing Strength Beads above the 20 sieve shall exhibit an average crushing strength of not less than 60,000 psi when measured with the L/D^2 method and with a minimum sampling of 100 glass beads.

Coatings Shall use manufacturer's recommended adhesion coating for optimum adhesion and embedment.

Chemical Resistance Both the primary and secondary beads shall be resistant to hydrochloric acid, water, calcium chloride, sodium sulfide, acid, mag chloride and shall not develop any haze, dulling or darkening of the bead as tested per methods outlined in sections 4.3.6 to 4.3.9 of the TT-B Federal Spec.1325C .

If the use of recycled post-consumer glass is used in manufacturing of beads those recycled glass beads shall be manufactured from North American glass waste streams.

Secondary glass beads for epoxy pavement marking (special) shall be glass beads for epoxy pavement marking as specified elsewhere in subsection 713.08.

**REVISION OF SECTION 627 AND 713
PREFORMED THERMOPLASTIC PAVEMENT MARKING**

Subsection 627.09 shall include the following:

For Xwalk and Stop Lines, the preformed thermoplastic pavement marking shall be inlaid. Depth of inlaying below the existing asphalt surface shall be a minimum of 90 mils. Grinding or inlaying of existing preformed thermoplastic pavement marking shall not be measured and paid for separately, but shall be included in the work.

For Word and Symbol, the preformed thermoplastic pavement marking shall be surface applied.

An epoxy resin primer shall be applied to all existing surfaces (concrete, asphalt, existing markings, etc.) prior to the application of any new preformed thermoplastic, plastic pavement marking. The epoxy resin primer shall conform to CDOT Standard Specifications subsection 708.07. Primer shall be required for all markings used including markings that manufacture does not require a primer. Primer and application will not be measured and paid for separately, but shall be included in the work.

Surface shall be dry and free of dirt, dust, chemicals, and/or significant oily substances. Application procedures for Portland concrete pavement shall be as described above except a compatible primer sealer shall be applied before application of marking to assure proper adhesion.

Subsection 713.14 shall include the following:

(a) General.

Material such as lines, legends, or symbols shall be capable of being affixed to HMA or PCC pavements. Marking shall be capable of conforming to pavement contours, breaks, and faults etc. by the use of the normal heat of a propane torch. Marking shall be capable of withstanding the actions of traffic at normal pavement temperatures. Marking shall have resealing characteristics such that it is capable of fusing with itself and previously applied thermoplastic pavement markings when heated with the torch.

(b) Physical Requirements.

1. Marking shall have a factory applied coated surface of beads in addition to the intermixed beads at the rate of 1 lb. ($\pm 10\%$) per 11 sq. ft. The factory applied coated surface beads shall have the following specifications:

- a) Minimum 80% round
- b) Minimum refractive index of 1.50.
- c) Minimum SiO₂ content of 70%
- d) Maximum iron content of 0.1%
- e) Size Gradation % Retained
 - 14 0-3%
 - 16 2-10%
 - 18 10-30%
 - 20 30-60%
 - 30 50-80%
 - 35 60-85%
 - 45 95-100%
 - 60 98-100%

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**REVISION OF SECTION 627 AND 713
PREFORMED THERMOPLASTIC PAVEMENT MARKING**

(c) Performance.

Marking, when applied in accordance with manufactures recommendations shall demonstrate a uniform level of sufficient night time retro-reflection when tested in accordance to ASTM E1710-97. The applied material must have an initial minimum intensity reading of $500 \text{ mcd} \cdot \text{m}^{-2} \cdot \text{lx}^{-1}$ for white and $300 \text{ mcd} \cdot \text{m}^{-2} \cdot \text{lx}^{-1}$ for yellow as measured with a retro-reflectometer.

The top surface of the stencils (the same side as the factory applied surface beads) shall have an indicator system for the Contractor to properly gauge the correct amount of heat to apply during installation. The indicator system shall have a positive visual indication, such as beads changing color or indents closing together, when the material has reached the correct installation temperature. The indicator system must also provide a positive, visual indication if the material has not reached the correct installation temperature.

**REVISION OF SECTION 630
IMPACT ATTENUATOR (TEMPORARY)**

Section 630 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of furnishing, installing, certifying, moving, repairing, maintaining, and removing temporary impact attenuators in accordance with these specifications and in conformity with the lines and details shown on the plans or established.

MATERIALS

Each impact attenuator shall be selected from the Crash Cushion and End Treatment Application Chart as listed in the *Safety Selection Guide* on the CDOT Design and Construction Project Support web site. Impact attenuators shall conform to the requirements of the manufacturer and be capable of bi-directional shielding of the objects detailed and located on the plans. Filler materials shall be treated according to the manufacturer's recommendations to prevent freezing to a temperature of -50 °F.

If the posted speed limits of the construction zone are 45 miles per hour or less, the impact attenuator shall meet the requirements of NCHRP Report 350 TL-2. For posted speed limits in the construction zone greater than 45 miles per hour, the attenuator shall meet the requirements of TL-3.

CONSTRUCTION REQUIREMENTS

If sand barrel arrays are used, the Contractor shall paint, with white epoxy paint, an outline and the weight of each barrel on the pavement prior to final placement. All numbers shall be a minimum of 6 inches high. Barrel type shall be one of those listed in the *Safety Selection Guide*.

The site shall be prepared to receive the impact attenuator by filling, excavating, smoothing, constructing the paved foundation pad, installing approved transition and anchoring, and all other work necessary for the proper installation of the attenuator.

The impact attenuator shall be fabricated and installed in accordance with the manufacturer's recommendations. The Contractor shall provide a copy of the manufacturer's installation instructions and parts list to the Engineer prior to installation of the device.

Each installation shall be supervised and certified as correct upon completion by a representative of the device manufacturer or by an employee of the Contractor who is a certified installer. The certified installer shall have completed device training and shall be registered with the manufacturer as a certified installer. The Contractor shall submit all appropriate documentation to validate that the certified installer has completed device training and has been registered with the manufacturer as a certified installer.

METHOD OF MEASUREMENT

Impact Attenuator (Temporary) will be measured by the number of attenuators shown on the plans, installed, certified, and accepted; or the actual number of authorized 24-hour periods that the attenuator is used.

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**REVISION OF SECTION 630
IMPACT ATTENUATOR (TEMPORARY)**

BASIS OF PAYMENT

The accepted quantities will be paid for at the contract unit price for the pay item listed below:

Payment will be made under:

Pay Item	Pay Unit
Impact Attenuator (Temporary)	Day

Payment will be full compensation for all work and materials required to furnish, install, certify, move, repair, maintain, and remove the impact attenuator. Site preparation, foundation pad, epoxy painting, and all necessary hardware including anchors and transitions will not be paid for separately, but shall be included in the work.

**REVISION OF SECTION 630
PORTABLE MESSAGE SIGN PANEL**

Section 630 of the Standard Specifications is hereby revised for this project as follows:

Subsection 630.01 shall include the following:

This work includes furnishing, operating, and maintaining a portable message sign panel.

Add subsection 630.031 immediately following subsection 630.03 as follows:

630.031 Portable Message Sign Panel. Portable message sign panel shall be furnished as a device fully self contained on a portable trailer, capable of being licensed for normal highway travel, and shall include leveling and stabilization jacks. The panel shall display a minimum of three - eight character lines. The panel shall be a dot-matrix type with an LED legend on a flat black background. LED signs shall have a pre-default message that activates before a power failure. The sign shall be solar powered with independent back-up battery power. The sign shall be capable of 360 degrees rotation and shall be able to be elevated to a height of at least five feet above the ground measured at the bottom of the sign. The sign shall be visible from one-half mile under both day and night conditions. The message shall be legible from a minimum of 750 feet. The sign shall automatically adjust its light source to meet the legibility requirements during the hours of darkness. The sign enclosure shall be weather tight and provide a clear polycarbonate front cover.

Solar powered message signs shall be capable of operating continuously for 10 days without any sun. All instrumentation and controls shall be contained in a lockable enclosure. The sign shall be capable of changing and displaying sign messages and other sign features such as flash rates, moving arrows, etc.

Each sign shall also conform to the following:

- (1) In addition to the onboard solar power operation with battery back-up, each sign shall be capable of operating on a hard wire, 100-110 VAC, external power source.
- (2) All electrical wiring, including connectors and switch controls necessary to enable all required sign functions shall be provided with each sign.
- (3) Each sign shall be furnished with an operating and parts manual, wiring diagrams, and trouble-shooting guide.
- (4) The portable message sign shall be capable of maintaining all required operations under Colorado mountain-winter weather conditions.
- (5) Each sign shall be furnished with an attached license plate and mounting bracket.
- (6) Each sign shall be wired with a 7-prong male electric plug for the brake light wiring system.

Subsection 630.13 shall include the following:

The portable message sign panel shall be on the project site at least 7 calendar days prior to the start of active roadway construction. Maintenance, storage, operation, relocation to different sites during the project, and all repairs of portable message sign panels shall be the responsibility of the Contractor.

Subsection 630.15 shall include the following:

Portable message sign panels will be measured one of the two following ways:

- (1) By the actual number of days each portable message sign is used on the project as approved by the Engineer.
- (2) By the maximum number of approved units in use on the project at any one time.

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**REVISION OF SECTION 630
PORTABLE MESSAGE SIGN PANEL**

Subsection 630.16 shall include the following:

Pay Item	Pay Unit
Portable Message Sign Panel	Each

**REVISION OF SECTION 703
AGGREGATES**

Section 703 of the Standard Specifications is hereby revised for this project as follows:

Subsection 703.01, **Fine Aggregate for Concrete** shall be revised as follows:

Fine aggregate for concrete shall conform to the requirements of AASHTO M 6, except that only natural sand will be permitted.

**REVISION OF SECTION 715
LIGHTING AND ELECTRICAL MATERIALS**

Section 715.04 Luminaires and Lamps shall be amended to include the following:

- (a) General (2) Optical Chamber. DELETE “The luminaire distribution shall be an IESNA full-cutoff, type III reflector system for lamps over 3200 lumens.”

Delete Section 715.04 (b) through (e) and replace it with:

(b) Roadway Luminaires.

Roadway luminaires shall be LED type with integral driver, flat lens, cast aluminum housing, and suitable for use in wet locations.

- (1) Listing: The luminaire and all components shall be UL/ETL listed for Wet Location and shall have minimum Ingress Protection Rating of IP66.
 - (2) Lamp: The luminaire shall be 105W consisting of 79 LEDs, 4000K CCT and 8100 lumens minimum.
 - (3) Optics: The luminaire shall have an asymmetrical, Type II distribution.
 - (4) Mounting: The luminaire and pole shall have a base plate with (4) anchor bolts for installation on concrete light standard foundation. Assembly shall include a 10'-0" arm.
 - (5) Materials: The luminaire housing shall be constructed of die-cast aluminum alloy.
 - (6) Power Supply: The luminaire shall be furnished with 240 volt Class 2 power supply (driver), total harmonic distortion of 20% or less, power factor of 0.9 or greater.
 - (7) Color: Powdercoat finish in GREY.
 - (8) Testing: Luminaire shall be tested in accordance with IESNA LM79 and LM80 certifying photometric performance and rated life, respectively.
 - (9) BUG Rating: Roadway luminaire shall have a maximum Backlight rating of B2, an Uplight rating of U0, and a Glare rating of G2.
- (c) Lamps. Lamps shall be installed and operated only in luminaires designed to accommodate the specific lamp. Lamps shall be compatible with ballasts and power generators supplied with the luminaires in which they are to be installed. All lamps of a similar type shall be provided by the same manufacturer.

LED lamp systems shall meet or exceed the following requirements:

- (1) Binning – All LEDs shall be matched to satisfy the CCT, CRI, and Luminous Flux requirements as described herein.
 - a. Correlated Color Temperature (CCT) – All LED lamps shall emit white light and have a (CCT) specified in the plans +/- 100° Kelvin.
 - b. Color Rendering Index (CRI) – LED lamps shall have a minimum Color Rendering Index (CRI) of 70.
 - c. Luminous Flux – LED lamps shall not exceed the junction temperature recommended by the LED manufacturer. Luminous flux differences between LEDs shall not exceed 10%.
- (2) Rated Lamp Life - LEDs shall have a minimum rated life of 70,000 hours. The lumen output shall be maintained at 70% of initial rated lumens or greater at the rated life of the lamp.
- (3) Quality Control – Luminaires with LEDs that have a perceptible and significant brightness or color differences shall be replaced by the Manufacturer at no cost to the Project.
- (4) Environmental Conditions – LEDs shall be temperature rated for operation and storage within the range of -40°C to +50°C, and shall withstand low and high frequency vibration over the rated life of the lamp.

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**REVISION OF SECTION 715
LIGHTING AND ELECTRICAL MATERIALS**

Section 715.05 Ballasts, LED Drivers, and Induction Lamp Power Generators shall be amended to include the following:

LED power supplies: LED power supplies shall have an input voltage of 240VAC/60Hz and the output voltage shall be per LED manufacturer's specifications. The output voltage shall be regulated automatically and continuously by an integral electronic voltage regulator to maintain the LED voltage within a tolerance of +/- 5%. The output current shall be regulated automatically and continuously by an integral electronic current regulator to maintain the current within a tolerance of +/- 5%. All electronics of the power supply and the LEDs shall be protected from all electrical surges, including but not limited to lightning strikes and stray current in rebar and concrete. Surge protection shall be integral to the LED power supply.

FORCE ACCOUNT ITEMS

DESCRIPTION

This special provision contains the Department's estimate for force account items included in the Contract. The estimated amounts marked with an asterisk will be added to the total bid to determine the amount of the performance and payment bonds. Force Account work shall be performed as directed by the Engineer.

BASIS OF PAYMENT

Payment will be made in accordance with subsection 109.04. Payment will constitute full compensation for all work necessary to complete the item.

Force account work valued at \$5,000 or less, that must be performed by a licensed journeyman in order to comply with federal, state, or local codes, may be paid for after receipt of an itemized statement endorsed by the Contractor.

<u>Force Account Item</u>	<u>Estimated Quantity</u>	<u>Amount</u>
F/A 01 Minor Contract Revisions	F.A.	\$ 280,000*
F/A 02 Partnering	F.A.	\$ 10,000
F/A 03 Asphalt Pavement Incentive	F.A.	\$ 85,000
F/A 04 Fuel-cost Adjustment	F.A.	\$ 70,000
F/A 05 Roadway Smoothness Incentive	F.A.	\$ 45,000
F/A 06 Asphalt Cement Cost Adjustment	F.A.	\$ 87,000
F/A 07 OJT Colorado Training Program	F.A.	\$ 3,840
F/A 08 Interim Surface Repair	F.A.	\$ 1,000
F/A 09 Furnish and Install Electric Service	F.A.	\$ 5,000
F/A 10 Erosion Control	F.A.	\$ 7,500
F/A 11 DRB Standing Committee	F.A.	\$ 15,000
F/A 12 Removal of Asbestos and Lead Based Paint	F.A.	\$ 15,000

*To be included in the bond amount

F/A 01 Minor Contract Revision

This work consists of minor work authorized and approved by the Engineer which is not included in the contract drawings or specifications and which is necessary to accomplish the scope of the work on this contract.

F/A 02 Partnering

This work consists of Partnering activities as described in the Standard Special Provision titled "Partnering Program."

F/A 03 Asphalt Pavement Incentive

Asphalt Incentive Payments will be made in accordance with the Standard Specification Section 105.05 Conformity to the Contract of Hot Mix Asphalt.

F/A 04 Fuel Cost Adjustment

This force account item makes adjustments to pay items for changes in fuel costs in accordance with the Standard Special Provision "Revision of Section 109 – Fuel Cost Adjustment."

F/A 05 Roadway Smoothness Incentive

Roadway Smoothness incentive payments will be made in accordance with the Standard Specification 105.07 Conformity to Roadway Smoothness Criteria of HMA.

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FORCE ACCOUNT ITEMS

F/A 06 Asphalt Cement Cost Adjustment

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 proceeding the month in which bids were received for the Contract. These cost adjustments are not a change to the contract unit prices bid.

F/A 07 OJT Colorado Training Program

This work includes the cost of maintaining the on-the-job training program in compliance with the Standard Special Provision "On the Job Training."

F/A 08 Interim Surface Repair

F/A 09 Furnish and Install Electric Service

This work consists of furnishing and installing electric service to traffic signals and the roundabout lighting controller.

F/A 10 Erosion Control

This force account item will be utilized at the Engineer's discretion to protect existing facilities and prevent erosion from impacting areas outside of the right-of-way.

F/A 11 DRB Standing Committee

This force account item is used to reimburse the Contractor for CDOT's portion of Dispute Review Board Costs in accordance with the Standard Special Provision "Revision of Section 105 – Disputes and Claims for Contract Adjustments."

F/A 12 Removal of Asbestos and Lead Based Paint

Structure K-18-CW may contain either asbestos and/or lead based materials, and shall be handled as per Section 250 of the Standard Specifications. This force account item is to reimburse the Contractor for work associated these materials.

TRAFFIC CONTROL PLAN – GENERAL

The key elements of the Contractor's method of handling traffic (MHT) are outlined in subsection 630.09.

The components of the TCP for this project are included in the following:

- (1) Subsection 104.04 and Section 630 of the Standard Specifications.
- (2) Schedule of Construction Traffic Control Devices.
- (3) Latest revised Standard Plan S-630-1 (02/27/2013), Traffic Controls for Highway Construction and Standard Plan S-630_2
- (4) Construction Traffic Control and Phasing Plans, included in Plans

Unless otherwise approved by the Engineer, the Contractor's equipment shall follow normal and legal traffic movements. The Contractor's ingress and egress of the work area shall be accomplished with as little disruption to traffic as possible. Traffic control devices shall be removed by picking up the devices in a reverse sequence to that used for installation. This may require moving backwards through the work zone. When located behind barrier or at other locations shown on approved traffic control plans, equipment may operate in a direction opposite to adjacent traffic.

Special Traffic Control Plan requirements for this project are as follows:

1. During the construction of this project, traffic shall use the present or reconstructed traveled roadway.
2. The Contractor shall not have construction equipment or materials in the lanes open to traffic at any time, unless directed to do so.
3. During construction, only one lane may be closed to traffic at any time in either direction. Traffic shall not be delayed for more than 10 minutes or as directed by the Engineer.
4. The schedule for traffic control signing and devices are totaled to allow the Contractor to work at two locations at one time for a maximum length of one half mile per location.
5. Advance notice of the construction shall be provided to the traveling public. The VMS shall be set up a minimum of one week in advance of the beginning of construction.
6. Prior to starting construction, the Contractor shall notify the CDOT R2 Traffic Engineer, Local Jurisdiction traffic engineer, State Patrol, City of Pueblo, Pueblo West Metro District and Pueblo County, and the local media of the date the Contractor intends to start construction and the expected duration of Construction activities.
7. The Contractor shall coordinate all work with major sporting events and graduation ceremonies through the University and special events through the City of Pueblo.
8. Traffic control devices shall not be stored on the shoulder or slopes of any roadway except behind guardrail unless laid flat outside of the approved clear zone; nor shall traffic control devices be stored in any landscaped area unless otherwise designated or permitted.
9. The Contractor may propose an alternative method of maintaining traffic for the project. Alternative proposals shall be submitted in writing to the Engineer for consideration. Written approval from the Engineer shall be obtained prior to beginning any work using the proposed alternative.
10. The Contractor shall perform work Monday thru Friday, 7 am to 7 pm, unless otherwise approved by the Engineer. If any night work is approved by the Engineer, all costs associated with this work, including but not limited to, lighting for the work, lighting for flagging stations, additional Traffic Control Supervisor, etc., shall not be paid for separately but shall be included in the cost of the work.

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TRAFFIC CONTROL PLAN – GENERAL

11. All Lane closures shall be subject to the approval of the Engineer. Request for each closure shall be made at least 24 hours in advance of the time the lane closure is to be implemented. Lane closures will not be allowed to remain unless being utilized in continuum for the intended purpose for which they were set up.
12. The Contractor shall not be allowed to have a lane closure at any time in excess of one-half mile in length and impacting any more than one public road intersection unless otherwise approved by the Engineer
13. The Contractor shall remove all existing signs prior to performing any work that affects those signs. All signs damaged due to Contractor operations shall be replaced in kind or repaired by the Contractor at no cost to the project. An inventory of all existing signs shall be made with the Engineer prior to beginning work
14. The Contractor will not be permitted to have workers or equipment operating on the paved Shoulders adjacent to open lanes during the times set forth above.
15. The Contractor Shall install construction traffic control devices where they do not block or impede other existing traffic control devices or sidewalks for pedestrians, disabled persons or bicyclists.
16. Vertical cuts or fills greater than 1 inch resulting from construction operations adjacent to traffic lanes, or within the clear zone shall be temporarily sloped at a 4: 1 or flatter slope, and delineated at 45 foot intervals immediately after removal and compaction operations to safeguard the traveling public
17. The Contractor and Subcontractors shall equip their construction vehicles with flashing amber lights. Equipment to be used at night shall also be equipped with flashing amber lights. Flashing amber light on vehicles and equipment shall be visible from all directions.
18. The Contractor shall maintain access to all roadways, side streets, walkways, driveways, doorways, and bike paths at all times unless otherwise approved by the Engineer. The Contractor shall develop an Access Maintenance Plan in coordination with, and based on the requirements of, the affected property owners and tenants, and submit it to the Engineer for approval prior to commencement of work. This plan shall detail all barricades, ramps, signs, and temporary means of access required by the property owners or tenants. Prior to commencing any work which affects access to a property, the Access Maintenance Plan for that property must be submitted and approved by the Engineer. The Access Plan shall include documentation of the coordination, including the approval signature of each affected owner or tenant. Should the Contractor be unable to obtain approval and signatures, documentation of the efforts made to obtain said approval and signatures must be submitted. All access shall be maintained on surfaces equal to or better than those existing at the time the access is first disturbed. For short periods of time only as allowed by the Engineer, access may be maintained on an aggregate base course surfaces. During construction, driveways shall be open with safe access to each property on the project. For Properties with a single driveway, either 12 feet or ½ of the existing driveway width must be left open at all times. For properties with 2 or more driveways, one driveway must be left open at all times
19. The costs of maintaining access will not be paid for separately, unless otherwise provided, but shall be included in the work. Utilization of materials to be incorporated into the work may be permitted. However, any degradation or other contamination or destruction shall be corrected at the Contractor's expense prior to acceptance.

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TRAFFIC CONTROL PLAN – GENERAL

20. During non-construction periods (evenings, weekends, holidays, etc.) all work shall be adequately protected to insure the safety of vehicular and pedestrian traffic, as detailed in the Contractor's MHT. Excavations or holes shall be filled in or fenced when unattended.
21. Whenever Contractor removes, obliterates, or overlays any pavement markings, he/she shall replace them on a daily basis prior to opening the affected areas to traffic. All temporary pavement markings shall fully comply with the Standard Specifications and Special Provisions.
22. All personal vehicle and construction equipment parking is prohibited where it conflicts with safety, access, or the flow of traffic. Landscaped areas and roadway shoulders shall be kept clear of parking and storage of all personal and construction equipment except where approved by the Engineer
23. The Contractor shall not place tack coat on any surface to be paved where traffic will be forced to travel upon fresh bituminous materials.
24. No work interferes with traffic will be allowed on holidays or any day of a three-day or four-day weekend that includes a holiday. Holidays on which this restriction applies consist of those holidays recognized by the State of Colorado as listed in subsection 101.36.
25. During non-working hours, the roadways shall be restored to a safe travel conditions for the free flow of traffic. The Contractor shall clean the roadway of all construction debris before opening it to traffic. Any maintenance required restoring the roadways to this condition, including the pavement patching and grading, shall be done prior to opening the areas to traffic or completing work for the day.
26. All flagging stations used at night shall be illuminated with floodlights. Street and highway lights may be used for flagging station illumination when approved by the Engineer. Floodlights shall be located and directed so as not to interfere with the sight of any motorists, and the cost to be included in the work
27. The Contractor shall not perform any work requiring lane closure on the roadway during hours lane closure is prohibited by the Region 2 Lane Closure Strategy, available at:
<http://www.coloradodot.info/library/traffic/traffic-manuals-guidelines>.
28. No Construction traffic shall be allowed on neighborhood streets. The Engineer shall specify the haul roads available for use by the Contractor. All other roads in the area shall not be used for hauling
29. The Contractor shall remove or cover all signs in the work zone that conflict with the construction traffic control plans
30. Where trenching shoring is required the Contractor shall ensure that the shoring method and design will support all adjacent traffic loads.
31. All MHTs will be reviewed and approved by the Engineer. All MHTS must be submitted a minimum 2 days prior to use on the project
32. Unless noted otherwise, all costs incidental to the foregoing requirements shall be included in the original contract prices for the project, including any additional traffic control items required for haul routes into the project

UTILITIES

Known utilities within the limits of this project are:

UTILITY / ADDRESS	CONTACT	PHONE / CELL
Black Hills Energy 105 S. Victoria St. Pueblo, Co. 81002	Lance Peters lance.peters@blackhillscorp.com	(719) 546-6419
Century Link/Qwest 141 Enterprise Dr. Pueblo West, CO 81007	Larry Gurule larry.gurule@qwest.com	719-647-5230
Xcel Energy 615 West Street, Pueblo, CO 80102	Edgie Walrath edgie.walrath@xcelenergy.com	719-549-3619
SECOM P.O. Box 521 La Junta, CO 81050	Derek Carrol	719-383-1349
San Isabel Electric 893 E Enterprise Dr. Pueblo, CO 81007	Randy Bryan	719-547-2160
Pueblo West Metro District		719-547-5000
Colorado Springs Utilities	Dennis Auge	719-668-9059
Comcast 213 North Union Blvd Colorado Springs, CO 80909	Vicky DeJesus Vicky_Dejesus@cable.comcast.com	719-442-4737
CDOT Fiber Optic 10 Monarch Lane Pueblo, CO 81004	Dave Pierce dave.piercc@dot.state.co.us	719-251-3596

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UTILITIES

UTILITY / ADDRESS	CONTACT / EMAIL	PHONE / CELL
Pueblo Public Works (Waste Water)	Bruce Morello bmaurello@pueblo.us	719-553-2262
Pueblo Public Works (Streets)	Jeff Pratt	719-553-2319
Pueblo Board of Water Works	Scot Burbidge SBurbidge@pueblowater.org	719-584-0478

The work described in these plans and specifications requires coordination between the Contractor and the utility companies in accordance with subsection 105.11 in conducting their respective operations as necessary to complete the utility work with minimum delay to the project.

THE WORK LISTED BELOW SHALL BE PERFORMED BY THE CONTRACTOR:

No utility work by the Contractor is expected. However, if any utility work by the Contractor or a utility company is determined to be necessary during the construction of the project, the following shall apply:

The Contractor shall be responsible for coordinating the adjustment of all utilities on this project. The Contractor shall keep each utility company advised of any work being performed on or around their facilities, so that each utility company can coordinate any needed inspections, including inspections with the Engineer.

The Contractor shall provide written notice to each utility company, with a copy to the Engineer, prior to any work by a utility company that is to be coordinated with project construction. A minimum of two (2) calendar weeks of prior notice is required.

If appropriate, the Contractor shall provide traffic control for any utility work to be coordinated with the project's construction, in accordance with an approved Method of Handling Traffic (MHT). Payment to be made via contract bid item(s).

THE WORK LISTED BELOW WILL BE COMPLETED BY THE UTILITY COMPANIES OR THEIR AGENTS:

No utility work by the Contractor is expected.

GENERAL:

The Contractor shall comply with Article 1.5 of Title 9, CRS ("Excavation Requirements") when excavation or grading is planned in the area of underground utility facilities. The Contractor shall notify all affected utilities at

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UTILITIES

least two (2) business days, not including the day of notification, prior to commencing such operations. The Contractor shall contact the Utility Notification Center of Colorado (UNCC) at (8-1-1) or 1-800-922-1987 to have locations of UNCC registered lines marked by member companies. All other underground facilities shall be located by contacting the respective company. Utility service laterals shall also be located prior to beginning excavating or grading.

The location of utility facilities as shown on the plan and profile sheets, and herein described, were obtained from the best available information.

All costs incidental to the foregoing requirements will not be paid for separately but shall be included in the work.



REVISION OF SECTION 103
ESCROW OF PROPOSAL DOCUMENTATION

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. SUBMITTAL 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: _____

July 31, 2014

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.

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REVISION OF SECTION 105
DISPUTES AND CLAIMS FOR CONTRACT ADJUSTMENTS

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

Delete subsections 105.22, 105.23 and 105.24 and replace with the following:

105.22 Dispute Resolution. Subsections 105.22, 105.23, and 105.24 detail the process through which the parties (CDOT and the Contractor) agree to resolve any issue that may result in a dispute. The intent of the process is to resolve issues early, efficiently, and as close to the project level as possible. Figure 105-1 in the standard special provisions outlines the process. Specified time frames may be extended by mutual agreement of the Engineer and the Contractor. In these subsections, when a time frame ends on a Saturday, Sunday or holiday, the time frame shall be extended to the next scheduled work day.

A dispute is a disagreement concerning contract price, time, interpretation of the Contract, or all three between the parties at the project level regarding or relating to the Contract. Disputes include, but are not limited to, any disagreement resulting from a delay, a change order, another written order, or an oral order from the Project Engineer, including any direction, instruction, interpretation, or determination by the Project Engineer, interpretations of the Contract provisions, plans, or specifications or the existence of alleged differing site conditions.

The term "merit" refers to the right of a party to recover on a claim or dispute, irrespective of quantum, based on the substance, elements, and grounds of that claim or dispute. The term "quantum" refers to the quantity or amount of compensation or time deserved when a claim or dispute is found to have merit.

Disputes from subcontractors, material suppliers, or any other entity not party to the Contract shall be submitted through the Contractor. Review of a pass-through dispute does not create privity of Contract between CDOT and the subcontractor.

If CDOT does not respond within the specified timelines, the Contractor may advance the dispute to the next level.

When the Project Engineer is a Consultant Project Engineer, actions, decisions, and determinations specified herein as made by the Project Engineer shall be made by the Resident Engineer.

The dispute resolution process set forth in this subsection shall be exhausted in its entirety prior to initiation of litigation or arbitration. Failure to comply with the requirements set forth in this subsection shall bar either party from any further administrative, equitable, or legal remedy. If a deadline is missed that does not prejudice either party, further relief shall be allowed.

All disputes and claims shall be submitted within 30 days of the date of the certified letter submitting the CDOT Form 96, Contractor Acceptance of Final Estimate, to the Contractor. Failure to submit a dispute or claim within this time period releases the State of Colorado from all disputes and claims for which notice has not already been submitted in accordance with the Contract.

All disputes and claims seeking damages calculated on a Total Cost or Modified Total Cost basis will not be considered unless the party asserting such damages establishes all the legal requirements therefore, which include:

- (1) The nature of the particular losses makes it impossible or highly impractical to determine them with a reasonable degree of accuracy.
- (2) The Contractor's bid or estimate was realistic.
- (3) The Contractor's actual costs were reasonable.
- (4) The Contractor was not responsible for the cost overrun.

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REVISION OF SECTION 105
DISPUTES AND CLAIMS FOR CONTRACT ADJUSTMENTS

Should the Contractor's dispute use the Total Cost approach for calculating damages, damages will be determined by subtracting the contract amount from the total cost of performance. Should the Contractor's dispute use the Modified Total Cost approach for calculating damages, if the Contractor's bid was unrealistic in part, and/or some of its costs were unreasonable and/or some of its damages were caused by its own errors, those costs and damages will be deducted from the total cost of performance to arrive at the Modified Total Cost. The Total Cost or Modified Total Cost basis for calculating damages shall not be available for any disputes or claims seeking damages where the Contractor could have kept separate cost records at the time the dispute arose as described in subsection 105.22(a).

(a) *Document Retention.* The Contractor shall keep full and complete records of the costs and additional time incurred for each dispute for a period of at least three years after the date of final payment or until dispute is resolved, whichever is more. The Contractor, subcontractors, and lower tier subcontractors shall provide adequate facilities, acceptable to the Engineer, for an audit during normal business hours. The Contractor shall permit the Engineer or Department auditor to examine and copy those records and all other records required by the Engineer to determine the facts or contentions involved in the dispute. The Contractor shall identify and segregate any documents or information that the Contractor considers particularly sensitive, such as confidential or proprietary information.

Throughout the dispute, the Contractor and the Project Engineer shall keep complete daily records of extra costs and time incurred, in accordance with the following procedures:

1. Daily records shall identify each operation affected, the specific locations where work is affected, and the potential effect to the project's schedule. Such records shall also reflect all labor, material, and equipment applicable to the affected operations.
 2. On the first work day of each week following the date of the written notice of dispute, the Contractor shall provide the Project Engineer with the daily records for the preceding week. If the Contractor's records indicate costs greater than those kept by the Department, the Project Engineer will meet with the Contractor and present his records to the Contractor at the meeting. The Contractor shall notify the Engineer in writing within three work days of any inaccuracies noted in, or disagreements with, the Department's records.
- (b) *Initial Dispute Resolution Process.* To initiate the dispute resolution process the Contractor shall provide a written notice of dispute to the Project Engineer upon the failure of the Parties to resolve the issue through negotiation. Disputes will not be considered unless the Contractor has first complied with specified issue resolution processes such as those specified in subsections 104.02, 106.05, 108.08(a), and 108.08(d).

The Contractor shall supplement the written notice of dispute within 15 days with a written Request for Equitable Adjustment (REA) providing the following:

- (1) The date of the dispute
- (2) The nature of the circumstances which caused the dispute
- (3) A statement explaining in detail the specific provisions of the Contract and any basis, legal or factual, which support the dispute.
- (4) If any, the estimated quantum, calculated in accordance with methods set forth in subsection 105.24(b)12., of the dispute with supporting documentation
- (5) An analysis of the progress schedule showing the schedule change or disruption if the Contractor is asserting a schedule change or disruption.

The Contractor shall submit as much information on the quantum and impacts to the Contract time as is reasonably available with the REA and then supplement the REA as additional information becomes available. If the dispute escalates to the DRB process the DRB shall not hear any issue or consider any information that was not contained in the Request for Equitable Adjustment and fully submitted to the Project Engineer and Resident Engineer during the 105.22 process.

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DISPUTES AND CLAIMS FOR CONTRACT ADJUSTMENTS

- (c) *Project Engineer Review.* Within 15 days after receipt of the REA, the Project Engineer will meet with the Contractor to discuss the merits of the dispute. Within seven days after this meeting, the Project Engineer will issue a written decision on the merits of the dispute.

The Project Engineer will either deny the merits of the dispute or notify the Contractor that the dispute has merit. This determination will include a summary of the relevant facts, Contract provisions supporting the determination, and an evaluation of all scheduling issues that may be involved.

If the dispute is determined to have merit, the Contractor and the Project Engineer will determine the adjustment in payment, schedule, or both within 30 days. When a satisfactory adjustment is determined, it shall be implemented in accordance with subsections 106.05, 108.08, 109.04, 109.05 or 109.10 and the dispute is resolved.

If the Contractor accepts the Project Engineer's denial of the merits of the dispute, the dispute is resolved and no further action will be taken. If the Contractor does not respond in seven days, it will be assumed he has accepted the denial. If the Contractor rejects the Project Engineer's denial of the merits of the dispute or a satisfactory adjustment of payment or schedule cannot be agreed upon within 30 days, the Contractor may further pursue resolution of the dispute by providing written notice to the Resident Engineer within seven days, according to subsection 105.22(d).

- (d) *Resident Engineer Review.* Within seven days after receipt of the Contractor's written notice to the Resident Engineer of unsatisfactory resolution of the dispute, the Project Engineer and Resident Engineer will meet with the Contractor to discuss the dispute. Meetings shall continue weekly for a period of up to 30 days and shall include a Contractor's representative with decision authority above the project level.

If these meetings result in resolution of the dispute, the resolution will be implemented in accordance with subsections 108.08, 109.04, 109.05, or 109.10 and the dispute is resolved.

If these meetings do not result in a resolution or the participants mutually agree that they have reached an impasse, the dispute shall be presented to the Dispute Review Board in accordance with subsection 105.23.

105.23 Dispute Review Board. A Dispute Review Board (DRB) is an independent third party that will provide specialized expertise in technical areas and administration of construction contracts. The DRB will assist in and facilitate the timely and equitable resolution of disputes between CDOT and the Contractor in an effort to avoid animosity and construction delays, and to resolve disputes as close to the project level as possible. The DRB shall be established and operate as provided herein and shall serve as an independent and impartial board.

There are two types of DRBs: the "On Demand DRB" and the "Standing DRB". The DRB shall be an "On Demand DRB" unless a "Standing DRB" is specified in the Contract. An On Demand DRB shall be established only when the Project Engineer initiates a DRB review in accordance with subsection 105.23(a). A Standing DRB, when specified in the Contract, shall be established at the beginning of the project.

- (a) *Initiation of Dispute Review Board Review.* When a dispute has not been resolved in accordance with subsection 105.22, the Project Engineer will initiate the DRB review process within 5 days after the period described in subsection 105.22(d).
- (b) *Formation of Dispute Review Board.* DRBs will be established in accordance with the following procedures:
1. CDOT, in conjunction with the Colorado Contractors Association, will maintain a statewide list of suggested DRB candidates experienced in construction processes and the interpretation of contract documents and the resolution of construction disputes. The Board members shall be experienced in highway and transportation projects. After December 31, 2013 only individuals who have completed training (currently titled DRB Administration & Practice Training) through the Dispute Resolution Board Foundation or otherwise approved by CDOT can be a DRB member. When a DRB is formed, the parties shall execute the agreement set forth in subsection 105.23(f).
 2. If the dispute has a value of \$250,000 or less, the On Demand DRB shall have one member. The Contractor and CDOT shall select the DRB member and execute the agreement within 30 days of initiating the DRB process. If the parties do not agree on the DRB member, each shall select five candidates. Each party shall numerically rank their list using a scale of one to five with one being their

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first choice and five being their last choice. If common candidates are listed, but the parties cannot agree, that common candidate with the lowest combined numerical ranking shall be selected. If there is no common candidate, the lists shall be combined and each party shall eliminate three candidates from the list. Each party shall then numerically rank the remaining candidates, with No. 1 being the first choice. The candidate with the lowest combined numerical ranking shall be the DRB member. The CDOT Project Engineer will be responsible for having all parties execute the agreement.

3. If the dispute has a value over \$250,000, the On Demand DRB shall have three members. The Contractor and CDOT shall each select a member and those two members shall select a third. Once the third member is approved the three members will nominate one of them to be the Chair and execute the agreement within 45 days of initiating the DRB process.
4. The Standing DRB shall always have three members. The Contractor and CDOT shall each select a member and those two members shall select a third member. Once the third member is approved the three members will nominate one of them to be the Chair.. The Contractor and CDOT shall submit their proposed Standing DRB members within 5 days of execution of the Contract. The third member shall be selected within 15 days of execution of the Contract. Prior to construction starting the parties shall execute the Three Party Agreement. The CDOT Project Engineer will be responsible for having all parties execute the agreement. The Project Engineer will invite the Standing DRB members to the Preconstruction and any Partnering conferences.
5. DRB members shall not have been involved in the administration of the project under consideration. DRB candidates shall disclose to the parties the following relationships:
 - (1) Prior employment with either party
 - (2) Prior or current financial interests or ties to either party
 - (3) Prior or current professional relationships with either party
 - (4) Anything else that might bring into question the impartiality or independence of the DRB member
 - (5) Prior to agreeing to serve on a DRB, members shall notify all parties of any other CDOT DRB's they are serving or that they will be participating in another DRB.

If either party objects to the selection of a potential DRB member based on the disclosures of the potential member, that potential member shall not be placed on the Board.

6. There shall be no ex parte communications with the DRB at any time.
7. The service of a Board member may be terminated only by written agreement of both parties.
8. If a Board member resigns, is unable to serve, or is terminated, a new Board member shall be selected within four weeks in the same manner as the Board member who was removed was originally selected.

(c) *Additional Responsibilities of the Standing Disputes Review Board*

1. General. Within 120 days after the establishment of the Board, the Board shall meet at a mutually agreeable location to:
 - (1) Obtain copies of the Contract documents and Contractor's schedules for each of the Board members.
 - (2) Agree on the location of future meetings, which shall be reasonably close to the project site.
 - (3) Establish an address and telephone number for each Board member for the purposes of Board business.
2. Regular meetings. Regular meetings of the Board shall be held approximately every 120 to 180 days throughout the life of the Contract, except that this schedule may be modified to suit developments on the job as the work progresses. Regular meetings shall be attended by representatives of the Contractor and the Department.
3. The Board shall establish an agenda for each meeting which will cover all items that the Board considers necessary to keep it abreast of the project such as construction status, schedule, potential problems and

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solutions, status of past claims and disputes, and potential claims and disputes. Copies of each agenda shall be submitted to the Contractor and the Department at least seven days before the meeting date. Oral or written presentations or both shall be made by the Contractor and the Department as necessary to give the Board all the data the Board requires to perform its functions. The Board will prepare minutes of each meeting, circulate them to all participants for comments and approval, and issue revised minutes before the next meeting. As a part of each regular meeting, a field inspection trip of all active segments of the work at the project site may be made by the Board, the Contractor, and the Department.

4. Advisory Opinions

- (1) Advisory opinions are typically used soon after the parties find they have a potential dispute and have conducted preliminary negotiations but before expenditure of additional resources and hardening their positions. Advisory opinions provide quick insight into the DRB's likely assessment of the dispute. This process is quick and may be entirely oral and does not prejudice the opportunity for a DRB hearing.
- (2) Both parties must agree to seek an advisory opinion and so notify the chairperson. The procedure for requesting and issuing advisory opinions should be discussed with the DRB at the first meeting with the parties.
- (3) The DRB may or may not issue a written opinion, but if a written advisory opinion is issued, it must be at the specific request of both parties.
- (4) The opinion is only advisory and does not require an acceptance or rejection by either party. If the dispute is not resolved and a hearing is held, the oral presentations and advisory opinion are completely disregarded and the DRB hearing procedure is followed.
- (5) Advisory opinions should be limited to merit issues only.

(d) *Arranging a Dispute Review Board Hearing.* When the Project Engineer initiates the DRB review process, the Project Engineer will:

1. Contact the Contractor and the DRB to coordinate an acceptable hearing date and time. The hearing shall be held at the Resident Engineer's office unless an alternative location is agreed to by both parties. Unless otherwise agreed to by both parties the DRB hearing will be held within 30 days after the DRB agreement is signed by the CDOT Chief Engineer.
2. Ensure DRB members have copies of all documents previously prepared by the Contractor and CDOT pertaining to the dispute, the DRB request, the Contract documents, and the special provisions at least two weeks before the hearing.

(e) *Pre-Hearing Submittal:* At least fifteen days prior to the hearing, CDOT and the Contractor shall submit by e-mail to the DRB Chairperson their parties pre-hearing position paper. The DRB Chairperson shall simultaneously distribute by e-mail the pre-hearing position papers to all parties and other DRB members, if any. At the same time, each party shall submit a copy of all its supporting documents to be used at the hearing to all DRB Members and the other party unless the parties have agreed to a common set of documents as discussed in #2 below. In this case, CDOT shall submit the common set of documents to the Board and the Contractor. The pre-hearing position paper shall contain the following:

1. A joint statement of the dispute, and the scope of the desired decision. The joint statement shall summarize in a few sentences the nature of the dispute. If the parties are unable to agree on the wording of the joint statement, each party's position paper shall contain both statements, and identify the party authoring each statement. The parties shall agree upon a joint statement at least 20 days prior to the hearing and submit it to the DRB or each party's independent statement shall be submitted to the DRB and the other party at least 20 days prior to the hearing.
2. The basis and justification for the party's position, with reference to specific contract language and other supporting documents for each element of the dispute. To minimize duplication and repetitiveness, the parties may identify a common set of documents that will be referred to by both parties and submit them in a separate package to the DRB. The engineer will provide a hard copy of the project plans and Project

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and Standard Special Provisions, if necessary, to the DRB. Other standard CDOT documents such as Standard Specifications and M&S Standards are available on the CDOT website.

- (1) If any party contends that they are not necessary to the proceedings, the DRB shall determine that issue in the first instance. Should the DRB determine that a dispute does not involve a party, that party shall be relieved from participating in the DRB hearing and paying any further DRB costs.
 - (2) When the scope of the hearing includes quantum, the requesting party's position paper shall include full cost details, calculated in accordance with methods set forth in subsection 105.24(b)12. The Scope of the hearing will not include quantum if CDOT has ordered an audit and that audit has not been completed.
3. A list of proposed attendees at the hearing. In the event of any disagreement, the DRB shall make the final determination as to who attends the hearing.
 4. A list of any intended experts including their qualifications and a summary of what their presentation will include and an estimate of the length of the presentation.

The number of copies, distribution requirements, and time for submittal shall be established by the DRB and communicated to the parties by the Chairperson.

A pre-hearing phone conference with all DRB members and the parties shall be conducted as soon as a hearing date is established but no later than 10 days prior to the hearing. The DRB Chairperson shall explain the specifics of how the hearing will be conducted including how the two parties will present their information to the DRB (Ex: Each party makes a full presentation of their position or presentations will be made on a "point by point" basis with each party making a presentation only on an individual dispute issue before moving onto to the next issue). If the pre-hearing position papers and documents have been received by the Board prior to the conference call, the DRB Chairperson shall at this conference discuss the estimated hours of review and research activities for this dispute (such as time spent evaluating and preparing recommendations on specific issues presented to the DRB). If the pre-hearing position papers and documents have not been received by the Board prior to the conference call, another conference call will be scheduled during the initial conference call to discuss the estimated hours of review. Compensation for time agreed to in advance by the parties will be made at an agreed rate of \$125 per hour in accordance with subsection 105.23 (k) 2. Compensation for the phone conference time will also be made at an agreed to rate of \$125 per hour in accordance with subsection 105.23 (k) 2. The Engineer shall coordinate the phone conference.

- (f) *Dispute Review Board Hearing.* The DRB shall preside over a hearing. The chairperson shall control the hearing and conduct it as follows:
1. An employee of CDOT presents a brief description of the project and the status of construction on the project.
 2. The party that requested the DRB presents the dispute in detail as supported by previously submitted information and documentation in the pre-hearing position paper. No new information or disputes will be heard or addressed by the DRB.
 3. The other party presents its position in detail as supported by previously submitted information and documentation in the pre-hearing position paper. No new information or disputes will be heard or addressed by the DRB.
 4. Employees of each party are responsible for leading presentations at the DRB hearing.
 5. Attorneys shall not participate in the hearing unless the DRB specifically addresses an issue to them or unless agreed to by both parties. Should the parties disagree on attorney participation, the DRB shall decide on what, if any, participation will be permitted. Attorneys representing the parties are permitted to attend the hearing, provided their presence has been noted in the pre-hearing submittal.
 6. Either party may use experts. A party intending to offer an outside expert's analysis at the hearing shall

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disclose such intention in the pre-hearing position paper. The expert's name and a general statement of the area of the dispute that will be covered by his presentation shall be included in the disclosure. The other party may present an outside expert to address or respond to those issues that may be raised by the disclosing party's outside expert.

7. If both parties approve, the DRB may retain an outside expert. The DRB chairperson shall include the cost of the outside expert in the DRB's regular invoice. CDOT and the Contractor shall equally bear the cost of the services of the outside expert employed by the DRB.
 8. Upon completion of their presentations and rebuttals, both parties and the DRB will be provided the opportunity to exchange questions and answers. All questions shall be directed to the chairperson first. Attendees may respond only when board members request a response.
 9. The DRB shall hear only those disputes identified in the written request for the DRB and the information contained in the pre-hearing submittals. The board shall not hear or address other disputes. If either party attempts to discuss a dispute other than those to be heard by the DRB or attempts to submit new information, the chairperson shall inform such party that the board shall not hear the issue and shall not accept any additional information. The DRB shall not hear any issue or consider any information that was not contained in the Request for Equitable Adjustment and fully submitted to the Project Engineer and Resident Engineer during the 105.22 process.
 10. If either party fails to timely deliver a position paper, the DRB may reschedule the hearing one time. On the final date and time established for the hearing, the DRB shall proceed with the hearing using the information that has been submitted.
 11. If a party fails to appear at the hearing, the DRB shall proceed as if all parties were in attendance.
- (g) *Dispute Review Board Recommendation.* The DRB shall issue a Recommendation in accordance with the following procedures:
1. The DRB shall not make a recommendation on the dispute at the meeting. Prior to the closure of the hearing, the DRB members and the Contractor and CDOT together will discuss the time needed for analysis and review of the dispute and the issuance of the DRB's recommendation. The maximum time shall be 30 days unless otherwise agreed to by both parties. At a minimum, the recommendation shall contain all the elements listed in Rule 35, Form of Award, of the Arbitration Regular Track Provisions listed at the end of subsection 105.24.
 2. After the meeting has been closed, the DRB shall prepare a written Recommendation signed by each member of the DRB. In the case of a three member DRB, where one member dissents that member shall prepare a written dissent and sign it.
 3. The chairperson shall transmit the signed Recommendation and any supporting documents to both parties.
- (h) *Clarification and Reconsideration of Recommendation.* Either party may request clarification or reconsideration of a decision within ten days following receipt of the Recommendation. Within ten days after receiving the request, the DRB shall provide written clarification or reconsideration to both parties unless otherwise agreed to by both parties.

Requests for clarification or reconsideration shall be submitted in writing simultaneously to the DRB and to the other party.

The Board shall not accept requests for reconsideration that amount to a renewal of a prior argument or additional argument based on facts available at the time of the hearing. The Board shall not consider any documents or arguments which have not been made a part of the pre-hearing submittal other than clarification and data supporting previously submitted documentation.

Only one request for clarification or reconsideration per dispute from each party will be allowed.

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- (i) *Acceptance or Rejection of Recommendation.* CDOT and the Contractor shall submit their written acceptance or rejection of *the* Recommendation, in whole or in part, concurrently to the other party and to the DRB within 14 days after receipt of the Recommendation or following receipt of responses to requests for clarification or reconsideration.

If the parties accept the Recommendation or a discreet part thereof, it will be implemented in accordance with subsections 108.08, 109.04, 109.05, or 109.10 and the dispute is resolved.

If either party rejects the Recommendation in whole or in part, it shall give written explanation to the other party within 14 days after receiving the Recommendation. When the Recommendation is rejected in whole or in part by either party, the other party may either abandon the dispute or pursue a formal claim in accordance with subsection 105.24.

If either party fails to submit its written acceptance or rejection of the Dispute Board's recommendation, according to these specifications, such failure shall constitute that party's acceptance of the Board's recommendation.

- (j) *Admissibility of Recommendation.* Recommendations of a DRB issued in accordance with subsection 105.23 are admissible in subsequent proceedings but shall be prefaced with the following paragraph:

This Recommendation may be taken under consideration with the understanding that:

1. The DRB Recommendation was a proceeding based on presentations by the parties.
 2. No fact or expert witnesses presented sworn testimony or were subject to cross-examination.
 3. The parties to the DRB were not provided with the right to any discovery, such as production of documents or depositions.
 4. There is no record of the DRB hearing other than the Recommendation.
- (k) *Cost and Payments.*

1. General Administrative Costs. The Contractor and the Department shall equally share the entire cost of the following to support the Board's operation:
 - (1) Copies of Contract and other relevant documentation
 - (2) Meeting space and facilities
 - (3) Secretarial Services
 - (4) Telephone
 - (5) Mail
 - (6) Reproduction
 - (7) Filing
2. The Department and the Contractor shall bear the costs and expenses of the DRB equally. Each DRB board member shall be compensated at an agreed rate of \$1,200 per day if time spent on-site per meeting is greater than four hours. Each DRB board member shall be compensated at an agreed rate of \$800 per day if time spent on-site per meeting is less than or equal to four hours. The time spent traveling to and from each meeting shall be reimbursed at \$50 per hour if the travel distance is more than 50 miles. The agreed daily and travel time rates shall be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel of more than 50 miles and incidentals for each day, or portion thereof that the DRB member is at an authorized DRB meeting. No additional compensation will be made for time spent by DRB members in review and research activities outside the official DRB meetings unless that time, (such as time spent evaluating and preparing recommendations on specific issues presented to the DRB), has been specifically agreed to in advance by the Department and Contractor. Time away from the project that has been specifically agreed to in advance by the parties will be compensated at an agreed rate of \$125 per hour. The agreed amount of \$125 per hour shall include all incidentals. Members serving on more than one DRB, regardless of the number of

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meetings per day, shall not be paid more than the all inclusive rate per day or rate per hour for an individual project.

- 3. Payments to Board Members and General Administrative Costs. Each Board member shall submit an invoice to the Contractor for fees and applicable expenses incurred each month following a month in which the Board members participated in Board functions. Such invoices shall be in the format established by the Contractor and the Department. The Contractor shall submit to the Department copies of all invoices. No markups by the Contractor will be allowed on any DRB costs. The Department will split the cost by authorizing 50 percent payment on the next progress payment. The Contractor shall make all payments in full to Board members within seven calendar days after receiving payment from the Department for this work.

(l) *Dispute Review Board Three Party Agreement.*

DISPUTE REVIEW BOARD
THREE PARTY AGREEMENT
COLORADO PROJECT NO.

THIS THREE PARTY AGREEMENT, made as of the date signed by the Chief Engineer below, by and between: the Colorado Department of Transportation, hereinafter called the "Department"; and

_____ hereinafter called the "Contractor"; and

_____ and

_____ hereinafter called the "Dispute Review Board" or "Board".

WHEREAS, the Department is now engaged in the construction of the _____ [Project Name]

and

WHEREAS, the Contract provides for the establishment of a Board in accordance with subsections 105.22 and 105.23 of the specifications.

NOW, THEREFORE, it is hereby agreed:

ARTICLE I
DESCRIPTION OF WORK AND SERVICES

The Department and the Contractor shall form a Board in accordance with this agreement and the provisions of subsection 105.23.

ARTICLE II
COMMITMENT ON PART OF THE PARTIES HERETO

The parties hereto shall faithfully fulfill the requirements of subsection 105.23 and the requirements of this agreement.

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ARTICLE III
COMPENSATION

The parties shall share equally in the cost of the Board, including general administrative costs (meeting space and facilities, secretarial services, telephone, mail, reproduction, filing) and the member's individual fees. Reimbursement of the Contractor's share of the Board expenses for any reason is prohibited.

The Contractor shall make all payments in full to Board members. The Contractor will submit to the Department an itemized statement for all such payments, and the Department will split the cost by including 50 percent payment on the next progress payment. The Contractor and the Department will agree to accept invoiced costs prior to payment by the Contractor.

DISPUTE REVIEW BOARD
THREE PARTY AGREEMENT PAGE 2
COLORADO PROJECT NO.

Board members shall keep all fee records pertaining to this agreement available for inspection by representatives of the Department and the Contractor for a period of three years after the termination of the Board members' services.

Payment to each Board member shall be at the fee rates established in subsection 105.23 and agreed to by each Board member, the Contractor, and the Department. In addition, reimbursement will be made for applicable expenses.

Each Board member shall submit an invoice to the Contractor for fees incurred each month following a month in which the members participated in Board functions. Such invoices shall be in the format established by the Contractor and the Department.

Payments shall be made to each Board member within 60 days after the Contractor and Department have received all the applicable billing data and verified the data submitted by that member. The Contractor shall make payment to the Board member within seven calendar days of receipt of payment from the Department.

ARTICLE IV
ASSIGNMENT

Board members shall not assign any of the work to be performed by them under this agreement. Board members shall disclose any conflicts of interest including but not limited to any dealings with the either party in the previous five years other than serving as a Board member under other contracts.

ARTICLE V
COMMENCEMENT AND TERMINATION OF SERVICES

The commencement of the services of the Board shall be in accordance with subsection 105.23 of the specifications and shall continue until all assigned disputes under the Contract which may require the Board's services have been heard and a Recommendation has been issued by the Board as specified in subsection 105.23. If a Board member is unable to fulfill his responsibilities for reasons specified in subsection 105.23(b)7, he shall be replaced as provided therein, and the Board shall fulfill its responsibilities as though there had been no change.

ARTICLE VI
LEGAL RELATIONS

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The parties hereto mutually agree that each Board member in performance of his duties on the Board is acting as an independent contractor and not as an employee of either the Department or the Contractor. Board members will guard their independence and avoid any communication about the substance of the dispute without both parties being present.

The Board members are absolved of any personal liability arising from the Recommendations of the Board. The parties agree that members of the dispute review board panel are acting as mediators for purposes of C.R.S. § 13-22-302(4) and, as such, the liability of any dispute review board member shall be limited to willful and wanton misconduct as provided for in C.R.S. § 13-22-305(6)

DISPUTE REVIEW BOARD
THREE PARTY AGREEMENT PAGE 3
COLORADO PROJECT NO.

IN WITNESS HEREOF, the parties hereto have caused this agreement to be executed the day and year first written above.

BOARD MEMBER: _____.

BY: _____.

BOARD MEMBER: _____.

BY: _____.

BOARD MEMBER: _____.

BY: _____.

CONTRACTOR: _____.

BY: _____.

TITLE:

COLORADO DEPARTMENT OF TRANSPORTATION

BY: _____ Date: _____.

TITLE: CHIEF ENGINEER

105.24 Claims for Unresolved Disputes. The Contractor may file a claim only if the disputes resolution process described in subsections 105.22 and 105.23 has been exhausted without resolution of the dispute. Other methods of nonbinding dispute resolution, exclusive of arbitration and litigation, can be used if agreed to by both parties.

This subsection applies to any unresolved dispute or set of disputes between CDOT and the Contractor with an aggregate value of more than \$15,000. Unresolved disputes with an aggregate value of more than \$15,000 from subcontractors, materials suppliers or any other entity not a party to the Contract shall be submitted through the Contractor in accordance with this subsection as a pass-through claim. Review of a pass-through claim does not create privity of Contract between CDOT and any other entity.

Subsections 105.22, 105.23 and 105.24 provide both contractual alternative dispute resolution processes and constitute remedy-granting provisions pursuant to Colorado Revised Statutes which must be exhausted in their entirety.

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Merit-binding arbitration or litigation proceedings must commence within 180-calendar days of the Chief Engineer's decision, absent written agreement otherwise by both parties.

The venue for all unresolved disputes with an aggregate value \$15,000 or less shall be the County Court for the City and County of Denver.

Non-binding Forms of alternative dispute resolution such as Mediation are available upon mutual agreement of the parties for all claims submitted in accordance with this subsection.

The cost of the non-binding ADR process shall be shared equally by both parties with each party bearing its own preparation costs. The type of nonbinding ADR process shall be agreed upon by the parties and shall be conducted within the State of Colorado at a mutually acceptable location. Participation in a nonbinding ADR process does not in any way waive the requirement that merit-binding arbitration or litigation proceedings must commence within 180-calendar days of the Chief Engineer's decision, absent written agreement otherwise by both parties.

(a) *Notice of Intent to File a Claim.*

Within 30 days after rejection of the Dispute Resolution Board's Recommendation issued in accordance with subsection 105.23, the Contractor shall provide the Region Transportation Director with a written notice of intent to file a claim. The Contractor shall also send a copy of this notice to the Resident Engineer. For the purpose of this subsection Region Transportation Director shall mean the Region Transportation Director or the Region Transportation Director's designated representative. CDOT will acknowledge in writing receipt of Notice of Intent within 7 days.

(b) *Claim Package Submission.* Within 60 days after submitting the notice of intent to file a claim, the Contractor shall submit five copies of a complete claim package representing the final position the Contractor wishes to have considered. All claims shall be in writing and in sufficient detail to enable the RTD to ascertain the basis and amount of claim. The claim package shall include all documents supporting the claim, regardless of whether such documents were provided previously to CDOT.

If requested by the Contractor the 60 day period may be extended by the RTD in writing prior to final acceptance. As a minimum, the following information shall accompany each claim.

1. A claim certification containing the following language, as appropriate:

A. For a direct claim by the Contractor:

<p>CONTRACTOR'S CLAIM CERTIFICATION</p> <p>Under penalty of law for perjury or falsification, the undersigned, _____ (name), (title) _____, of _____ (company), hereby certifies that the claim of \$ _____ for extra compensation and ___ Days additional time, made herein for work on this contract is true to the best of my knowledge and belief and supported under the Contract between the parties. This claim package contains all available documents that support the claims made herein and I understand that no additional information, other than for clarification and data supporting previously submitted documentation, may be presented by me.</p> <p>Dated _____ /s/ _____</p> <p>Subscribed and sworn before me this ___ day of _____</p> <p>_____</p> <p>NOTARY PUBLIC My Commission Expires: _____</p>

B. For a pass-through claim:

<p>PASS-THROUGH CLAIM CERTIFICATION</p>
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Under penalty of law for perjury or falsification, the undersigned, _____ (name) _____, (title) _____, of _____ (company) _____, hereby certifies that the claim of \$ _____ for extra compensation and ___ Days additional time, made herein for work on this Project is true to the best of my knowledge and belief and supported under the contract between the parties.

This claim package contains all available documents that support the claims made herein and I understand that no additional information, other than for clarification and data supporting previously submitted documentation, may be presented by me.

Dated _____ /s/ _____

Subscribed and sworn before me this ___ day of _____.

NOTARY PUBLIC

My Commission Expires: _____

Dated _____ /s/ _____

The Contractor certifies that the claim being passed through to CDOT is passed through in good faith and is accurate and complete to the best of my knowledge and belief.

Dated _____ /s/ _____

Subscribed and sworn before me this ___ day of _____.

NOTARY PUBLIC

My Commission Expires: _____

2. A detailed factual statement of the claim for additional compensation, time, or both, providing all necessary dates, locations, and items of work affected by the claim. The Contractor's detailed factual statement shall expressly describe the basis of the claim and factual evidence supporting the claim. This requirement is not satisfied by simply incorporating into the claim package other documents that describe the basis of the claim and supporting factual evidence.
3. The date on which facts were discovered which gave rise to the claim.
4. The name, title, and activity of all known CDOT, Consultant, and other individuals who may be knowledgeable about facts giving rise to such claim.
5. The name, title, and activity of all known Contractor, subcontractor, supplier and other individuals who may be knowledgeable about facts giving rise to such claim.
6. The specific provisions of the Contract, which support the claim and a statement of the reasons why such provisions support the claim.
7. If the claim relates to a decision of the Project Engineer, which the Contract leaves to the Project Engineer's discretion, the Contractor shall set out in detail all facts supporting its position relating to the decision of the Project Engineer.
8. The identification of any documents and the substance of all oral communications that support the claim.
9. Copies of all known documents that support the claim.
10. The Dispute Review Board Recommendation.
11. If an extension of contract time is sought, the documents required by subsection 108.08(d).
12. If additional compensation is sought, the exact amount sought and a breakdown of that amount into the following categories:
 - 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
 - (2) Costs for additional bond, insurance and tax

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- (3) Increased costs for materials
 - (4) Equipment costs calculated in accordance with subsection 109.04(c) for Contractor owned equipment and based on certified invoice costs for rented equipment
 - (5) Costs of extended job site overhead
 - (6) Salaried employees assigned to the project
 - (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.
 - (9) Interest shall be paid in accordance with CRS 5-12-102 beginning from the date of the Notice of Intent to File Claim
- B. In adjustment for the costs as allowed above, the Department will have no liability for the following items of damages or expense:
- (1) Profit in excess of that provided in 12.A.(8) above
 - (2) Loss of Profit
 - (3) Additional cost of labor inefficiencies in excess of that provided in A. above
 - (4) Home office overhead in excess of that provided in A. above
 - (5) Consequential damages, including but not limited to loss of bonding capacity, loss of bidding opportunities, and insolvency
 - (6) Indirect costs or expenses of any nature in excess of that provided in A. above
 - (7) Attorney's fees, claim preparation fees, and expert fees
- (c) *Audit.* An audit may be performed by the Department for any dispute or claim, and is mandatory for all disputes and claims with amounts greater than \$250,000. All audits will be complete within 60 days of receipt of the complete claim package, provided the Contractor allows the auditors reasonable and timely access to the Contractor's books and records. For all claims with amounts greater than \$250,000 the Contractor shall submit a copy of certified claim package directly to the CDOT Audit Unit at the following address:

Division of Audit
 4201 E. Arkansas Ave
 Denver, Co. 80222

- (d) *Region Transportation Director Decision.* When the Contractor properly files a claim, the RTD will review the claim and render a written decision to the Contractor to either affirm or deny the claim, in whole or in part, in accordance with the following procedure.

The RTD may consolidate all related claims on a project and issue one decision, provided that consolidation does not extend the time period within which the RTD is to render a decision. Consolidation of unrelated claims will not be made.

The RTD will render a written decision to the Contractor within 60 days after the receipt of the claim package or receipt of the audit whichever is later. In rendering the decision, the RTD: (1) will review the information in the Contractor's claim; (2) will conduct a hearing if requested by either party; and (3) may consider any other information available in rendering a decision.

The RTD will assemble and maintain a claim record comprised of all information physically submitted by the Contractor in support of the claim and all other discoverable information considered by the RTD in reaching a decision. Once the RTD assembles the claim record, the submission and consideration of additional information, other than for clarification and data supporting previously submitted documentation, at any subsequent level of review by anyone, will not be permitted.

The RTD will provide a copy of the claim record and the written decision to the Contractor describing the information considered by the RTD in reaching a decision and the basis for that decision. If the RTD fails to render a written decision within the 60 day period, or within any extended time period as agreed to by both parties, the Contractor shall either: (1) accept this as a denial of the claim, or (2) appeal the claim to the Chief

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Engineer, as described in this subsection.

If the Contractor accepts the RTD decision, the provisions of the decision shall be implemented in accordance with subsections 108.08, 109.04, 109.05, or 109.10 and the claim is resolved.

If the Contractor disagrees with the RTD decision, the Contractor shall either: (1) accept the RTD decision as final, or (2) file a written appeal to the Chief Engineer within 30 days from the receipt of the RTD decision. The Contractor hereby agrees that if a written appeal is not properly filed, the RTD decision is final.

- (e) *Chief Engineer Decision.* When a claim is appealed, the RTD will provide the claim record to the Chief Engineer. Within 15 days of the appeal either party may submit a written request for a hearing with the Chief Engineer or duly authorized Headquarters delegates. The Chief Engineer or a duly authorized Headquarters delegate will review the claim and render a decision to affirm, overrule, or modify the RTD decision in accordance with the following.

The Contractor's written appeal to the Chief Engineer will be made a part of the claim record.

The Chief Engineer will render a written decision within 60 days after receiving the written appeal. The Chief Engineer will not consider any information that was not previously made a part of the claim record, other than clarification and data supporting previously submitted documentation.

The Contractor shall have 30 days to accept or reject the Chief Engineer's decision. The Contractor shall notify the Chief Engineer of its acceptance or rejection in writing.

If the Contractor accepts the Chief Engineer's decision, the provisions of the decision will be implemented in accordance with subsections 108.08, 109.04, 109.05, or 109.10 and the claim is resolved.

If the Contractor disagrees with the Chief Engineer's decision, the Contractor shall either (1) pursue an alternative dispute resolution process in accordance with this specification or (2) initiate litigation or merit binding arbitration in accordance with subsection 105.24(f).

If the Chief Engineer does not issue a decision as required, the Contractor may immediately initiate either litigation or merit binding arbitration in accordance with subsection 105.24(f).

For the convenience of the parties to the Contract it is mutually agreed by the parties that any merit binding arbitration or De Novo litigation shall be brought within 180-calendar days from the date of the Chief Engineer's decision. The parties understand and agree that the Contractor's failure to bring suit within the time period provided, shall be a complete bar to any such claims or causes of action.

- (f) *De Novo Litigation or Merit Binding Arbitration.* If the Contractor disagrees with the Chief Engineer's decision, the Contractor may initiate de novo litigation or merit binding arbitration to finally resolve the claim that the Contractor submitted to CDOT, depending on which option was selected by the Contractor on Form 1378 which shall be submitted at the preconstruction conference. Such litigation or arbitration shall be strictly limited to those claims that were previously submitted and decided in the contractual dispute and claims processes outlined herein. This does not preclude the joining in one litigation or arbitration of multiple claims from the same project provided that each claim has gone through the dispute and claim process specified in subsections 105.22 through 105.24. The parties may agree, in writing, at any time, to pursue some other form of alternative dispute resolution.

Any offer made by the Contractor or the Department at any stage of the claims process, as set forth in this subsection, shall be deemed an offer of settlement pursuant to Colorado Rule of Evidence 408 and therefore inadmissible in any litigation or arbitration.

If the Contractor selected litigation, then de novo litigation shall proceed in accordance with the Colorado Rules of Civil Procedure and the proper venue is the Colorado State District Court in and for the City and County of Denver, unless both parties agree to the use of arbitration.

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If the Contractor selected merit binding arbitration, or if both parties subsequently agreed to merit binding arbitration, arbitration shall be governed by the modified version of AAA's Construction Industry Arbitration Rules which follow. Pursuant to the modified arbitration rules (R35 through R39), the arbitrators shall issue a binding decision with regard to entitlement and a non-binding decision with regard to quantum. If either party disagrees with the decision on quantum, the disagreeing party may seek a trial de novo in Denver District Court with regard to quantum only.

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**AMERICAN ARBITRATION ASSOCIATION CONSTRUCTION INDUSTRY ARBITRATION RULES MODIFIED
FOR USE WITH CDOT SPECIFICATION SUBSECTION 105.24**

REGULAR TRACK PROCEDURES

R-1. Agreement of Parties

- (a) The parties shall be deemed to have made these rules a part of their Contract. These rules and any amendments shall apply in the form in effect at the time the administrative requirements are met for a demand for arbitration. The parties, by written agreement, may vary the procedures set forth in these rules. After appointment of the arbitrator, such modifications may be made only with the consent of the arbitrator.
- (b) Unless the parties determine otherwise, the Fast Track Procedures shall apply in any case in which aggregate claims do not exceed \$75,000, exclusive of interest and arbitration fees and costs. Parties may also agree to use these procedures in larger cases. Unless the parties agree otherwise, these procedures will not apply in cases involving more than two parties except for pass-through claims. The Fast Track Procedures shall be applied as described in Sections F-1 through F-13 of these rules, in addition to any other portion of these rules that is not in conflict with the Fast Track Procedures.
- (c) Unless the parties agree otherwise, the Procedures for Large, Complex Construction Disputes shall apply to all cases in which the disclosed aggregate claims of any party is at least \$500,000, exclusive of claimed interest, arbitration fees and costs. Parties may also agree to use these procedures in cases involving claims under \$500,000, or in nonmonetary cases. The Procedures for Large, Complex Construction Disputes shall be applied as described in Sections L-1 through L-4 of these rules, in addition to any other portion of these rules that is not in conflict with the Procedures for Large, Complex Construction Disputes.
- (d) All other cases shall be administered in accordance with Sections R-1 through R-45 of these rules.

R-2. Independent Arbitration Provider and Delegation of Duties

When parties agree to arbitrate under these rules, or when they provide for arbitration by an independent third-party (Arbitration Provider) and arbitration is initiated under these rules, they thereby authorize the Arbitration Provider to administer the arbitration. The authority and duties of the Arbitration Provider are prescribed in the parties' Contract and in these rules, and may be carried out through such of the Arbitration Provider's representatives as it may direct. The Arbitration Provider will assign the administration of an arbitration to its Denver office

R-3. Initiation of Arbitration

Arbitration shall be initiated in the following manner.

- (a) The Contractor shall, within 30 days after the Chief Engineer issues a decision, submit to the Chief Engineer written notice of its intention to arbitrate (the "demand"). The demand shall indicate the appropriate qualifications for the arbitrator(s) to be appointed to hear the arbitration.
- (b) CDOT may file an answering statement with the Contractor within 15 days after receiving the demand. If a counterclaim is asserted, it shall contain a statement setting forth the nature of the counterclaim, the amount involved, if any, and the remedy sought.
- (c) The Chief Engineer shall retain an Arbitration Provider, such as the American Arbitration Association, which will administer an arbitration pursuant to these Rules, except to the extent that such rules conflict with the

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specifications, in which case the specifications shall control.

(d) The Arbitration Provider shall confirm its retention to the parties.

R-4. Consolidation or Joinder

If the parties' agreement or the law provides for consolidation or joinder of related arbitrations, all involved parties will endeavor to agree on a process to effectuate the consolidation or joinder.

If they are unable to agree, the Arbitration Provider shall directly appoint a single arbitrator for the limited purpose of deciding whether related arbitrations should be consolidated or joined and, if so, establishing a fair and appropriate process for consolidation or joinder. The Arbitration Provider may take reasonable administrative action to accomplish the consolidation or joinder as directed by the arbitrator.

R-5. Appointment of Arbitrator

An arbitrator shall be appointed in the following manner:

- (a) Immediately after the Arbitration Provider is retained, the Arbitration Provider shall send simultaneously to each party to the dispute an identical list of 10 names of potential arbitrators. The parties are encouraged to agree to an arbitrator from the submitted list and to advise the AAA of their agreement. Absent agreement of the parties, the arbitrator shall not have served as the mediator in the mediation phase of the instant proceeding.
- (b) If the parties cannot agree to arbitrator(s), each party to the dispute shall have 15 calendar days from the transmittal date in which to strike names objected to, number the remaining names in order of preference, and return the list to the Arbitration Provider. If a party does not return the list within the time specified, all persons named therein shall be deemed acceptable. From among the persons who have been approved on both lists, and in accordance with the designated order of mutual preference, the Arbitration Provider shall invite an arbitrator to serve.
- (c) Unless both parties agree otherwise one arbitrator shall be used for claims less than \$250,000 and three arbitrators shall be used for claims \$250,000 and greater. Within 15 calendar days from the date of the appointment of the last arbitrator, the Arbitration Provider shall appoint a chairperson.
- (d) The entire claim record will be made available to the arbitrators by the Chief Engineer within 15 calendar days from the date of the appointment of the last arbitrator.

R-6. Changes of Claim

The arbitrator(s) will not consider any information that was not previously made a part of the claim record as transmitted by the Chief Engineer, other than clarification and data supporting previously submitted documentation.

R-7. Disclosure

- (a) Any person appointed or to be appointed as an arbitrator shall disclose to the Arbitration Provider any circumstance likely to give rise to justifiable doubt as to the arbitrator's impartiality or independence, including any bias or any interest in the result of the arbitration or any relationship with the parties or their representatives. Such obligation shall remain in effect throughout the arbitration.
- (b) Upon receipt of such information from the arbitrator or another source, the Arbitration Provider shall communicate the information to the parties and, if it deems it appropriate to do so, to the arbitrator and others.

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- (c) In order to encourage disclosure by arbitrators, disclosure of information pursuant to this Section R-6 is not to be construed as an indication that the arbitrator considers that the disclosed circumstances are likely to affect impartiality or independence.
- (d) In no case shall an arbitrator be employed by, affiliated with, or have consultive or business connection with the claimant Contractor or CDOT. An arbitrator shall not have assisted either in the evaluation, preparation, or presentation of the claim case either for the Contractor or the Department or have rendered an opinion on the merits of the claim for either party, and shall not do so during the proceedings of arbitration.

R-8. Disqualification of Arbitrator

- (a) Any arbitrator shall be impartial and independent and shall perform his or her duties with diligence and in good faith, and shall be subject to disqualification for: (i) partiality or lack of independence, (ii) inability or refusal to perform his or her duties with diligence and in good faith; and/or (iii) any grounds for disqualification provided by applicable law.
- (b) Upon objection of a party to the continued service of an arbitrator, or on its own initiative, the Arbitration Provider shall determine whether the arbitrator should be disqualified under the grounds set out above, and shall inform the parties of its decision, which decision shall be conclusive.

R-9. Communication with Arbitrator

No party and no one acting on behalf of any party shall communicate *ex parte* with an arbitrator or a candidate for arbitrator concerning the arbitration.

R-10. Vacancies

- (a) If for any reason an arbitrator is unable to perform the duties of the office, the Arbitration Provider may, on proof satisfactory to it, declare the office vacant. Vacancies shall be filled in accordance with the applicable provisions of these rules.
- (b) In the event of a vacancy in a panel of neutral arbitrators after the hearings have commenced, the remaining arbitrator or arbitrators may continue with the hearing and determination of the controversy, unless the parties agree otherwise.
- (c) In the event of the appointment of a substitute arbitrator, the panel of arbitrators shall determine in its sole discretion whether it is necessary to repeat all or part of any prior hearings.

R-11. Jurisdiction

- (a) The arbitrator shall have the power to rule on his or her own jurisdiction, including any objections with respect to the existence, scope or validity of the arbitration agreement.
- (b) The arbitrator shall have the power to determine the existence or validity of a contract of which an arbitration clause forms a part. Such an arbitration clause shall be treated as an agreement independent of the other terms of the contract. A decision by the arbitrator that the contract is null and void shall not for that reason alone render invalid the arbitration clause.
- (c) A party must object to the jurisdiction of the arbitrator or to the arbitrability of a claim or counterclaim no later than 15 days after the Arbitration Provider confirms its retention to the parties. The arbitrator may rule on such objections as a preliminary matter or as part of the final award.

R-12. Administrative Conference

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At the request of any party or upon the Arbitration Provider's own initiative, the Arbitration Provider may conduct an administrative conference, in person or by telephone, with the parties and/or their representatives. The conference may address such issues as arbitrator selection, potential exchange of information, a timetable for hearings and any other administrative matters.

R-13. Preliminary Hearing

- (a) At the request of any party or at the discretion of the arbitrator or the Arbitration Provider, the arbitrator may schedule as soon as practicable a preliminary hearing with the parties and/or their representatives. The preliminary hearing may be conducted by telephone at the arbitrator's discretion.
- (b) During the preliminary hearing, the parties and the arbitrator should discuss the future conduct of the case, including clarification of the issues and claims, a schedule for the hearings and any other preliminary matters.

R-14. Exchange of Information

- (a) At the request of any party or at the discretion of the arbitrator, consistent with the expedited nature of arbitration, the arbitrator may direct: (i) the production of documents and other information; (ii) short depositions, particularly with regard to experts; and/or (iii) the identification of any witnesses to be called.
- (b) At least five business days prior to the hearing, the parties shall exchange copies of all exhibits they intend to submit at the hearing.
- (c) The arbitrator is authorized to resolve any disputes concerning the exchange of information.
- (d) Additional discovery may be ordered by the arbitrator in extraordinary cases when the demands of justice require it.

R-15. Date, Time, and Place of Hearing

- (a) The arbitrator shall set the date, time, and place for each hearing and/or conference. The parties shall respond to requests for hearing dates in a timely manner, be cooperative in scheduling the earliest practicable date, and adhere to the established hearing schedule.
- (b) The parties may mutually agree on the locale where the arbitration is to be held. Absent such agreement, the arbitration shall be held in the City and County of Denver.
- (c) The Arbitration Provider shall send a notice of hearing to the parties at least ten calendar days in advance of the hearing date, unless otherwise agreed by the parties.

R-16. Attendance at Hearings

The arbitrator and the Arbitration Provider shall maintain the privacy of the hearings unless the law provides to the contrary. Any person having a direct interest in the arbitration is entitled to attend hearings. The arbitrator shall otherwise have the power to require the exclusion of any witness, other than a party or other essential person, during the testimony of any other witness. It shall be discretionary with the arbitrator to determine the propriety of the attendance of any person other than a party and its representative.

R-17. Representation

Any party may be represented by counsel or other authorized representative. A party intending to be so represented shall notify the other party and the Arbitration Provider of the name and address of the representative at least three calendar days prior to the date set for the hearing at which that person is first to appear.

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R-18. Oaths

Before proceeding with the first hearing, each arbitrator may take an oath of office and, if required by law, shall do so. The arbitrator may require witnesses to testify under oath administered by any duly qualified person and, if it is required by law or requested by any party, shall do so.

R-19. Stenographic Record

Any party desiring a stenographic record shall make arrangements directly with a stenographer and shall notify the other parties of these arrangements at least three days in advance of the hearing. The requesting party or parties shall pay the cost of the record. If the transcript is agreed by the parties, or determined by the arbitrator to be the official record of the proceeding, it must be provided to the arbitrator and made available to the other parties for inspection, at a date, time, and place determined by the arbitrator.

R-20. Interpreters

Any party wishing an interpreter shall make all arrangements directly with the interpreter and shall assume the costs of the service.

R-21. Postponements

The arbitrator for good cause shown may postpone any hearing upon agreement of the parties, upon request of a party, or upon the arbitrator's own initiative.

R-22. Arbitration in the Absence of a Party or Representative

Unless the law provides to the contrary, the arbitration may proceed in the absence of any party or representative who, after due notice, fails to be present or fails to obtain a postponement. An award shall not be made solely on the default of a party. The arbitrator shall require the party who is present to submit such evidence as the arbitrator may require for the making of an award.

R-23. Conduct of Proceedings

- (a) The Contractor shall present evidence to support its claim. CDOT shall then present evidence supporting its defense. Witnesses for each party shall also submit to questions from the arbitrator and the adverse party. The arbitrator has the discretion to vary this procedure; provided that the parties are treated with equality and that each party has the right to be heard and is given a fair opportunity to present its case.
- (b) The arbitrator, exercising his or her discretion, shall conduct the proceedings with a view to expediting the resolution of the dispute and may direct the order of proof, bifurcate proceedings, and direct the parties to focus their presentations on issues the decision of which could dispose of all or part of the case. The arbitrator shall entertain motions, including motions that dispose of all or part of a claim or that may expedite the proceedings, and may also make preliminary rulings and enter interlocutory orders.
- (c) The parties may agree to waive oral hearings in any case.

R-24. Evidence

- (a) The arbitrators shall consider all written information available in the claim record and all oral presentations in support of that record by the Contractor and CDOT. Conformity to legal rules of evidence shall not be necessary.
- (b) The arbitrators shall not consider any written documents or arguments which have not previously been made

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a part of the claim record, other than clarification and data supporting previously submitted documentation. The arbitrators shall not consider an increase in the amount of the claim, or any new claims.

- (c) The arbitrator shall determine the admissibility, relevance, and materiality of any evidence offered. The arbitrator may request offers of proof and may reject evidence deemed by the arbitrator to be cumulative, unreliable, unnecessary, or of slight value compared to the time and expense involved. All evidence shall be taken in the presence of all of the arbitrators and all of the parties, except where: (i) any of the parties is absent, in default, or has waived the right to be present, or (ii) the parties and the arbitrators agree otherwise.
- (d) The arbitrator shall take into account applicable principles of legal privilege, such as those involving the confidentiality of communications between a lawyer and client.
- (e) An arbitrator or other person authorized by law to subpoena witnesses or documents may do so upon the request of any party or independently.

R-25. Evidence by Affidavit and Post-hearing Filing of Documents or Other Evidence

- (a) The arbitrator may receive and consider the evidence of witnesses by declaration or affidavit, but shall give it only such weight as the arbitrator deems it entitled to after consideration of any objection made to its admission.
- (b) If the parties agree or the arbitrator directs that documents or other evidence be submitted to the arbitrator after the hearing, the documents or other evidence, unless otherwise agreed by the parties and the arbitrator, shall be filed with the Arbitration Provider for transmission to the arbitrator. All parties shall be afforded an opportunity to examine and respond to such documents or other evidence.

R-26. Inspection or Investigation

An arbitrator finding it necessary to make an inspection or investigation in connection with the arbitration shall direct the Arbitration Provider to so advise the parties. The arbitrator shall set the date and time and the Arbitration Provider shall notify the parties. Any party who so desires may be present at such an inspection or investigation. In the event that one or all parties are not present at the inspection or investigation, the arbitrator shall make an oral or written report to the parties and afford them an opportunity to comment.

R-27. Interim Measures

- (a) The arbitrator may take whatever interim measures he or she deems necessary, including injunctive relief and measures for the protection or conservation of property and disposition of perishable goods.
- (b) A request for interim measures addressed by a party to a judicial authority shall not be deemed incompatible with the agreement to arbitrate or a waiver of the right to arbitrate.

R-28. Closing of Hearing

When satisfied that the presentation of the parties is complete, the arbitrator shall declare the hearing closed.

If documents or responses are to be filed as provided in Section R-24, or if briefs are to be filed, the hearing shall be declared closed as of the final date set by the arbitrator for the receipt of documents, responses, or briefs. The time limit within which the arbitrator is required to make the award shall commence to run, in the absence of other agreements by the parties and the arbitrator, upon the closing of the hearing.

R-29. Reopening of Hearing

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The hearing may be reopened on the arbitrator's initiative, or by direction of the arbitrator upon application of a party, at any time before the award is made. If reopening the hearing would prevent the making of the award within the specific time agreed to by the parties in the arbitration agreement, the matter may not be reopened unless the parties agree to an extension of time. When no specific date is fixed by agreement of the parties, the arbitrator shall have 15 calendar days from the closing of the reopened hearing within which to make an award.

R-30. Waiver of Rules

Any party who proceeds with the arbitration after knowledge that any provision or requirement of these rules has not been complied with and who fails to state an objection in writing shall be deemed to have waived the right to object.

R-31. Extensions of Time

The parties may modify any period of time by mutual agreement. The Arbitration Provider or the arbitrator may for good cause extend any period of time established by these rules, except the time for making the award. The Arbitration Provider shall notify the parties of any extension.

R-32. Serving of Notice

- (a) Any papers, notices, or process necessary or proper for the initiation or continuation of an arbitration under these rules; for any court action in connection therewith, or for the entry of judgment on any award made under these rules, may be served on a party by mail addressed to the party or its representative at the last known address or by personal service, in or outside the state where the arbitration is to be held, provided that reasonable opportunity to be heard with regard thereto has been granted to the party.
- (b) The Arbitration Provider, the arbitrator and the parties may also use overnight delivery, electronic facsimile transmission (fax), or electronic mail (email) to give the notices required by these rules.
- (c) Unless otherwise instructed by the Arbitration Provider or by the arbitrator, any documents submitted by any party to the Arbitration Provider or to the arbitrator shall simultaneously be provided to the other party or parties to the arbitration.

R-33. Majority Decision

When the panel consists of more than one arbitrator, unless required by law or by the arbitration agreement, a majority of the arbitrators must make all decisions.

R-34. Time of Award

The award shall be made promptly by the arbitrator and, unless otherwise agreed by the parties or specified by law, no later than 30 calendar days from the date of closing the hearing, or, if oral hearings have been waived, from the date of the Arbitration Provider's transmittal of the final statements and proofs to the arbitrator.

R-35. Form of Award

After complete review of the facts associated with the claim, the arbitrators shall render a written explanation of their decision. When three arbitrators are used, and only two arbitrators agree then the award shall be signed by the two arbitrators. The arbitrator's decision shall include:

- (a) A summary of the issues and factual evidence presented by the Contractor and the Department concerning the claim;

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- (b) Decisions concerning the validity of the claim;
- (c) Decisions concerning the value of the claim as to cost impacts if the claim is determined to be valid;
- (d) The contractual and factual bases supporting the decisions made including an explanation as to why each and every position was accepted or rejected;
- (e) Detailed and supportable calculations which support any decisions.

R-36. Scope of Award

- (a) The arbitrator may grant any remedy or relief that the arbitrator deems just and equitable and within the scope of the agreement of the parties, including, but not limited to, equitable relief and specific performance of a contract.
- (b) In addition to the final award, the arbitrator may make other decisions, including interim, interlocutory, or partial rulings, orders, and awards. (c) The award of the arbitrator may include interest at the statutory rate and from such date as the arbitrator may deem appropriate.

R-37. Delivery of Award to Parties

Parties shall accept as notice and delivery of the award the placing of the award or a true copy thereof in the mail addressed to the parties or their representatives at the last known address, personal or electronic service of the award, or the filing of the award in any other manner that is permitted by law.

R-38. Modification of Award

Within 10 calendar days after the transmittal of an award, the arbitrator on his or her initiative, or any party, upon notice to the other parties, may request that the arbitrator correct any clerical, typographical, technical or computational errors in the award. The arbitrator is not empowered to redetermine the merits of any claim already decided.

If the modification request is made by a party, the other parties shall be given 10 calendar days to respond to the request. The arbitrator shall dispose of the request within 25 calendar days after transmittal by the Arbitration Provider to the arbitrator of the request.

If applicable law provides a different procedural time frame, that procedure shall be followed.

R-39. Appeal of Award

Appeal of the arbitrators' decision concerning the merit of the claim is governed by the Colorado Uniform Arbitration Act, C.R.S. §§ 13-22-202 to -230. Either party may appeal the arbitrator's decision on the value of the claim to the Colorado State District Court in and for the City and County of Denver for trial de novo.

R-40. Release of Documents for Judicial Proceedings

The Arbitration Provider shall, upon the written request of a party, furnish to the party, at its expense, certified copies of any papers in the Arbitration Provider's possession that may be required in judicial proceedings relating to the arbitration.

R-41. Applications to Court and Exclusion of Liability

- (a) No judicial proceeding by a party relating to the subject matter of the arbitration shall be deemed a waiver of

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the party's right to arbitrate.

- (b) Neither the Arbitration Provider nor any arbitrator in a proceeding under these rules is a necessary or proper party in judicial proceedings relating to the arbitration.
- (c) Parties to these rules shall be deemed to have consented that judgment upon the arbitration award may be entered in any federal or state court having jurisdiction thereof.
- (d) Parties to an arbitration under these rules shall be deemed to have consented that neither the Arbitration Provider nor any arbitrator shall be liable to any party in any action for damages or injunctive relief for any act or omission in connection with any arbitration under these rules.

R-42. Administrative Fees

The Arbitration Provider shall prescribe filing and other administrative fees and service charges to compensate it for the cost of providing administrative services. The fees in effect when the fee or charge is incurred shall be applicable. Such fees and charges shall be borne equally by the parties.

The Arbitration Provider may, in the event of extreme hardship on the part of any party, defer or reduce the administrative fees.

R-43. Expenses

The expenses of witnesses for either side shall be paid by the party producing such witnesses. All other expenses of the arbitration, including required travel and other expenses of the arbitrator, Arbitration Provider representatives, and any witness and the cost of any proof produced at the direct request of the arbitrator, shall be borne equally by the parties.

R-44. Neutral Arbitrator's Compensation

Arbitrators shall be compensated a rate consistent with the arbitrator's stated rate of compensation.

If there is disagreement concerning the terms of compensation, an appropriate rate shall be established with the arbitrator by the Arbitration Provider and confirmed to the parties.

Such compensation shall be borne equally by the parties.

R-45. Deposits

The Arbitration Provider may require the parties to deposit in advance of any hearings such sums of money as it deems necessary to cover the expense of the arbitration, including the arbitrator's fee, if any, and shall render an accounting to the parties and return any unexpended balance at the conclusion of the case.

R-46. Interpretation and Application of Rules

The arbitrator shall interpret and apply these rules insofar as they relate to the arbitrator's powers and duties by a majority vote. If that is not possible, either an arbitrator or a party may refer the question to the Arbitration Provider for final decision. All other rules shall be interpreted and applied by the Arbitration Provider.

R-45. Suspension for Nonpayment

If arbitrator compensation or administrative charges have not been paid in full, the Arbitration Provider may so

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inform the parties in order that the parties may advance the required payment. If such payments are not made, the arbitrator may order the suspension or termination of the proceedings. If no arbitrator has yet been appointed, the Arbitration Provider may suspend the proceedings.

FAST TRACK PROCEDURES

F-1. Limitations on Extensions

In the absence of extraordinary circumstances, the Arbitration Provider or the arbitrator may grant a party no more than one seven-day extension of the time in which to respond to the demand for arbitration or counterclaim as provided in Section R-3.

F-2. Changes of Claim

The arbitrator will not consider any information that was not previously made a part of the claim record as transmitted by the Chief Engineer, other than clarification and data supporting previously submitted documentation

F-3. Serving of Notice

In addition to notice provided above, the parties shall also accept notice by telephone. Telephonic notices by the Arbitration Provider shall subsequently be confirmed in writing to the parties. Should there be a failure to confirm in writing any such oral notice, the proceeding shall nevertheless be valid if notice has, in fact, been given by telephone.

F-4. Appointment and Qualification of Arbitrator

Immediately after the retention of the Arbitration Provider, the Arbitration Provider will simultaneously submit to each party a listing and biographical information from its panel of arbitrators knowledgeable in construction who are available for service in Fast Track cases. The parties are encouraged to agree to an arbitrator from this list, and to advise the Arbitration Provider of their agreement, or any factual objections to any of the listed arbitrators, within 7 calendar days of the transmission of the list. The Arbitration Provider will appoint the agreed-upon arbitrator, or in the event the parties cannot agree on an arbitrator, will designate the arbitrator from among those names not stricken for factual objections.

The parties will be given notice by the Arbitration Provider of the appointment of the arbitrator, who shall be subject to disqualification for the reasons specified above. Within the time period established by the Arbitration Provider, the parties shall notify the Arbitration Provider of any objection to the arbitrator appointed. Any objection by a party to the arbitrator shall be for cause and shall be confirmed in writing to the Arbitration Provider with a copy to the other party or parties.

F-5. Preliminary Telephone Conference

Unless otherwise agreed by the parties and the arbitrator, as promptly as practicable after the appointment of the arbitrator, a preliminary telephone conference shall be held among the parties or their attorneys or representatives, and the arbitrator.

F-6. Exchange of Exhibits

At least 2 business days prior to the hearing, the parties shall exchange copies of all exhibits they intend to submit at the hearing. The arbitrator is authorized to resolve any disputes concerning the exchange of exhibits.

F-7. Discovery

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There shall be no discovery, except as provided in Section F-4 or as ordered by the arbitrator in extraordinary cases when the demands of justice require it.

F-8. Date, Time, and Place of Hearing

The arbitrator shall set the date and time, and place of the hearing, to be scheduled to take place within 30 calendar days of confirmation of the arbitrator's appointment. The Arbitration Provider will notify the parties in advance of the hearing date. All hearings shall be held within the City and County of Denver.

F-9. The Hearing

(a) Generally, the hearing shall not exceed 1 day. Each party shall have equal opportunity to submit its proofs and complete its case. The arbitrator shall determine the order of the hearing, and may require further submission of documents within two business days after the hearing. For good cause shown, the arbitrator may schedule 1 additional hearing day within 7 business days after the initial day of hearing.

(b) Generally, there will be no stenographic record. Any party desiring a stenographic record may arrange for one pursuant to the provisions above.

F-10. Time of Award

Unless otherwise agreed by the parties, the award shall be rendered not later than 14 calendar days from the date of the closing of the hearing or, if oral hearings have been waived, from the date of the Arbitration Provider's transmittal of the final statements and proofs to the arbitrator.

F-11. Time Standards

The arbitration shall be completed by settlement or award within 60 calendar days of confirmation of the arbitrator's appointment, unless all parties and the arbitrator agree otherwise or the arbitrator extends this time in extraordinary cases when the demands of justice require it.

F-12. Arbitrator's Compensation

Arbitrators will receive compensation at a rate to be suggested by the Arbitration Provider regional office.

PROCEDURES FOR LARGE, COMPLEX CONSTRUCTION DISPUTES

L-1. Large, Complex Construction Disputes

The procedures for large, complex construction disputes shall apply to any claim with a value exceeding \$500,000 or as agreed to by the parties.

L-2. Administrative Conference

Prior to the dissemination of a list of potential arbitrators, the Arbitration Provider shall, unless the parties agree otherwise, conduct an administrative conference with the parties and/or their attorneys or other representatives by conference call. The conference call will take place within 14 days after the retention of the Arbitration Provider. In the event the parties are unable to agree on a mutually acceptable time for the conference, the Arbitration Provider may contact the parties individually to discuss the issues contemplated herein. Such administrative conference shall be conducted for the following purposes and for such additional purposes as the parties or the Arbitration Provider may deem appropriate:

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- (a) To obtain additional information about the nature and magnitude of the dispute and the anticipated length of hearing and scheduling;
- (b) To discuss the views of the parties about the technical and other qualifications of the arbitrators;
- (c) To obtain conflicts statements from the parties; and
- (d) To consider, with the parties, whether mediation or other non-adjudicative methods of dispute resolution might be appropriate.

L-3. Arbitrators

- (a) Large, Complex Construction Cases shall be heard and determined by three arbitrators.
- (b) The Arbitration Provider shall appoint arbitrator(s) in the manner provided in the Regular Construction Industry Arbitration Rules.

L-4. Preliminary Hearing

As promptly as practicable after the selection of the arbitrator(s), a preliminary hearing shall be held among the parties and/or their attorneys or other representatives and the arbitrator(s). Unless the parties agree otherwise, the preliminary hearing will be conducted by telephone conference call rather than in person.

At the preliminary hearing the matters to be considered shall include, without limitation:

- (a) Service of a detailed statement of claims, damages and defenses, a statement of the issues asserted by each party and positions with respect thereto, and any legal authorities the parties may wish to bring to the attention of the arbitrator(s);
- (b) Stipulations to uncontested facts;
- (c) The extent to which discovery shall be conducted;
- (d) Exchange and premarking of those documents which each party believes may be offered at the hearing;
- (e) The identification and availability of witnesses, including experts, and such matters with respect to witnesses including their biographies and expected testimony as may be appropriate;
- (f) Whether, and the extent to which, any sworn statements and/or depositions may be introduced;
- (g) The extent to which hearings will proceed on consecutive days;
- (h) Whether a stenographic or other official record of the proceedings shall be maintained;
- (i) The possibility of utilizing mediation or other non-adjudicative methods of dispute resolution; and
- (j) The procedure for the issuance of subpoenas.

By agreement of the parties and/or order of the arbitrator(s), the pre-hearing activities and the hearing procedures that will govern the arbitration will be memorialized in a Scheduling and Procedure Order.

L-5. Management of Proceedings

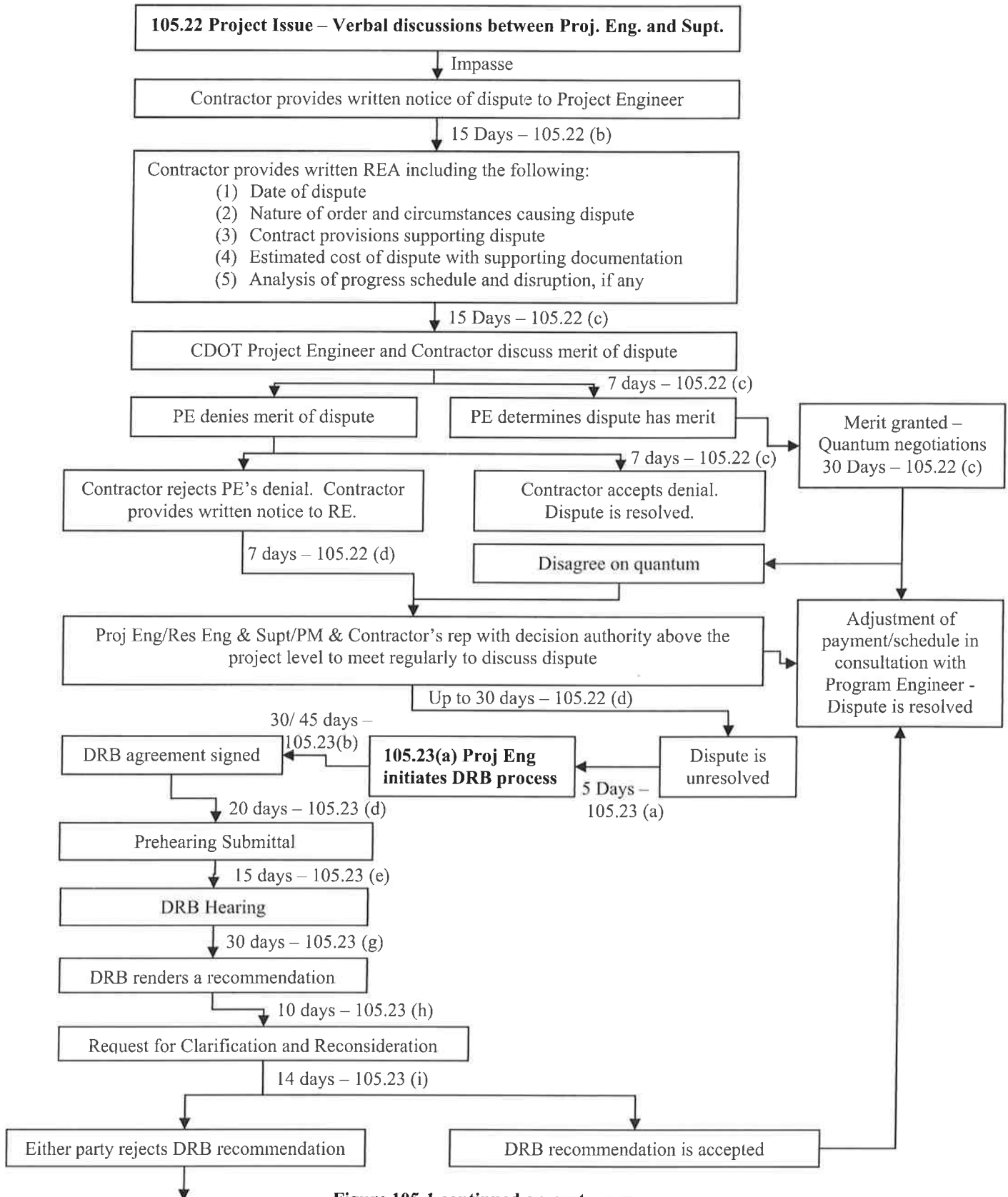
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- (a) Arbitrator(s) shall take such steps as they may deem necessary or desirable to avoid delay and to achieve a just, speedy and cost-effective resolution of Large, Complex Construction Cases.
- (b) Parties shall cooperate in the exchange of documents, exhibits and information within such party's control if the arbitrator(s) consider such production to be consistent with the goal of achieving a just, speedy and cost effective resolution of a Large, Complex Construction Case.
- (c) The parties may conduct such discovery as may be agreed to by all the parties provided, however, that the arbitrator(s) may place such limitations on the conduct of such discovery as the arbitrator(s) shall deem appropriate. If the parties cannot agree on production of document and other information, the arbitrator(s), consistent with the expedited nature of arbitration, may establish the extent of the discovery.
- (d) At the discretion of the arbitrator(s), upon good cause shown and consistent with the expedited nature of arbitration, the arbitrator(s) may order depositions of, or the propounding of interrogatories to such persons who may possess information determined by the arbitrator(s) to be necessary to a determination of the matter.
- (e) The parties shall exchange copies of all exhibits they intend to submit at the hearing 10 business days prior to the hearing unless the arbitrator(s) determine otherwise.
- (f) The exchange of information pursuant to this rule, as agreed by the parties and/or directed by the arbitrator(s), shall be included within the Scheduling and Procedure Order.
- (g) The arbitrator is authorized to resolve any disputes concerning the exchange of information.
- (h) Generally hearings will be scheduled on consecutive days or in blocks of consecutive days in order to maximize efficiency and minimize costs.

The following flow chart provides a summary of the disputes and claims process described in subsections 105.22, 105.23, and 105.24

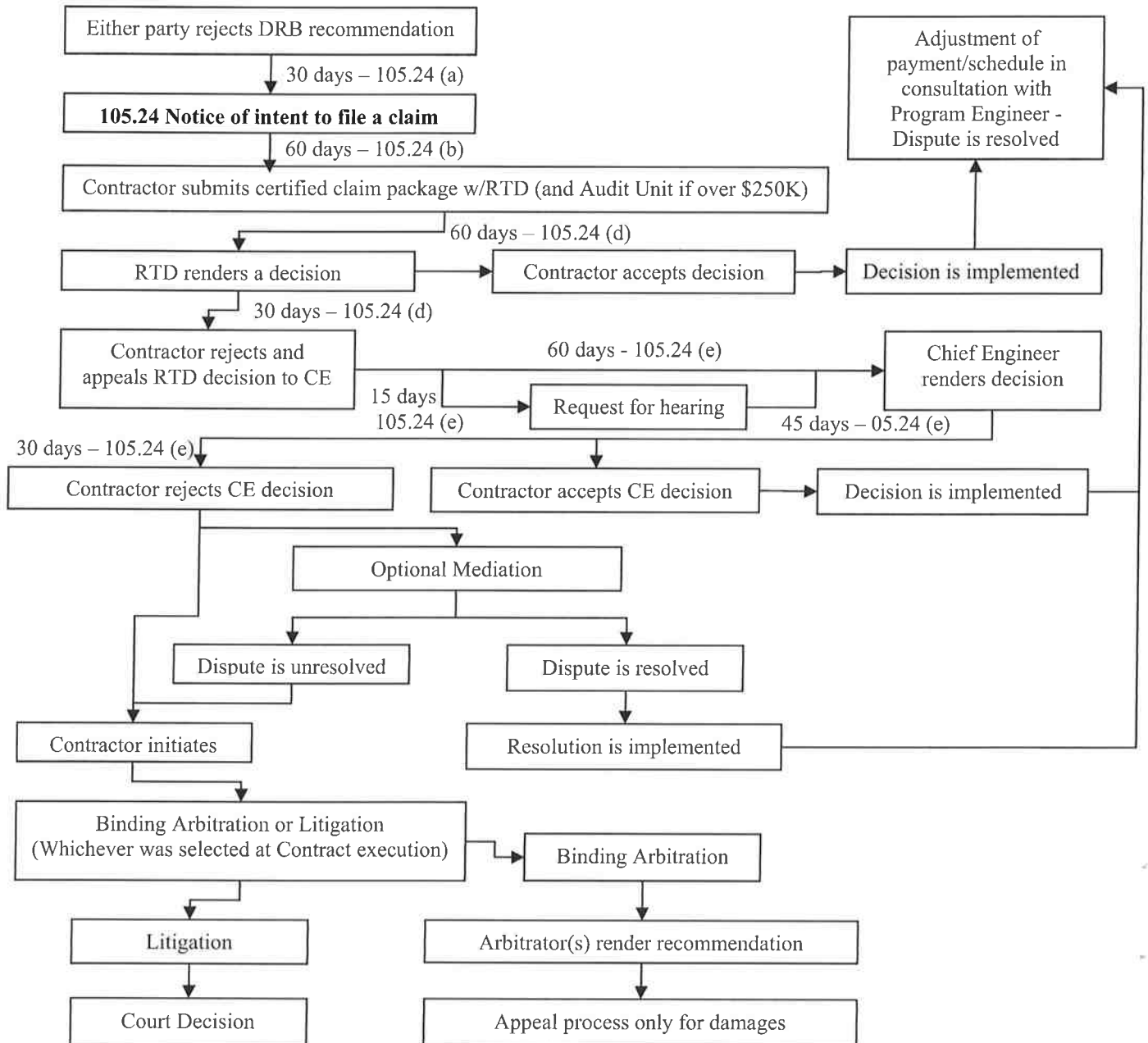
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**Figure 105-1
 DISPUTES AND CLAIMS FLOW CHART**



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Figure 105-1 (continued)



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HOT MIX ASPHALT PAVEMENT SMOOTHNESS

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

Delete subsection 105.07 and replace with the following:

105.07 Conformity to Roadway Smoothness Criteria of HMA. Roadway smoothness testing and corrective work shall be performed as described below. The pavement smoothness category shall be HRI Category II unless shown on the plans.

(a) *Smoothness Quality Control Testing.*

1. The Contractor shall perform Smoothness Quality Control (SQC) testing. The test results shall be submitted to the Engineer within 48 hours of completion. SQC test results shall show the Half Car Roughness Index (HRI) for each 0.10 mile section and shall show the results for localized roughness.

All traffic control costs associated with SQC testing will be paid for in accordance with Section 630.

SQC testing shall be performed on the first 2,000 tons for the final layer.

SQC testing shall be performed using the Contractor's inertial profiler, pursuant to the methods described in subsection 105.07(b) and in accordance with the manufacturer's recommendations. The Contractor's Profiler shall be certified according to CP 78. A list of certified profilers is located at <http://www.dot.state.co.us/DesignSupport/>.

Production shall be suspended if SQC testing indicates that corrective work is required in accordance with subsection 105.07 (c). If the SQC data becomes available after production has started for the day, suspension will begin at the end of that production day. Production will remain suspended until the problem is identified and corrected. Each time production is suspended, corrective actions shall be proposed in writing by the Contractor. Production will not be allowed to resume until the proposed corrective actions have been accepted by the Project Engineer in writing.

When production resumes, the Contractor shall profile the first 2,000 tons of HMA. The conditions above for suspension of work will apply.

2. The finished transverse and longitudinal surface elevation of the pavement shall be measured using a 10 foot straightedge. Areas to be measured will be directed by the Engineer. The Contractor shall furnish an approved 10 foot straightedge, depth gauge and operator to aid the Engineer in testing the pavement surface. Areas showing high spots of more than 3/16 inch in 10 feet shall be marked and diamond ground until the high spot does not exceed 3/16 inch in 10 feet.

(b) *Initial Smoothness Acceptance Testing.* The Contractor shall perform Smoothness Acceptance Testing (SA) which will be used for acceptance and calculation of incentive and disincentive adjustments.

All traffic control costs associated with SA testing will be paid for in accordance with Section 630.

1. Longitudinal Pavement Surface Smoothness Acceptance. Pavement surfaces shall be tested and accepted for longitudinal smoothness as described herein.

A. Testing Procedure (General). The longitudinal surface smoothness of the final pavement surface shall be tested by the Contractor in accordance with CP 74 and using the Contractor's high-speed profiler (HSP). The Contractor's Profiler shall be certified according to CP 78. A list of certified profilers is located at <http://www.dot.state.co.us/DesignSupport/>

The HSP instrumentation shall be verified in accordance with CP 74 prior to measurements. The Contractor shall lay out a distance calibration site. The distance calibration site shall be located no more than ten miles from the Project limits. The distance calibration site shall be 1056 feet long and shall be on a relatively flat, straight section of pavement as approved by the Engineer. The site

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shall have a speed limit equal to the Project's highest speed limit that allows for the HSP to operate uninterrupted. The limits of the site shall be clearly marked and the distance shall be measured to an accuracy of +/- 3 inches. The Contractor shall provide in writing the site location to the Engineer. The cost of the distance calibration site will not be measured and paid for separately, but shall be included in the work.

The entire length of each through lane, climbing lane and passing lane including bridge approaches, bridge decks and intersections from the beginning to the end of the project shall be profiled in their planned final configuration. Shoulders less than 12 foot in width and medians will not be profiled and will not be subject to incentive/disincentive adjustments. Shoulders with a width of 12 feet or greater, ramps, tapers, turn slots, acceleration lanes and deceleration lanes will be profiled, but will not be subject to incentive/disincentive adjustments. Shoulders with a width of 12 feet or more, ramps, tapers, turn slots, acceleration lanes and deceleration lanes will be evaluated for localized roughness corrective work. The profile of the entire length of a lane shall be taken at one time. However, the Engineer may break a project into sections to accommodate Project phasing.

A sufficient distance shall be deleted from the profile to allow the profiler to obtain the testing speed plus a 300 foot distance to stop and start when required. Incentive/disincentive adjustments will not be made for this area. The final surface of these areas shall be tested in accordance with subsection 105.07(a) 2.

Shoulders less than 12 foot in width and medians constructed as part of this project shall be measured in accordance with subsection 105.07(a) 2.

The profile shall include transverse joints when pavement is placed by the project on both sides of the joint. When pavement is placed on only one side of the joint, the profile shall start 25 feet outside the project paving limits. The profile of the section of pavement 25 feet outside the paving limits to 25 feet inside paving limits will not be subjected to incentive or disincentive adjustments, but will be evaluated for localized roughness.

The profile of the area 25 feet each side of every railroad crossing, cattle guard, bus pad, manhole, gutter pan and intersection (where there is a planned breakpoint in the profile grade line in the direction of traffic) shall be deleted from the profile before the HRI is determined. Incentive/disincentive adjustments will not be made for these areas. Areas deleted from the profile shall be tested in accordance with subsection 105.07(a) 2.

When both new pavement and a new bridge or new bridge pavement are being constructed in a project, the profile of the area 25 feet each side of the bridge deck shall be deleted from the profile before the HRI is determined. Incentive/disincentive adjustments will not be made for this area. Areas deleted from the profile shall be tested in accordance with subsection 105.07(a) 2. The bridge deck will be evaluated for localized roughness. Corrective work required in these areas will not be measured and paid for separately, but shall be included in the work. For all other projects, the profile of the area 25 feet each side of the bridge deck shall be deleted from the profile before the HRI is determined. Incentive/disincentive adjustments will not be made for this area. If the Engineer determines that corrective work is required in this area, payment will be made in accordance with subsection 109.04.

The Contractor shall notify the Engineer in writing at least five working days in advance of his intention to perform SA testing. The Contractor shall profile the Project within 14 days after the completion of paving operations. The Engineer will witness the SA profiling and take immediate possession of the SA data.

The Contractor shall not perform any corrective work that will affect the pavement smoothness for ten working days after completion of the SA testing or as approved by the Engineer. This time is to allow for the Department to analyze the data and perform smoothness verification testing.

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HOT MIX ASPHALT PAVEMENT SMOOTHNESS

- B. Smoothness Testing Procedures. The Contractor shall mark the profiling limits and excluded areas. The Engineer will verify that the Contractor's marks are located properly. The Contractor shall use traffic cones with reflective tape or reflective tape on the pavement at the beginning and end of each lane for triggering the start and stop locations on the profiler and at any other location, where portions of the profile are being deleted. These locations shall be marked with temporary paint so that the Department's profiler uses the same locations for smoothness verification testing.

The ambient temperature shall be at least 34 °F for the profiler to operate.

The Contractor shall clear the lanes to be tested of all debris before profiling.

The Contractor shall submit a Method for Handling Traffic (MHT) to the Engineer for approval at least five days in advance of SA testing. The MHT shall detail the methods for traffic control that will allow for continuous non-stop profiling of each lane to be profiled at a minimum speed of 15 mph. The Contractor shall provide the traffic control in accordance with the approved MHT.

Each lane shall be profiled at least once. Profiling shall be at a constant speed (+/- 5 mph of the distance calibration speed) with a minimum speed of 15 mph and a maximum speed of 70 mph. Shoulders with a width of 12 feet or more, ramps, tapers, turn slots, acceleration lanes and deceleration lanes shall be profiled. The profile shall be taken in the planned direction of travel. The left and right wheel paths shall be profiled simultaneously. The collected profiles shall be turned over immediately to the Engineer and will be analyzed using CP 74.

- (1) The Department will determine a HRI for each 0.1 mile section or fraction thereof of completed pavement. The HRI consists of the left and right wheel path's profile passed through the International Roughness Index (IRI) filter.

The Contractor's SA test results will be available within ten working days of the completion of SA testing. The Engineer will give the Contractor a report that will include the lane profiled, the HRI in 0.10 mile increments and a summary of areas requiring corrective work. The Engineer may determine that it is necessary for the Contractor to re-profile a lane.

Areas requiring corrective work will be determined according to subsection 105.07(c) 1.

Sections less than 0.01 miles in length shall not be subject to corrective work as specified by Table 105-6. Sections less than 0.01 miles in length shall be included in the Localized Roughness determination.

- C. Acceptance and incentive/disincentive adjustments for pavement smoothness will be made on a square yard basis in accordance with the following:

Incentive and Disincentive adjustments will be based on the HRI for each 0.1 mile section or fraction thereof. Incentive/Disincentive adjustments for Pavement Smoothness will be made in accordance with Table 105-6. Sections less than 0.01 miles in length will not be subject to disincentives.

Incentive payments will not be made until all localized roughness areas have been corrected.

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 HOT MIX ASPHALT PAVEMENT SMOOTHNESS

Table 105-6
HMA PAVEMENT SMOOTHNESS (INCHES/MILE)
HALF-CAR ROUGHNESS INDEX

Pavement Smoothness Category	Incentive Payment (\$/sqyd)	No Incentive or Disincentive	Disincentive Payment (\$/sqyd)	Corrective Work Required
I	When HRI ≤ 40.0 I = \$1.28	When HRI ≥ 63.0 and ≤ 72.0 I = \$0.00	When HRI > 72.0 and < 90.0 I = 5.12 – 0.07111 x HRI	When HRI > 90.0
	When HRI > 40.0 and < 63.0 I = 3.51 – 0.05565 x HRI		When HRI ≥ 90.0 I = – \$1.28	
II	When HRI ≤ 35.0 I = \$1.28	When HRI ≥ 58.0 and ≤ 67.0 I = \$0.00	When HRI > 67.0 and < 85.0 I = 4.76 – 0.07111 x HRI	When HRI > 85.0
	When HRI > 35.0 and < 58.0 I = 3.23 – 0.05565 x HRI		When HRI ≥ 85.0 I = – \$1.28	
III	When HRI ≤ 45.0 I = \$1.28	When HRI ≥ 70.0 and ≤ 80.0 I = \$0.00	When HRI > 80.0 and < 100.0 I = 5.12 – 0.064 x HRI	When HRI > 100.0
	When HRI > 45.0 and < 70.0 I = 3.584 – 0.0512 x HRI		When HRI ≥ 100 I = - \$1.28	

(c) *Corrective Work.*

The Department will analyze the SA testing for acceptance and indicate areas requiring corrective work in accordance with subsection 105.07(b). Corrective work shall be proposed in writing by the Contractor. Corrective work shall not be performed until approved in writing by the Engineer. The Contractor shall not perform any corrective work on the final layer until after the Engineer returns the results of the Initial Smoothness Acceptance testing and after the Department's Smoothness Verification testing, if performed. The Contractor shall perform corrective work in the areas indicated by the SA testing.

Corrective work on lower layers shall be at the Contractor's discretion.

The Contractor shall profile the roadway to verify the required corrective work has been completed.

If the Contractor elects to perform corrective work prior to the completion of initial SA testing, the entire 0.10 mile section, or fraction thereof, will not be eligible for incentive payment, but will be eligible for disincentive. The Engineer will not modify the limits of the 0.10 mile sections to group corrective work areas in an effort to reduce the number of sections impacted by this decision.

The Contractor may elect to perform additional corrective work to reduce or eliminate the disincentive payment for each 0.1 mile section or fraction thereof after the initial SA testing and the Department's verification testing.

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The criteria for determining if a 0.1 mile section or fraction thereof requires corrective work is specified in Table 105-6. In addition to determining if a 0.1 mile section or fraction thereof requires corrective work, the profiles shall be analyzed for areas of Localized Roughness.

Localized Roughness. The profiles shall be analyzed to determine where areas of localized roughness occur. The profile shall be summarized using the continuous HRI reporting system using an averaging length of 25 feet. The FHWA's latest version of ProVal software will shall be used to generate the continuous HRI report. ProVal can be downloaded at <http://www.roadprofile.com>.

Areas of localized roughness are determined to be where the continuous HRI report exceeds the values in Table 105-9. Areas of localized roughness greater than 15.0 feet in length shall be considered deficient, and require corrective work.. Areas of localized roughness less than 25 feet in distance that contain a valve box shall be tested in accordance with subsection 105.07 (a) 2. for corrective work.

**Table 105-9
CONTINUOUS HRI USING 25 FOOT AVERAGING FOR LOCALIZED
ROUGHNESS CORRECTIVE WORK ON HMA PAVEMENTS**

HRI SMOOTHNESS CATEGORY	HRI In/mile
I	135.0
II	125.0
III	150.0

1. Corrective Methods. Corrective work shall consist of diamond grinding, an approved overlay, or removal and replacement.

Corrective work shall conform to of one of the following conditions:

- (1) Removal and Replacement. The pavement requiring corrective work shall be removed, full width of the lane and the full thickness of the layer in accordance with subsection 202.09.

The removal area shall begin and end with a transverse butt joint, which shall be constructed with a transverse saw cut perpendicular to centerline. Replacement material shall be placed in sufficient quantity so the finished surface conforms to grade and smoothness requirements. Sections removed and replaced shall be at least 0.20 miles in length.

- (2) Overlay. The overlay shall cover the full width of the pavement including shoulders. The area overlaid shall begin and end with a transverse butt joint, which shall be constructed with a transverse saw cut and asphalt removal. All material shall be approved hot bituminous mixtures that meet all contract requirements. The overlay shall be placed so that the finished surface conforms to grade and smoothness requirements. The overlay area shall be compacted to the specified density. The overlay thickness shall be equivalent to that of the final layer in accordance with the Contract. Sections overlaid shall be at least 0.20 miles in length.

- (3) Diamond Grinding. Grinding shall not reduce planned pavement thickness by more than 0.3 inches. Diamond grinding shall be the full width of the lane. The entire ground area of the final pavement surface shall be covered with a Tack Coat conforming to Section 407 (CSS-1h at 0.1 gallons per square yard of diluted emulsion; the emulsion shall be diluted with water at the rate of 50 percent water and 50 percent emulsion) when grinding is complete. Cores shall be taken to verify that minimum pavement thicknesses have been maintained. A minimum of one core shall be taken every

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100 cumulative feet or fraction thereof per lane of diamond grinding, as directed by the Engineer. Coring shall be at the Contractor's expense.

- (d) *Final Smoothness Acceptance Testing.* After the Contractor has completed the required corrective work and any additional corrective work, the Contractor shall retest the pavement in accordance with subsection 105.07(b). If the Contractor requests to do additional corrective work to reduce disincentive after Final SA Testing, the Contractor shall perform an additional Final SA Testing for the project. A charge of \$500 will be assessed to the Contractor for each additional Final SA Testing. Time count will be charged pursuant to contract requirements during the time period required for all Final SA Testing. Delays associated with additional Final SA Testing will be considered non-excusable and non-compensable.

The Contractor shall notify the Engineer pursuant to 105.07(b) to schedule the final SA testing.

Final acceptance and incentive/disincentive adjustments for pavement smoothness will be made on a square yard basis in accordance with the following:

Incentive payments will be based on the HRI for each 0.1 mile section or fraction thereof from the Contractor's initial SA testing. Those sections which earned incentives or full payment based on the initial SA testing will not be re-evaluated for incentive after final SA testing.

The disincentive payment will be based on the HRI for each 0.1 mile section or fraction thereof from the Contractor's Initial SA testing or the Contractor's Final SA testing, whichever is less. Those sections which had disincentive levels indicated by the initial SA, will be re-evaluated for disincentive. The Contractor may eliminate all disincentives on those 0.1 mile sections; however, no incentives may be earned in these areas, regardless of the final smoothness.

- (e) *Department Smoothness Verification Testing (SV).* The Department may elect to perform smoothness verification (SV) testing using the Department's inertial profiler, with the methods described in subsection 105.07(b). The Engineer will notify the Contractor of the Department's intention to perform SV testing. All traffic control costs associated with Department SV testing will be paid for by the Department in accordance with Section 630.

The Contractor's SA test results will be compared to the Department's SV test results. The Contractor's SA test results will be considered acceptable and will be used for incentive/disincentive payment if the following criteria are met:

- (1) The difference in HRI for a 1/10 mile section is less than 6.1 inches/mile for a minimum of 90 percent of the 1/10 mile sections for each lane.
- (2) The difference in average HRI for each lane is less than 6.1 inches/mile.
- (3) The difference in the length of each lane is less than 0.2 percent

When the Contractor's SA test results are not considered acceptable, the Department's SV test results will be used for incentive/disincentive payment and the Contractor's profiler certification will be evaluated pursuant to CP 78. The Department will have 30 days to complete this evaluation.

The Contractor will be assessed a charge of \$1,000 for SV testing when the Contractor's SA test results are not considered acceptable.

- (f) *HRI Category IV: HMA Recycling Treatments Thin Lifts and Urban Rehabilitation treatments smoothness criteria.* For HRI Category IV pavements, the following shall be used for acceptance:

An HRI for each 0.1 mile section shall be determined on the original pavement surface prior to beginning the work.

An HRI for each 0.1 mile section shall be determined on the pavement surface after the work is complete.

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When a 0.1 mile section has a final HRI greater than 80.0 in/mile and the final HRI is greater than the HRI prior to performing the work, that 0.1 mile section shall be corrected by a method approved in writing by the Engineer. Corrective work shall be such that the resulting final HRI is equal to or less than the initial HRI or 80.0 in/mile, whichever is greater. All costs associated with corrective work shall be at the Contractor's expense, including but not limited to traffic control, additional hot mix asphalt, grinding and milling.

Incentive/disincentive adjustments for smoothness will not be made for Category IV. Localized Roughness determinations will not be made for HRI Category IV.

The pavement smoothness for HMA Recycling Treatments and Thin Lifts that will be overlaid with a final riding surface will not be evaluated by the Department for acceptance.

May 8, 2014

REVISION OF SECTION 105
PORTLAND CEMENT CONCRETE PAVEMENT SMOOTHNESS

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

In subsection 105.08 (b) 1. A. delete the eighth paragraph and replace with the following:

The profile shall include transverse joints when pavement is placed by the project on both sides of the joint. When pavement is placed on only one side of the joint, the profile shall start 25 feet outside the project paving limits.

In subsection 105.08 (b) 1. B. add the following:

The ambient temperature shall be at least 34 °F for the profiler to operate.

In subsection 105.08 (b) 1. C. delete the third and fourth paragraph and replace with the following:

Incentive/Disincentive adjustments for Pavement Smoothness will be made in accordance with Table 105-10. Sections less than 0.01 miles in length will not be subject to disincentives. The profile of the section of pavement 25 feet outside the paving limits to 25 feet inside the paving limits will not be subjected to incentive or disincentive adjustments, but will be evaluated for localized roughness.

Incentive payments will not be made until all localized roughness areas have been corrected.

In subsection 105.08 (c) delete the sixth and seventh paragraphs and replace with the following:

Localized Roughness. The profiles shall be analyzed to determine where areas of localized roughness occur. The profile shall be summarized using the continuous HRI reporting system using an averaging length of 25 feet. The latest version of FHWA's ProVal software shall be used to generate the continuous HRI report. ProVal can be downloaded at <http://www.roadprofile.com>.

Areas of localized roughness are determined to be where the continuous HRI report exceeds the values in Table 105-11. Areas of localized roughness greater than 15.0 feet in length shall be considered deficient, and require corrective work. Areas of localized roughness less than 25 feet in distance that contain a valve box shall be tested in accordance with subsection 105.08 (a) 2. for corrective work.

In subsection 105.08 (c) add the following to the ninth paragraph:

Diamond grinding shall be the full width of the lane.

**REVISION OF SECTION 105
VIOLATION OF WORKING TIME LIMITATION**

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

Incident	Incident Rate	Total Price Reduction
1 st	Notice to Stop Work	----
2 nd	\$150	\$150
3 rd	300	450
4 th	600	1,050
5 th	1,200	2,250
6 th	1,200	3,450
Etc.	1,200	4,650
	Etc.	Etc.

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REVISION OF SECTIONS 105 AND 106
CONFORMITY TO THE CONTRACT OF HOT MIX ASPHALT
(VOIDS ACCEPTANCE)

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, voids in the mineral aggregate, air voids, 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 subsection 106.05 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 subsection 106.05. Additional samples may be selected and tested at the Engineer's discretion.

A process will consist of either a 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 and/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 of each element being tested and evaluated. A change in process is defined as a change that affects the element involved. A process for any element normally will include all produced materials associated with that element prior to a change in the job mix formula (Form 43) with the exception of the process for joint density element. For joint density, a new process will be established for each new layer of pavement or for changes in joint construction. In-place 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 the asphalt content, in-place density and/or joint density element greater than the distance $2 \times V$ (see Table 105-2) outside the tolerance limits will be designated as a separate process and the quantity it represents will be evaluated 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 accordance with 105.05(e) Evaluation of Work.

Any test result for the air voids or VMA elements greater than the distance $2 \times V$ (see Table 105-2) outside the tolerance limits will be designated as a separate process and the quantity it represents shall be removed and replaced with specification material at the Contractor's expense.

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 $2 \times V$ 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.

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 REVISION OF SECTIONS 105 AND 106
 CONFORMITY TO THE CONTRACT OF HOT MIX ASPHALT
 (VOIDS ACCEPTANCE)

- (1) *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

$$PF = 1.00 - [0.25(T_0 - T_U)/V]$$

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

$$PF = 1.00 - [0.25(T_L - T_0)/V]$$

Where: PF = pay factor.

V = V factor from Table 105-2.

T₀ = the individual test result.

T_U = upper specification limit.

T_L = lower specification limit.

If the pay factor of any of the above calculations is less than 0.75 for any element, the acceptance of the work will be evaluated according to subsection 105.05(e).

- (2) *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.
- (3) *Joint Density Element.* Joint density will be tested according to subsection 401.17.
- (4) *Process Pay Factor.* Using the calculated QL for the process, compute the 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):

$$(1) PF = \frac{(PF_1 + PF_2)}{2} + \frac{PF_2 + PF_3}{2} \frac{(PF_1 + PF_2)}{2} \frac{(Pn_2 - Pn_x)}{(Pn_2 - Pn_3)}$$

Where, when referring to Table 105-3:

PF₁= PF determined at the next lowest Pn formula using process QL

PF₂= PF determined using the Pn formula shown for the process QL

PF₃= PF determined at the next highest Pn formula using process QL

Pn₂= the lowest Pn in the spread of values listed for the process Pn formula

Pn₃= 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 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.

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 REVISION OF SECTIONS 105 AND 106
 CONFORMITY TO THE CONTRACT OF HOT MIX ASPHALT
 (VOIDS ACCEPTANCE)

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

(5) *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 for the air voids or VMA elements within *any* process is less than 0.75, the Contractor shall remove and replace the material with specification material at the Contractor's expense. If PF for any other element within any process 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 shall not be greater than 0.75. The Region Materials Engineer (RME) will be consulted prior to determining the material will be allowed to remain in place. The RME will also be consulted to assist in determining an appropriate pay factor.

When condition red, as described in subsection 106.05(g), exists for any element, resolution and correction will be in accordance with subsection 106.05(g). Material that 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 six 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 six 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. The process will be approved by the Engineer before commencing the corrective work

Table 105-2
"W" AND "V" FACTORS FOR VARIOUS ELEMENTS

Element	V Factor	W Factor
Asphalt Content	0.20	10
Voids in the Mineral Aggregate	0.60	10
Air Voids	0.60	30
In-place Density	1.10	35
Joint Density	1.60	15

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 REVISION OF SECTIONS 105 AND 106
 CONFORMITY TO THE CONTRACT OF HOT MIX ASPHALT
 (VOIDS ACCEPTANCE)

**Table 105-3
 FORMULAS FOR CALCULATING PF BASED ON PN**

Pn	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:	Maximum PF
3	$0.31177 + 1.57878 (QL/100) - 0.84862 (QL/100)^2$	1.025
4	$0.27890 + 1.51471 (QL/100) - 0.73553 (QL/100)^2$	1.030
5	$0.25529 + 1.48268 (QL/100) - 0.67759 (QL/100)^2$	1.030
6	$0.19468 + 1.56729 (QL/100) - 0.70239 (QL/100)^2$	1.035
7	$0.16709 + 1.58245 (QL/100) - 0.68705 (QL/100)^2$	1.035
8	$0.16394 + 1.55070 (QL/100) - 0.65270 (QL/100)^2$	1.040
9	$0.11412 + 1.63532 (QL/100) - 0.68786 (QL/100)^2$	1.040
10 to 11	$0.15344 + 1.50104 (QL/100) - 0.58896 (QL/100)^2$	1.045
12 to 14	$0.07278 + 1.64285 (QL/100) - 0.65033 (QL/100)^2$	1.045
15 to 18	$0.07826 + 1.55649 (QL/100) - 0.56616 (QL/100)^2$	1.050
19 to 25	$0.09907 + 1.43088 (QL/100) - 0.45550 (QL/100)^2$	1.050
26 to 37	$0.07373 + 1.41851 (QL/100) - 0.41777 (QL/100)^2$	1.055
38 to 69	$0.10586 + 1.26473 (QL/100) - 0.29660 (QL/100)^2$	1.055
70 to 200	$0.21611 + 0.86111 (QL/100)$	1.060
≥ 201	$0.15221 + 0.92171 (QL/100)$	1.060

(6) 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:

$$UP = [(Ton_{HMA})(UP_{HMA}) + (Ton_{AC})(UP_{AC})]/Ton_{HMA}$$

Where: Ton_{HMA} = Tons of Asphalt Mix
 UP_{HMA} = Unit Bid Price of Asphalt Mix
 Ton_{AC} = Tons of Asphalt Cement
 UP_{AC} = Unit Bid Price of Asphalt Cement

For the Joint Density element:

$$UP = UP_{HMA}$$

Where: UP_{HMA} is as defined above.

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 REVISION OF SECTIONS 105 AND 106
 CONFORMITY TO THE CONTRACT OF HOT MIX ASPHALT
 (VOIDS ACCEPTANCE)

When AC is paid for separately UP shall be:

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

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

- (7) *Element I/DP.* The I/DP for an element shall be computed by accumulating the process I/DP for that element.
- (8) *I/DP for a Mix Design.* The I/DP for a mix design shall be computed by accumulating the process I/DP's for the asphalt content, voids in the mineral aggregate, air voids, and in-place density 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.
- (9) *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 HMA, Item 403, except HMA (Patching) and temporary pavement shall be tested in accordance with the following program of process control testing and acceptance testing:

- (a) *Process Control Testing.* The Contractor shall be responsible for process control testing on all elements listed in Table 106-1. Process control testing shall be performed at the expense of the Contractor. The Contractor shall develop a quality control plan (QCP) in accordance with the following:
1. *Quality Control Plan.* For each element listed in Table 106-1, the QCP must provide adequate details to ensure that the Contractor will perform process control. The Contractor shall submit the QCP to the Engineer at the preconstruction conference. The Contractor shall not start any work on the project until the Engineer has approved the QCP in writing.
 - A. *Frequency of Tests or Measurements.* The QCP shall indicate a random sampling frequency, which shall not be less than that shown in Table 106-1. The process control tests shall be independent of acceptance tests.
 - B. *Worksheets, Forms, and Charts.* The Contractor shall submit examples of worksheets, test result forms, and test results charts in accordance with CP 12 as part of the QCP.
 - C. *Test Result Chart.* Each process control test result, the appropriate tonnage and the tolerance limits shall be plotted. For in-place density tests, only results after final compaction shall be shown. The chart shall be posted daily at a location convenient for viewing by the Engineer.
 - D. *Quality Level Chart.* The Quality Level (QL) for each element used to calculate incentive or disincentive in Table 106-1 and each required sieve size shall be plotted. The QL will be calculated in accordance with the procedure in CP 71 for Determining Quality Level (QL). The QL will be calculated on tests 1 through 3, then tests 1 through 4, then tests 1 through 5, then thereafter the last five consecutive test results. The tonnage of material represented by the last test result shall correspond to the QL. For in-place density tests, only results after final compaction shall be shown. The chart shall be posted daily at a location convenient for viewing by the Engineer.

REVISION OF SECTIONS 105 AND 106
CONFORMITY TO THE CONTRACT OF HOT MIX ASPHALT
(VOIDS ACCEPTANCE)

2. Elements Not Conforming to Process Control. The QL of each discrete group of five test results, beginning with the first group of five test results, shall be a standard for evaluating material not conforming to process control. When the group QL is below 65, the process shall be considered as not conforming to the QCP. In this case, the Contractor shall take immediate action to bring the process back into control. Except where the cause of the problem is readily apparent and corrected without delay, production shall be suspended until the source of the problem is determined and corrected. A written explanation of actions taken to correct control problems shall accompany the test data and be submitted to the Engineer on the day the actions are taken.
 3. Point of Sampling. The material for process control testing shall be sampled by the Contractor using approved procedures. Acceptable procedures are Colorado Procedures, AASHTO and ASTM. The order of precedence is Colorado Procedures, AASHTO procedures and then ASTM procedures. The location where material samples will be taken shall be indicated in the QCP.
 4. Testing Standards. The QCP shall indicate which testing standards will be followed. Acceptable standards are Colorado Procedures, AASHTO and ASTM. The order of precedence is Colorado Procedures, AASHTO procedures and then ASTM procedures.
 5. Testing Supervisor Qualifications. The person responsible for the process control sampling and testing shall be identified in the QCP and be qualified according to the requirements of CP 10
 6. Technician Qualifications. Technicians taking samples and performing tests must be qualified according to the requirements of CP 10.
 7. Testing Equipment. All of the testing equipment used to conduct process control testing shall conform to the standards specified in the test procedures and be in good working order. Nuclear testing devices used for process control testing of in-place density do not have to be calibrated on the Department's calibration blocks.
 8. Reporting and Record Keeping. The Contractor shall report the results of the process control tests to the Engineer in writing at least once per day. The Contractor shall assemble a Quality Control (QC) notebook and update it daily. This notebook shall contain all worksheets, test results forms, test results charts and quality level charts for each of the elements listed in Table 106-1. The Contractor shall submit the QC notebook to the Engineer for review once a month on the date agreed to at the Pre-Paving Conference. The QC notebook will be returned to the Contractor within one working day after submittal. The Engineer will notify the Contractor in writing of any deficiencies in the QC notebook, including the failure to submit the notebook on time or an absence of the required reports. Upon the second failure to submit the complete QC notebook on time or with an absence of the required reports, the Engineer will notify the Contractor, and the pay estimate will be withheld until the Contractor submits, in writing, a report detailing the cause for the failure to submit the complete QC notebook on time or the cause for the absence of required reports. The report shall include how the Contractor plans to resolve the failures. Additional failures to submit the QC notebook on time or absent the required reports will result in a delay of the pay estimate until the Contractor has identified and resolved the failure along with revising and resubmitting his QCP to address these issues. Once the Engineer has reviewed and approved the revised QCP the estimate may be paid. Upon submittal of the QC notebook for the semi-final estimate, the QC notebook shall become the property of the Department. The Contractor shall make provisions such that the Engineer can inspect process control work in progress, including QC notebook, sampling, testing, plants, and the Contractor's testing facilities at any time.
- (b) *Acceptance Testing.* Acceptance testing is the responsibility of the Department and shall not be addressed in the QCP. 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 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 a stratified random procedure. 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.

REVISION OF SECTIONS 105 AND 106
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Where appropriate, the Contractor shall reduce each sample to the size designated by the Engineer. The Contractor may retain a split of each sample which cannot be included as part of the QCP.

All materials being used are subject to inspection and testing at any time prior to, during, or after incorporation into work. Acceptance tests will be made by and at the expense of the Department, except when otherwise provided.

- (c) *Check Testing Program (CTP)*. Prior to or in conjunction with placing the first 500 tons of asphalt pavement, under the direction of the Engineer, a CTP will be conducted between acceptance testing and process control testing programs. The CTP will consist of testing for asphalt content, theoretical maximum specific gravity, voids in the mineral aggregate, air voids, in-place density, and joint density in accordance with CP 13 of the Department's Field Materials Manual. The CTP will be continued until the acceptance and process control test results are within the acceptable limits shown in Table 13-1 of CP 13. For joint density, the initial check test will be a comparison of the seven cores tested by CDOT and the seven cores tested by the Contractor. These are the cores from the compaction test section used for nuclear gauge calibration and test section payment.

During production a split sample check will be conducted at the frequency shown in Table 106-1. The split samples will be from an acceptance sample obtained in accordance with subsection 106.05(b). Except for joint density, the split samples will be from an acceptance sample obtained in accordance with subsection 106.05(b). The acceptance test result will be compared to the process control test result obtained by the Contractor using the acceptable limits shown in Table 13-1 of CP 13. For joint density, the comparison sample material for testing by the Contractor will be obtained by taking a second core adjacent to the joint density acceptance core. The acceptance test result will be compared to the process control test result obtained by the Contractor using the acceptable limits shown in the above table and following the check testing procedure given in CP 13.

If production has been suspended and then resumed, the Engineer may order a CTP between process control and acceptance testing persons to assure the test results are within the acceptable limits shown in Table 13-1 of CP 13. Check test results shall not be included in process control testing. The Region Materials Engineer shall be called upon to resolve differences if a CTP shows unresolved differences beyond the values shown in Table 13-1 of CP 13.

- (d) *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 Hot mix asphalt conforms to the approved mix design:

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. 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.

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(VOIDS ACCEPTANCE)

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 1/10,000 tons.
- (e) *Target Values for VMA.* After the mix design has been approved and production commences, the first three *acceptance* tests for Voids in Mineral Aggregate (VMA) will be analyzed to verify and establish a target value for VMA. The Contractor shall make adjustments if required in accordance with the following: The target value for VMA will be the average of the first three volumetric field verification 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 1.0 percent below the VMA target on original Form 43.

Whenever a new or revised mix design is used and production resumes, the next three acceptance tests will be evaluated and a target value for VMA will be established in accordance with the above requirements.

- (f) *Independent Assurance Testing.* Independent assurance testing for Asphalt Content and In-Place Density will be in accordance with the Department's Field Materials Manual. Independent assurance testing for *Voids* in the Mineral Aggregate and Air Voids will be performed by the Department's Flexible Pavement laboratory on samples sent from the field at a frequency of one per 10 000 tons.
- (g) *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.

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.

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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.

- (h) *Correction Factor.* In determining the air voids and VMA in the materials compacted with the SuperPave Gyratory Compactor (SGC), the following correction for bulk specific gravity shall be performed during the CTP:
1. The difference in the average value of bulk specific gravity between the process control testing SGC and acceptance testing SGC will be determined and used as a correction factor for the process control bulk specific gravity.
 2. This correction factor shall be used to correlate the process control SGC to the acceptance testing SGC for comparison of air voids and VMA during the CTP and full project production. Values in Table 13-1 of CP 13 apply to SGC comparison after correction factor has been applied.
 3. This correction factor shall be applied in correlating the SGC's air voids and VMA test results from process control and acceptance testing to produce comparable data. Any changes in SGC equipment or in the mix design properties, specifically the number of gyrations, asphalt binder grade, aggregate gradation, combination of aggregates, and aggregate sources shall require a new correction factor to be determined under a CTP.

Example: If for the five CTP tests on split samples the process control SGC averages bulk specific gravity of 2.391 and the acceptance SGC averages 2.382, the correction factor would be -0.009 ($2.382 - 2.391$) to the process control bulk specific gravities. Each of the five process control CTP bulks would be decreased by 0.009 before CTP result comparison of voids and VMA is made. If the volumetric results satisfy Table 13-1 of CP 13, use corrected bulks to calculate voids and VMA for process control testing program.

If process control and acceptance SGCs are not from the same equipment manufacturer, project-specific material shall be used to perform the CTP and generate the correction factor.

10
 REVISION OF SECTIONS 105 AND 106
 CONFORMITY TO THE CONTRACT OF HOT MIX ASPHALT
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Table 106-1
SCHEDULE FOR MINIMUM SAMPLING AND TESTING

Element	Process Control	Acceptance ³	Check (CTP)
Determining Asphalt Content of Hot Bituminous Mixtures	1/500 tons	1/1000 tons ¹	1/10,000 tons
Theoretical Maximum Specific Gravity	1/1000 tons, minimum 1/day	1/1000 tons, minimum 1/day	1/10,000 tons
Void in the Mineral Aggregate	1/1000 tons	1/1000 tons ¹	1/10,000 tons
Air Voids	1/1000 tons	1/1000 tons ¹	1/10,000 tons
Hveem Stability	1/10,000 tons	1/10,000 tons ²	Not applicable.
Resistance to Moisture Damage (Lottman)	1/10,000 tons	According to subsection 401.02	Not applicable.
Gradation	1/10,000 tons	1/10 000 tons ²	Not applicable.
Determining Percent Relative Compaction of Bituminous Pavement	1/500 tons ¹	1/500 tons ¹	1/5000 tons
Joint Density	1 core/2500 linear feet of joint	1 core/5000 linear feet of joint ¹	1 core/50,000 linear feet of joint
Aggregate Percent Moisture ⁽⁴⁾	1/2000 T or 1/Day if less than 2000 T	1/2000 T	Not applicable
Percent Lime ⁽⁴⁾⁽⁵⁾	1/Day	Not applicable	Not applicable

Notes for Table 106-1:

- (1) The minimum number of acceptance tests will be at least 5 asphalt content, 5 voids in the mineral aggregate, 5 air voids, 10-in-place density and 5 joint densities for all projects.
- (2) For information only. These elements are not used to calculate pay factors.
- (3) When unscheduled job mix formula changes are made (Form 43) acceptance of the elements, except for in-place density, will be based on the actual number of samples that have been selected up to that time, even if the number is below the minimum listed in Table 106-1. At the Engineer's discretion, additional random in-place density test may be taken in order to meet scheduled minimums, provided the applicable pavement layer is available for testing under safe conditions. Beginning with the new job mix formula, the quantity it will represent shall be estimated. A revised schedule of acceptance tests will be based on that estimate.
- (4) Not to be used for incentive/disincentive pay. Test according to CP-60B and report results from Form 106, Form 565 or Form 6.
- (5) Verified per Contractor's QC Plan.

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.

1
 REVISION OF SECTION 106
 HOT MIX ASPHALT - VERIFICATION TESTING

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

Delete subsection 106.05 (e) and replace with the following:

(e) *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 (HMA) 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:

AC	± 0.3 percent
Air Voids	± 1.2 percent
VMA	± 1.2 percent

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 notice 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

REVISION OF SECTION 106
HOT MIX ASPHALT - VERIFICATION TESTING

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.

REVISION OF SECTION 106
MATERIAL SOURCES

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.

January 30, 2014

REVISION OF SECTION 106
SUPPLIER LIST

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.

1
 REVISION OF SECTIONS 106, 627 AND 713
 GLASS BEADS FOR PAVEMENT MARKING

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 627.04 shall include the following:

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

In subsection 627.05, delete the seventh paragraph and replace with the following:

Epoxy pavement marking shall be applied to the road surface according to the epoxy manufacturer's recommended methods at the application rate or coverage shown below. Glass beads shall be applied into the epoxy pavement marking by means of a low pressure, gravity drop bead applicator.

In subsection 627.05, delete the last paragraph and replace with the following:

Epoxy pavement marking and beads shall be applied within the following limits:

	Application Rate or Coverage Per Gallon of Epoxy Pavement Marking	
	Minimum	Maximum
16 – 18 mil marking	90 sq. ft.	100 sq. ft.
Beads	20 lbs.	22 lbs.

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:

U.S. Mesh	Microns	% Passing	
		Epoxy and MMA	Waterborne, Low VOC and High Build
16	1180	90-100	100
18	1000	65-80	97-100
20	850		85-100
30	600	30-50	50-70
40	425		10-35
50	300	0-5	0-10
80	180		0-5

REVISION OF SECTIONS 106, 627 AND 713
GLASS BEADS FOR PAVEMENT MARKING

- (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

REVISION OF SECTION 107
CONTRACTOR OBTAINED STORMWATER CONSTRUCTION PERMIT

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

Subsection 107.25 shall include the following:

- (d) *Contractor Obtained CDPS-SCP Stormwater Permit* . This project is covered by a Colorado Discharge Permit System Stormwater Construction Permit (CDPS-SCP). The Contractor shall apply for and obtain the permit upon award of the Contract. The Contractor shall submit a copy of the CDPS-SCP to the Engineer prior to or at the project Pre-construction Conference. 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 the CDPS-SCP has been obtained from CDPHE and submitted to the Engineer. A copy of the Permit shall be placed in the project SWMP notebook.

Prior to final acceptance, a project walk through shall be conducted in accordance with subsection 208.10 (c). The walk through shall take place upon sufficient completion of the project, as determined by the Engineer.

Upon receipt of written final acceptance of the water quality work from the Engineer and written concurrence from the Maintenance Superintendent, the Contractor shall transfer the CDPS-SCP to the CDOT Maintenance Superintendent. The transfer forms will only be signed if the project is in an acceptable state as determined by the Maintenance Superintendent and the CDOT Region Water Pollution Control Manager (RWPCM). CDOT will submit the Application of Transfer of Ownership to the CDPHE. Under no circumstances shall the Contractor inactivate the permit.

Until the transfer has been completed, the Contractor shall continue to adhere to all permit requirements. Requirements shall include inspections, BMP installation, BMP maintenance and BMP repair, including seeded areas. 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.

May 2, 2013

REVISION OF SECTION 107
PROJECT PAYROLLS

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.

February 3, 2011

REVISION OF SECTION 107
RESPONSIBILITY FOR DAMAGE CLAIMS,
INSURANCE TYPES AND COVERAGE LIMITS

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.

January 30, 2014

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.

REVISION OF SECTION 108
LIQUIDATED DAMAGES

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:

Original Contract Amount (\$)		Liquidated Damages per Calendar Day (\$)
From More Than	To And Including	
0	250,000	400
250,000	500,000	700
500,000	1,000,000	1,100
1,000,000	2,000,000	1,600
2,000,000	4,000,000	2,500
4,000,000	10,000,000	3,300
10,000,000	-----	3,300 plus 200 Per Each Additional 1,000,000 Contract Amount or Part Thereof Over 10,000,000

July 31, 2014

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.

1
REVISION OF SECTION 108
PROJECT SCHEDULE

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 project.

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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.

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 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:

Activity ID	Activity Description
Original Duration	Total Float
Early start date	Early finish date
Late start date*	Late finish date*
Actual Start date^	Actual Finish date^
Calendar used on the activity	Activity Responsibility
Remaining Duration^	Duration Percent Complete^
Gantt chart (time-scaled logic diagram)	
*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.

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- (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.

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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.

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REVISION OF SECTION 108
PROJECT SCHEDULE

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 SECTIONS 108 AND 109
PAYMENT SCHEDULE (MULTIPLE CONSTRUCTION YEARS)

Sections 108 and 109 of the Standard Specifications are hereby revised for this project as follows:

Delete subsection 108.04, and replace with the following:

108.04 Payment Schedule. The Contractor shall prepare a payment schedule which shall show the dollar amount of work the Contractor expects to complete by the progress estimate date each month for the duration of construction. The schedule shall cover the period from the commencement of work to the expected completion date as shown on the Contractor's progress schedule. The payment schedule may be prepared using standard spreadsheet software such as MS Excel and submitted in electronic format.

(a) *Initial Payment Schedule.* The Contractor shall submit the initial payment schedule at the preconstruction conference. The payment schedule shall show the total dollar amount of work expected to be completed by each month's progress estimate date and a total for each of the State's Fiscal Years that the project will be active.

The amounts shown shall include planned force account work and expected incentive payments.

(b) *Payment Schedule Updates.* Once each month the Contractor shall submit a payment schedule update to the Engineer. The schedule update shall be in the same format as the initial schedule and shall be submitted to the Engineer by the first day of each month. In each payment schedule update, estimated monthly dollar amounts shall be revised to match actual progress payments made to the Contractor to date. Each payment schedule update shall show corrected dollar amounts of work to be completed each month through the expected completion date as shown on the Contractor's progress schedule.

If the payment schedule update has any State Fiscal Year (July 1 to June 30) payment in excess of the most recently approved payment schedule's fiscal year totals, the Department may, in its sole discretion, approve the Fiscal Year payment increases in the Contractor's schedule of payments. If the Department does not approve the Fiscal Year payment increases the Contractor shall either revise the payment schedule to conform to the most recently approved payment schedule or proceed at his own risk. A Contractor proceeding at his own risk will be paid for the at risk work in the July Partial Payment.

If the payment schedule update has any State Fiscal Year payment in excess of the most recently approved payment schedule because of differing site conditions, changes, or extra work performed in accordance with Section 104, and this payment is not approved by the Department, the delay for not performing this defined work in the scheduled Fiscal Year will be compensable in accordance with subsection 108.08(c), if the Contractor does not proceed at his own risk.

If the payment schedule update has any State Fiscal Year payment in excess of the most recently approved payment schedule because of the Contractor's accelerated schedule, and this payment is not approved by the Department, the delay for not performing the work associated with the Contractor's accelerated schedule in the scheduled Fiscal Year will be noncompensable in accordance with subsection 108.08(c), if the Contractor does not proceed at his own risk.

(c) *Failure to Submit Payment Schedule.* If the Contractor fails to submit the initial payment schedule or a payment schedule update by the required date, the Engineer will withhold progress payments until such time as the Contractor has submitted a current payment schedule.

Subsection 109.06 shall include the following:

(h) *Maximum Partial Payments.* Partial payments will not be made in excess of the initial payment schedule's fiscal year totals except at the sole discretion of the Department. Work performed in excess of the initial Fiscal Year estimate, without written approval of the Department, shall be performed at the Contractor's risk. A Contractor proceeding at his own risk will be paid for the at risk work in the July Partial Payment.

1
 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 in subsection 109.06(i) 2.D below. The index will be the average for the month of the daily postings of the spot price per barrel of Flint Hills Resources daily crude oil posting, as published on http://www.fhr.com/refining/crude_oil.aspx. The index from this source will be converted to US Dollars using the currency converter at <http://finance.yahoo.com/currency>; the posted price of Canadian Dollars per cubic meter of WCS on fhr.com will be converted to US Dollars per cubic meter. A conversion factor of 0.89 cubic meter per Ton will be used to convert the posted price from cubic meter to tons. The converted daily prices and the average index number for the month will be posted as soon as they are available on the CDOT website at:

<http://www.coloradodot.info/business/designsupport/construction-specifications/2011-Specs/asphalt-cement-cost-adjustment>

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:

Item No.	Item	Pay Unit
403*	Hot Mix Asphalt (Grading __) (Asphalt)	Ton
403	Stone Matrix Asphalt (Grading __) (Asphalt)	Ton

*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:
 $ACCA = (EP - 1.05 BP)(PA) (Q)$

EP less than BP:
 $ACCA = (EP - 0.95 BP) (PA) (Q)$

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 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 postings 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.

REVISION OF SECTION 109
COMPENSATION FOR COMPENSABLE DELAYS

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.

1
 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:

Item	Pay Unit	Fuel Factor (FF)
202-Removal of Asphalt Mat (Planing)	Square Yard	0.006 Gal/SY/Inch depth
203-Excavation (muck, unclassified) Embankment, Borrow	Cubic Yard	0.29 Gal/CY
203-Rock Excavation	Cubic Yard	0.39 Gal/CY
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 & backfill, such as RCP(CIP)]	Cubic Yard	0.29 Gal/CY
304-Aggregate Base Course (Class ___)	Cubic Yard	0.85 Gal/CY
304-Aggregate Base Course (Class ___)	Ton	0.47 Gal./Ton
307-Processing Lime Treated Subgrade	Square Yard	0.12 Gal/SY
310-Full Depth Reclamation	Square Yard	0.06 Gal/SY
403-Hot Mix Asphalt (HMA) (Grading ___) *	Ton	2.47 Gal/Ton
403-Stone Matrix Asphalt (Grading ___)	Ton	2.47 Gal/Ton
405-Heating and Scarifying Treatment	Square Yard	0.44 Gal/SY
405-Heating and Repaving Treatment	Square Yard	0.44 Gal/SY
405-Heating and Remixing Treatment	Square Yard	0.44 Gal/SY
406-Cold Bituminous Pavement (Recycle)	Square Yard	0.01 Gal/SY/Inch depth
412- Concrete Pavement (___ Inch)	Square Yard	0.03 Gal/SY/Inch thickness
412-Place Concrete Pavement**	Square Yard	0.03 Gal/SY/Inch thickness

*Hot Mix Asphalt (Patching) is not subject to fuel cost adjustment.
 **Use the thickness shown on the plans.

REVISION OF SECTION 109
FUEL COST ADJUSTMENT

- 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:

EP greater than BP:

$$FA = (EP - 1.05 BP)(Q)(FF)$$

EP less than BP:

$$FA = (EP - 0.95 BP)(Q)(FF)$$

Where:

- BP = Average fuel price index for the calendar month prior to the calendar month in which bids are opened
- EP = Average fuel price index for the calendar month prior to the calendar month in which the partial estimate pay period ends
- FA = Adjustment for fuel costs in dollars
- 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.

1
REVISION OF SECTION 109
MEASUREMENT OF QUANTITIES

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.

REVISION OF SECTION 109
MEASUREMENT OF WATER

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:

2 inch	4 years
4 inch to 6 inch	2 years
8 inch to 10 inch	1 year

January 31, 2013

REVISION OF SECTION 109
PROMPT PAYMENT

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.

1
REVISION OF SECTION 203
IMPORTED MATERIAL FOR EMBANKMENT

Section 203 of the Standard Specifications is hereby revised for this project as follows:

Subsection 203.03 (a) shall include the following:

Imported Material used for backfilling 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
- (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 on the plans. 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.

2
 REVISION OF SECTION 203
 IMPORTED MATERIAL FOR EMBANKMENT

Table 203-1
SULFATE, CHLORIDE AND PH OF IMPORTED MATERIAL

Pipe Class	SOIL		
	Sulfate (SO ₄)	Chloride (Cl)	pH
	% max	% max	
0, 7	0.05	0.05	6.0-8.5
1, 7	0.10	0.10	6.0-8.5
2, 8	0.20	0.20	6.0-8.5
3, 9	0.50	0.50	6.0-8.5
4, 9	1.00	1.00	5.0-9.0
5, 10	2.00	2.00	5.0-9.0
6, 10	>2.00	>2.00	<5 or >9

Table 203-2
RESISTIVITY AND PH OF IMPORTED MATERIAL

SOIL SIDE	
Resistivity, R (Ohm – cm)	pH
≥1,500	5.0-9.0
≥250	3.0-12.0

REVISION OF SECTIONS 203, 206, 304 AND 613
COMPACTION

Sections 203, 206, 304 and 613 of Standard Specifications are hereby revised for this project as follows:

In subsection 203.03 (a), delete the fifth paragraph and replace with the following:

1. *Soil Embankment.* Soil embankment consists of materials with 50 percent or more of the material passing the 4.75 mm (No. 4) sieve.

A soil embankment may also have more than 50 percent of the material retained on the 4.75 mm (No. 4) sieve, but no more than 30 percent of the material retained on the 19 mm (3/4 inch) sieve.

Soil embankment shall be constructed with moisture density control in accordance with the requirements of subsection 203.07.

2. *Rock Embankment.* Rock embankment consist of materials with 50 percent or more of the material retained on the 4.75 mm (No. 4) sieve and with more than 30 percent of the material retained on the 19 mm (3/4 inch) sieve. All material shall be smaller than 6 inches. Rock embankments shall be constructed without moisture density control in accordance with the requirements of subsection 203.08.

Delete Subsection 203.07 and replace with the following:

203.07 Construction of Embankment and Treatment of Cut Areas with Moisture and Density Control. Soil embankments shall be constructed with moisture and density control and the soil upon which the embankments are to be constructed shall be scarified to a depth of 6 inches and compacted with moisture and density control. The moisture content of the soil at the time of compaction shall be as specified or directed.

The material shall be removed from the full width of roadbed in all cut sections to the designated depth. The soil below the designated depth shall be thoroughly scarified to a depth of 6 inches and the moisture content increased or reduced, as necessary, to obtain the moisture content specified. This scarified layer shall then be compacted to the relative compaction specified.

All embankment material shall be compacted to not less than 95 percent relative compaction. Maximum dry density of all soil types encountered or used will be determined in accordance with AASHTO T 99 as modified by CP 23.

Soils shall be compacted at ± 2 percent of Optimum Moisture Content (OMC) as determined by AASTHO T 99. Soils having greater than 35 percent passing the 75 μm (No. 200) sieve shall be compacted to 0 to 3 percent above OMC. Soils which are unstable at the above moisture content shall be compacted at lower moisture content to the specified density.

Additional work involved in drying embankment material to the required moisture content shall be included in the contract price paid for excavating or furnishing the material with no additional compensation.

Density requirements will not apply to materials which cannot be tested in accordance with the above procedures for determining maximum dry density. Compaction for materials which cannot be tested shall be in accordance with subsection 203.08.

Claystone or soil-like non-durable shale shall be pulverized and compacted to the specified moisture and percent of relative compaction and shall be compacted with a heavy tamping foot roller, weighing at least 30 tons. Each tamping foot roller shall protrude from the drum a minimum of 4 inches. Each embankment layer shall receive a minimum of three or more coverages with the tamping foot roller to obtain density. One coverage consists of one pass over the entire surface designated. One pass consists of the passing of an acceptable tamping foot roller over a given spot. The roller shall be operated at a uniform speed not exceeding 3 miles per hour. No additional compensation will be made for additional roller coverages to achieve specified density requirements.

REVISION OF SECTIONS 203, 206, 304 AND 613
COMPACTION

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 before compacting to the required density and 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 \pm 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 \pm 2 percent of Optimum Moisture Content (OMC). Materials having greater than 35 percent passing the 75 μ m (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 \pm 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 \pm 2 percent of Optimum Moisture Content (OMC). Materials having greater than 35 percent passing the 75 μ m (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.

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
- (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 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.

2
 REVISION OF SECTION 206
 IMPORTED MATERIAL FOR STRUCTURE BACKFILL

**Table 206-1
 SULFATE, CHLORIDE AND PH OF IMPORTED MATERIAL**

Pipe Class	SOIL		
	Sulfate	Chloride	pH
	(SO ₄)	(Cl)	
	% max	% max	
0, 7	0.05	0.05	6.0-8.5
1, 7	0.10	0.10	6.0-8.5
2, 8	0.20	0.20	6.0-8.5
3, 9	0.50	0.50	6.0-8.5
4, 9	1.00	1.00	5.0-9.0
5, 10	2.00	2.00	5.0-9.0
6, 10	>2.00	>2.00	<5 or >9

**Table 206-2
 RESISTIVITY AND PH OF IMPORTED MATERIAL**

SOIL SIDE	
Resistivity, R (Ohm – cm)	pH
≥1,500	5.0-9.0
≥250	3.0-12.0

REVISION OF SECTION 206
STRUCTURE BACKFILL (FLOW-FILL)

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:

Fine Aggregate ^{1,4}	703.01
Coarse Aggregate ^{2,4}	703.02
Portland Cement	701.01
Fly Ash ^{3,4}	701.02
Water	712.01
Air Entraining Admixture	711.02
Chemical Admixtures	711.03

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

REVISION OF SECTION 206
STRUCTURE BACKFILL (FLOW-FILL)

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:

Sieve Size	Percent Passing
25.0 mm (1 inch)	100
75 µm (No. 200)	0- 10 ¹

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.

January 30, 2014

REVISION OF SECTION 206
STRUCTURE BACKFILL AT BRIDGE ABUTMENTS

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.

July 29, 2011

REVISION OF SECTIONS 206 AND 601
BACKFILLING STRUCTURES THAT
SUPPORT LATERAL EARTH PRESSURES

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).

Subsection 601.12 shall include the following:

- (o) *Backfilling Structures that Support Lateral Earth Pressure.* Concrete compressive strengths shall reach f'c as 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.

REVISION OF SECTION 208
AGGREGATE BAG

Section 208 of the Standard Specifications is hereby revised for this project as follows:

In subsection 208.02 delete (l) and replace with the following:

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

Diameter (inches)	Weight (minimum) (pounds per foot)
6-8	6
10	10
12	15

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:

Property	Requirement	Test Method
Grab Tensile Strength	90 lbs. min.	ASTM D 4632
Trapezoid Tear Strength	25 lbs. min.	ASTM D 4533
Mullen Burst	300 psi	ASTM D 3786
Ultraviolet Resistance	70%	ASTM D 4355

Subsection 208.12 shall include the following:

Pay Item	Pay Unit
Aggregate Bag	Linear Foot

REVISION OF SECTION 208
EROSION LOG

Section 208 of the Standard Specifications is hereby revised for this project as follows:

In subsection 208.02, delete (h) and replace with the following:

(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 3/8 inches of HDPE mesh, 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 208-1
NOMINAL DIMENSIONS OF EROSION LOGS**

Diameter	Length (feet)		Weight (minimum) (pounds/foot)	Stake Dimensions (Inches)
	Min.	Max.		
9 inch	10	180	1.6	1.5 by 1.5 (nominal) by 18
12 inch	10	180	2.5	1.5 by 1.5(nominal) by 24
20 inch	10	100	4.0	2 by 2 (nominal) by 30

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

Subsection 208.11 shall include the following:

All BMPs measured by the linear foot shall be determined along the centerline of the BMP. Measured length will not include required overlap.

REVISION OF SECTION 212
SEED

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.

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 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):

Property	Requirement	Test Method
(1) pH 1% solution	6.5 - 8.0	
(2) Mucilage content	75% min.	ASTM D7047

Pre-gelatinized 100 percent natural corn starch polymer:

(1) Organic Nitrogen as protein	5.5-7%
(2) Ash content	0-2%
(3) Fiber	4-5%
(4) pH 1% solution	6.5 – 8.0
(5) Size	100% thru 850 microns (20 mesh)
(6) Settleable solids	<2%

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:

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REVISION OF SECTION 213
MULCHING

Properties	Requirement	Test Method
Organic Fibers	71% Min.	ASTM D 2974
Cross linked Tackifiers	10% +/- 2% Min.	
Reinforcing Interlocking Fibers	10% +/- 1% Min.	
Biodegradability	100%	ASTM D 5338
Ground Cover @ Application Rate	90% Min.	ASTM D 6567
Functional Longevity	12 Months Min.	
Cure Time	< 8 hours	
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:

Property	Requirement	Test Method
Fiber Retention On 28-Mesh Screen	≥ 40%	Tyler Ro-Tap Method
Moisture Content	12% ± 2%	Total Air Dry Weight Basis
Organic Matter	99.2% ± 0.2%	Oven Dry Weight Basis
Ash Content	0.8% ± 0.2%	Oven Dry Weight Basis
pH At 3% Consistency In Water	4.5-7.0 ± 0.5%	
Sterilized Weed-Free	Yes	
Non-Toxic To Plant Or Animal Life	Yes	

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:

Property	Requirement
Molecular Weight	≥ 12x10 ⁶
Charge Density	> 25%
Non-Toxic To Plant Or Animal Life	Yes

- (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

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 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:

Property	Requirement	Test Method
Ground Cover (%)	95	ASTM 6567
Bio-degradability (%)	100	ASTM 5338
Functional Longevity (months)	9 month minimum	
Cure Time (hours)	24-48	
Cross-linked tackifier	10% minimum	
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.

Powder	Fiber	Water
200 lbs./Acre	300 lbs./Acre	2000 gal./Acre

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 use 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.

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REVISION OF SECTION 213
MULCHING

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:

Pay Item	Pay Unit
Bonded Fiber Matrix	Acre
Bonded Fiber Matrix	Pound
Spray on Mulch Blanket	Pound

Payment for spray-on mulch blanket and bonded fiber matrix will be full compensation for all work and materials necessary to complete this item.

REVISION OF SECTION 216
SOIL RETENTION COVERING

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 Table 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 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 seed. 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 agricultural straw and 30 percent coconut fiber. It shall be either biodegradable or photodegradable. 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. Blankets shall be sewn together on 1.50 inch to 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. When specified, lightweight polypropylene netting shall be fastened on both sides of the blanket and shall be 1.5 pounds per 1000 square feet. 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.

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 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**

Product Class	Minimum Roll Width	Minimum Thickness ASTM D 6525	Acceptable Matrix Fill Material	Min. Mass per Unit Area ASTM D 6475	Size of Net Opening	
					Photo-degradable	Bio-degradable
1	6.5'	0.25"	Straw/Coconut	8 oz/sy	Minimum: 0.50"x0.50" Maximum: 0.75"x0.75"	Minimum: 0.50"x0.50" Maximum: 0.5"x1.0"
1	6.5'	0.25"	Excelsior	8 oz/sy	Minimum: 0.50"x0.50" Maximum: 1.0"x2.0"	NONE
2	6.5'	0.20"	Coconut Fibers	8oz/sy	Minimum: 0.50" x0.5" Maximum: 0.75"x0.75"	Minimum: 0.50"x0.50" Maximum: 0.5"x1.0"

**Table 216-2
 PERFORMANCE REQUIREMENTS FOR SOIL RETENTION BLANKET –
 PHOTODEGRADABLE OR BIODEGRADABLE BLANKETS**

Product Class	Slope Application "C" Factor ¹ ASTM D 6459	Channel Application Permissible Shear Stress ² (Un-vegetated) ASTM D 6460	Minimum Tensile Strength ASTM D 6818
1	≤ 0.10@3:1	2.00 lbs/sf	100 lbs/ft
2	≤ 0.10@3:1	2.25 lbs/sf	125 lbs/ft

Notes:

¹ "C" Factor calculated as ratio of soil loss from soil retention blanket protected slope (tested at specified or greater gradient, h:v) to ratio of soil loss from unprotected (control) plot in large-scale testing.

² Permissible shear stress is the minimum shear stress that a product must be able to sustain without physical damage or excess soil loss when it is installed on a bare soil channel. Failure is defined as ½ inch of soil loss during a 30 minute flow event in large scale testing.

Blankets shall be tested for physical properties and have published data from a pre-approved independent testing facility.

REVISION OF SECTION 216
SOIL RETENTION COVERING

Large scale testing of Permissible Shear Stress and Slope Erosion Protection ("C" factor) shall be performed by a pre-approved independent testing facility.

A sample of the staples and a copy of 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.

- (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 Table 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 REQUIREMENTS¹ FOR TURF REINFORCEMENT MAT**

Product Class	Minimum Roll Width	Minimum Thickness ASTM D 6525	Acceptable Matrix Fill Material ²	Size of Net Opening ²
1	6.5'	0.25"	Excelsior, Straw/Coconut, Coconut, or Polymer fibers	Minimum: 0.50"x0.50" Maximum: 0.75"x0.75"
2	6.5'	0.25"	100% UV Stabilized Synthetic or Coconut Fibers	0.50"x 0.50"
3	6.5'	0.25"	100% UV Stabilized Synthetic Fibers	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 1.5 inch to 2 inch centers.

**Table 216-4
PERFORMANCE REQUIREMENTS FOR TURF REINFORCEMENT MAT**

Product Class	Tensile Strength MD ASTM D 6818	UV Stability @ 500 Hours ASTM D 4355	Maximum Permissible Shear Stress ¹ (Vegetated) ASTM D 6460	Maximum Permissible Shear Stress ¹ (Unvegetated) ASTM D 6460
1	125 lbs/ft	80%	6.0 lbs/sf	4.0 lbs/sf
2	150 lbs/ft	80%	8.0 lbs/sf	6.0 lbs/sf
3	175 lbs/ft	80%	10.0 lbs/sf	8.0 lbs/sf

Notes:

¹ Permissible shear stress is the minimum shear stress that a product must be able to sustain when placed on a fully vegetated channel or unvegetated 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.

REVISION OF SECTION 216
SOIL RETENTION COVERING

TRMs shall be tested for physical properties and have published data from a pre-approved independent testing facility.

Large scale testing of Permissible Shear Stress will be performed by a pre-approved independent testing facility.

A sample of the staples and a copy of the manufacturer's product data showing that the product meets the Contract requirements shall be submitted for approval at the environmental preconstruction conference.

- (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.

CONSTRUCTION REQUIREMENTS

216.03 The Contractor shall install soil retention coverings in accordance with Standard Plan M-208-1 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 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 (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. When specified by the manufacturer, trench depth shall be increased up to 12 inches in depth. 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 stapled 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 applied on the slope every 35 feet. Each staple check shall consist of two rows of staggered staples.

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

REVISION OF SECTION 216
SOIL RETENTION COVERING

soil conditioning or topsoil, compacted by foot tamping, and seeded. Fabric shall be brought back over trench and stapled. 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 at the minimum rate shown on the plans. Staple 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. When specified by the manufacturer, trench depth shall be increased up to 12 inches in depth. 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 be anchored every 30 feet with a check slot. 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. Allowance will not be made for overlap.

BASIS OF PAYMENT

216.08 The accepted quantities of soil retention coverings will be paid for at the contract unit price per square yard.

Payment will be made under:

Soil Retention Blanket (____) (Photodegradable Class _)	Square Yard
Soil Retention Blanket (____) (Biodegradable Class _)	Square Yard
Turf Reinforcement Mat (Class _)	Square Yard

REVISION OF SECTION 216
SOIL RETENTION COVERING

Preparation of seedbed, fertilizing, and seeding will be measured and paid for in accordance with Section 212.

TRM and its associated blanket will be measured and paid for separately. 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 Section 207 and 212.

REVISION OF SECTION 250
ENVIRONMENTAL, HEALTH AND SAFETY MANAGEMENT

Section 250 of the Standard Specifications is hereby revised for this project as follows:

In subsection 250.03, delete the second and third paragraphs and replace with the following:

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) shall be followed.

In subsection 250.07 delete, (d) and replace with the following:

- (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. Training must be given by a Certified Asbestos Inspector or Certified Asbestos Abatement Designer 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.

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.

REVISION OF SECTION 401
COMPACTION PAVEMENT TEST SECTION (CTS)

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.

REVISION OF SECTION 401
COMPOSITION OF MIXTURES – VOIDS ACCEPTANCE

Section 401 of the Standard Specifications is hereby revised for this project as follows:

Subsection 401.02(a) shall include the following:

On projects with voids acceptance of hot mix asphalt, mix designs based on a theoretical rejection of baghouse fines may be used when necessary to meet CDOT mix design requirements if the following additional requirements are met. Written approval for use of theoretical rejection of baghouse fines mixture design shall be obtained before production of project material.

- (1) Price adjustment for the hot mix asphalt shall be made based on voids acceptance criteria as prescribed in the latest version of the Standard Special Provision, Revision of Sections 105 and 106, Conformity to the Contract of Hot Mix Asphalt (Voids Acceptance). All costs associated with theoretical rejection of baghouse fines mix design, production, and acceptance shall be at the Contractor's expense.
- (2) The Contractor shall submit a separate Quality Control (QC) plan for handling the rejection of baghouse fines. The plan shall identify the plan, equipment, and procedures that will be used for the rejection of baghouse fines. The plan shall include detailed information on baghouse control systems and actual data demonstrating consistent system functionality. The QC plan shall be approved in writing prior to production.
- (3) The Contractor shall demonstrate that the material can be produced in accordance with one of the two procedures listed below. The Contractor shall supply project aggregate material for use in establishing acceptance testing equipment correction factors. Aggregate samples that have been produced according to CP-L 5117 to represent plant-produced material shall be provided by the mix design lab.
 - (i) The Contractor shall produce a minimum of 3000 tons of material. This material shall be placed on non thru lanes or offsite in locations approved by the Engineer. A minimum of 3 samples will be tested for AC content, air voids and VMA. QL's for each element will be determined in accordance with the contract documents. If the QL is equal to or greater than 65 for VMA and Asphalt Cement Content and the QL for the element of air voids is equal to or greater than 70, full production may commence. This material may be considered a separate process and price adjustment will be in accordance with subsection 105.05 or;
 - (ii) The Contractor shall construct a 500-ton test strip on the main line on the project. Tonnage other than 500 tons may be produced only if approved. 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 QL's are calculated. If the QL is equal to or greater than 65 for VMA and Asphalt Cement Content and the QL for the element of air voids is equal to or greater than 70, full production may commence. If the TQL 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 the Contractor's expense.

February 3, 2011

REVISION OF SECTION 401
PLANT MIX PAVEMENTS

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.

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 REVISION OF SECTION 401
 RECLAIMED ASPHALT PAVEMENT

Section 401 of the Standard Specifications is hereby revised for this project as follows:

Subsection 401.02(b) shall include the following:

Reclaimed Asphalt Pavement (RAP) is allowed in hot mix asphalt (HMA) up to a maximum binder replacement of 23 percent for all lifts, provided all specifications for HMA are met. Fine Aggregate Angularity requirements shall apply only to the virgin fraction of the fine aggregate. The RAP shall not contain clay balls, vegetable matter, or other deleterious substances, and must meet the uniformity requirements as outlined below.

HMA Project Verification Testing for asphalt content and gradation will be performed at the frequencies listed in the Field Materials Manual in accordance with CP-L 5120.

The Contractor shall have an approved mix design for the amount of RAP to be used. The AC content of the RAP utilized in the Contractor RAP mix design shall be the average AC content determined in accordance with 1B or 1C, below, or alternatively, a minimum of five samples of the Contractors RAP stockpile may be sampled and the average AC content of the RAP be determined using AASHTO T-164, Method A or B, or in accordance with 1C below. The Contractor shall determine the total binder replaced by the binder in the RAP pursuant to the following equation:

$$\text{Total Binder Replaced} = (A \times B) \times 100/E$$

Where:

A = RAP % Binder Content *

B = RAP % in Mix *

E = Total Effective Binder Content *

* in decimal format (i.e. 2% is 0.02)

The Total Binder Replaced by the binder in the RAP shall not exceed 23 percent of the effective binder content of either the mix design or the produced mix.

The use of RAP shall be controlled in accordance with subsections 105.05 and 106.05. If the Contractor elects to use RAP, the following additional conditions shall apply:

1. The Contractor shall have an approved Quality Control (QC) Plan that details how the RAP will be processed and controlled. The QC plan shall address the following:
 - A. RAP Processing Techniques. This requires a schematic diagram and narrative that explains the processing (crushing, screening, and rejecting) and stockpile operation for this specific project.
 - B. Control of RAP Asphalt Binder Content (AASHTO T-164, Method A or B). RAP Asphalt Binder Content may also be determined in accordance with CP-L 5120, provided an RAP AC content correction factor is determined through correlation testing with AASHTO T-164, Method A or B. The correction factor shall be determined by performing correlation testing on the first five samples of the RAP AC content, then at a frequency of one for every five AC content tests thereafter. The correction factor shall be determined by calculating the average difference in AC content between CP-L 5120 and AASHTO T-164, Method A or B, and applying the correction to the AC content determined in accordance with CP-L 5120 :
 Frequency: 1/1000 tons of processed RAP material (minimum five tests)
 - C. (Alternate) The Contractor may propose a RAP asphalt content correction factor to be used in conjunction with CP-L 5120. The proposed CP-L 5120 RAP asphalt content correction factor shall be used with all RAP asphalt contents tested for the mixture design and quality control sampling and testing. The methodology of the proposed CP-L 5120 RAP asphalt content correction factor shall be outlined in detail in the approved RAP QC Plan. At a minimum, the proposed CP-L 5120 correction factor shall identify the principal source locations of the RAP aggregate, gradation of the material tested, and specific ignition oven serial number used in all the RAP asphalt content testing. The RAP source

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 REVISION OF SECTION 401
 RECLAIMED ASPHALT PAVEMENT

locations, material gradation, and specific equipment used shall substantiate the CP-L 5120 asphalt content correction factor used for the testing. The substantiation must be from data gathered from historical information or specific asphalt content correction data obtained from tests performed on similar virgin aggregate sources, virgin material gradations, and the specific equipment used.

- D. Control of RAP Gradation (CP31 or AASHTO T-30):
 Frequency: 1/1000 tons of processed RAP material (minimum three tests)
 - E. Process Control Charts shall be maintained for binder content and each screen listed in subsection 401.02(b), during addition of any RAP material to the stockpile. The Contractor shall maintain separate control charts for each RAP stockpile. The control charts shall be displayed and shall be made available, along with RAP AC extraction testing laboratory reports to the Engineer upon request
2. The processed RAP must be 100 percent passing the 31.5 mm (1¼ inch) sieve. The aggregate obtained from the processed RAP shall be 100 percent passing the 25.0 mm (1 inch) sieve. The aggregate and binder obtained from the processed RAP shall be uniform in all the measured parameters in accordance with the following:

UNIFORMITY*

Parameter	Standard Deviation
Binder Content	0.5
Percent Passing 19 mm (¾")	4.0
Percent Passing 12.5 mm (½")	4.0
Percent Passing 9.5 mm (⅜")	4.0
Percent Passing 4.75 mm (#4)	4.0
Percent Passing 2.36 mm (#8)	4.0
Percent Passing 600 µm (#30)	3.0
Percent Passing 75 µm (#200)	1.5

*Uniformity is the Maximum allowable Standard Deviation of test results of processed RAP.

- 3. If RAP millings generated are incorporated in the same project, in accordance with CPL 5145 the Contractor shall pave with a virgin mix design until sufficient amount of processed RAP has been stockpiled and tested to allow full production of a RAP HMA mix.

REVISION OF SECTION 401
RECLAIMED ASPHALT SHINGLES

Section 401 of the Standard Specifications is hereby revised for this project as follows:

Subsection 401.02(b) shall include the following:

Reclaimed Asphalt Shingles (RAS) will be allowed in hot mix asphalt (HMA) up to a maximum of 5 percent of the total weight of the mix provided all specifications for HMA are met. Only RAS from manufactured shingle waste or post-consumer asphalt shingles as defined by AASHTO MP 15 shall be allowed.

The RAS shall not contain clay balls or vegetable matter. Deleterious materials such as metals, glass, rubber, soil, brick, tars, paper, wood, and plastic shall not exceed 3.0 percent by mass as determined by material retained on the 4.75 mm (No. 4) sieve. Lightweight materials such as paper, wood, and plastic shall not exceed 1.5 percent by mass as determined by material retained on the 4.75 mm (No. 4) sieve. Deleterious material will be determined by the amount retained on the 4.75 mm (No. 4) sieve from a 500g-700g RAS sample. The Contractor shall pick and weigh the amount retained on the 4.75 mm (No. 4) sieve.

The moisture content of the RAS shall not exceed 15percent by mass.

The Contractor shall provide, using the Polarized Light Microscopy (PLM) method (EPA-600/M4-82-020), asbestos test results from an independent laboratory accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) verifying compliance with the Environmental Protection Agency (EPA) National Emission Standards for Hazardous Air Pollutants (NESHAP) requirements (i.e. nondetectable is defined as less or equal to 1percent asbestos). The Contractor's Project Safety Management Plan shall include a hazard assessment and safety considerations for the RAS processing, construction operations, and materials testing operations.

The Contractor shall certify in writing and by submitting certificates of compliance in accordance with subsection 106.12 that RAS samples collected and analyzed, for the purpose of identifying properties of RAS as defined in this specification, are representative of the RAS that will be used in the HMA production for this project. The Contractor or RAS Supplier shall allow CDOT to visit the RAS production, shipping site, or both during normal business hours to perform an audit by observing the quality control activities, to inspect the facilities, and to obtain RAS samples for testing. Access to the site shall be provided within 24 hours of notice from the Engineer.

The Contractor shall submit a mix design in accordance with Section 403 and CP 52 for the amount of RAS to be used. The shingle aggregate gradation and specific gravity shall be determined in accordance with AASHTO PP 53. The AC content of the RAS utilized in the Contractor RAS mix design shall be determined in accordance with AASHTO T-164, Method A or B. The Contractor may use both RAS and RAP in the mix design. The Contractor shall determine the total binder replaced by the binder in the RAS and RAP pursuant to the following equation:

$$\text{Total Binder Replaced} = ((A \times B) + (C \times D)) \times 100/E$$

Where:

A= RAP % Binder Content *

B= RAP % in Mix *

C= RAS % Binder Content *

D= RAS % in Mix *

E= Total Effective Binder Content *

*in decimal format (i.e. 2% is 0.02)

The Total Binder Replaced by the binder in the RAS, RAP, or both shall not exceed 30percent of the effective binder content of either the mix design or the produced mix.

The same equation shall be used to calculate the total binder replaced for RAS only mixes.

The Contractor shall supply CDOT with total binder grading tests from a single sample collected during production specified by the Engineer.

2
REVISION OF SECTION 401
RECLAIMED ASPHALT SHINGLES

The Contractor may uniformly blend sand or fine aggregate with RAS in stockpiles if needed to keep the processed material workable. The sand or fine aggregate added shall be considered in the final gradation of the new HMA.

HMA with RAS shall be tested for acceptance in accordance with subsections 105.05 and 106.05. HMA Project Verification Testing for asphalt content and gradation will be performed at the frequencies listed in the Field Materials Manual in accordance with CP-L 5120. If the Contractor elects to use RAS, the following additional conditions shall apply:

1. The Contractor shall have an approved Quality Control Plan (QCP) that details how the RAS will be processed and controlled. When the Contractor intends to use RAS from a RAS Supplier, that supplier's QCP shall be submitted by the Contractor. The Engineer will, in writing, suspend the work wholly or in part, for failure to comply with the approved QCP. The QCP shall be submitted with the Contractor's HMA mix design and shall address the following:
 - A. RAS Processing Plan. The RAS Processing Plan shall include a schematic diagram and narrative that explains the processing (grinding, screening, and rejecting) and stockpile operation for this specific project. Hand sorting of deleterious material prior to grinding is required. In addition, this plan shall address the control of agglomeration and moisture.
 - B. Determination and Control of RAS Asphalt Binder Content (AASHTO T-164, Method A or B). RAS Asphalt Binder Content (AC) may also be determined in accordance with CP-L 5120, provided a RAS AC content correction factor is determined through correlation testing with AASHTO T-164, Method A or B. The correction factor shall be determined by performing correlation testing on the first five samples of the RAS AC content, then at a frequency of one for every five AC content tests thereafter. The correction factor shall be determined by calculating the average difference in AC content between CP-L 5120 and AASHTO T-164, Method A or B, and applying the correction to the AC content determined in accordance with CP-L 5120.

Frequency: 1/250 tons of processed RAS material (minimum five tests).
 - C. Control of RAS Gradation (CP31 or AASHTO T-30):

Frequency: 1/250 tons of processed RAS material (minimum three tests)
 - D. Process Control Charts shall be maintained for RAS binder content and each screen listed in subsection 401.02(b)2., during addition of any RAS material to the stockpile. The Contractor shall maintain separate control charts for each RAS stockpile. The control charts shall be displayed and shall be made available to the Engineer upon request.
 - E. Asbestos content of RAS:

Frequency: 1/1000 tons of processed RAS material (minimum three tests)
 - F. Moisture content of RAS:

Frequency: 1/day
 - G. Deleterious Material:

Frequency: 1/1000 tons of RAS material (minimum three tests)

REVISION OF SECTION 401
RECLAIMED ASPHALT SHINGLES

2. The processed RAS shall be ground to meet the following requirements.

Sieve Size	Percent Passing by Mass
9.5 mm (3/8 inch)	100
4.75 mm (No.4)	90-100

3. The aggregate and binder obtained from the processed RAS shall be uniform in all the measured parameters in accordance with the following:

UNIFORMITY*

Parameter	Standard Deviation
Binder Content	2.0
Percent Passing 75 µm (No. 200)	6.0
*Uniformity is the maximum allowable Standard Deviation of test results of processed RAS.	

In Subsection 401.22, delete the fifth paragraph and replace with the following:

When asphalt binder is a separate pay item, the amount of asphalt binder contained in RAP material and RAS material will not be measured or paid for separately but shall be included in the work.

REVISION OF SECTION 401
TEMPERATURE SEGREGATION

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.

REVISION OF SECTION 401
TOLERANCES FOR HOT MIX ASPHALT (VOIDS ACCEPTANCE)

Section 401 of the Standard Specifications is hereby revised for this project as follows:

In subsection 401.02(b) delete Table 401-1, including the footnotes, and replace with the following:

Table 401-1
Tolerances for Hot Bituminous Pavement

Element	Tolerance
Asphalt Cement Content	$\pm 0.3 \%$
Voids in the Mineral Aggregate (VMA)	$\pm 1.2 \%$
Air Voids	$\pm 1.2 \%$

REVISION OF SECTIONS 401 AND 412
SAFETY EDGE

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.

2
REVISION OF SECTIONS 401 AND 412
SAFETY EDGE

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:

Pay Item	Pay Unit
Concrete Safety Edge	Linear Foot

Payment for concrete safety edge will be full compensation for all work and materials required to complete the item.

REVISION OF SECTION 412
PORTLAND CEMENT CONCRETE PAVEMENT FINISHING

Section 412 of the Standard Specifications is hereby revised for this project as follows:

Delete subsection 412.12(a) and replace it with the following:

- (a) *Hand Finishing.* Hand finishing should be minimized wherever possible. The Engineer shall be notified prior to hand finishing work and the proposed hand finished work shall be addressed in the Quality Control Plan for concrete finishing. Unless otherwise specified, hand finishing methods will be permitted only under the following conditions. 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 slab 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 unless otherwise approved by the Engineer. 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 in the concrete pavement placement. It shall also 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. Paving operations shall not begin until the Engineer has approved the QCP. The QCP shall identify and address issues affecting the quality of finished concrete pavement 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.

REVISION OF SECTIONS 412, 601 AND 711
LIQUID MEMBRANE-FORMING COMPOUNDS
FOR CURING CONCRETE

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:

Burlap Cloth made from Jute or Kenaf	AASHTO M 182
Liquid Membrane-Forming Compounds for Curing Concrete	ASTM C 309
Sheet Materials for Curing Concrete	AASHTO M 171*
*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.

REVISION OF SECTION 518
BRIDGE EXPANSION DEVICE

Section 518 of the Standard Specifications is hereby revised for this project as follows:

In subsection 518.04, delete the fifth paragraph and replace with the following:

All structural steel elements of the bridge expansion device, including cover plates, shall be galvanized after fabrication in accordance with Section 509, whether or not they are in contact with the elastomeric seals.

In subsection 518.05 (b), delete the third paragraph and replace with the following:

All structural steel elements of the bridge expansion device, including cover plates, shall be galvanized after fabrication in accordance with Section 509, whether or not they are in contact with the elastomeric seals.

February 3, 2011

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.

February 3, 2011

REVISION OF SECTIONS 601 CONCRETE FINISHING

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.

REVISION OF SECTION 601
CONCRETE FORM AND FALSEWORK REMOVAL

Section 601 of the Standard Specifications is hereby revised for this project as follows:

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, $0.80f_c$. 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 $0.80f_c$.

Concrete compressive strength shall be determined using information concrete cylinders or by maturity meters. At the pre-pour conference, the Contractor shall submit the method of determining the structure's strength and the location where information cylinders will be taken or maturity meters placed.

If information cylinders are used they shall be cast by the Contractor and cured in the same manner as the structure. A set of information cylinders shall be taken for each concrete placement on the structure. A set of information cylinders shall be taken for any load of concrete that is being placed at the mid-span of beams and at support locations and other locations as directed by the Engineer. Casting of the information cylinders will be witnessed by the Engineer. The information cylinders shall remain in the molds and cured in the same manner as the structure until they are tested in the laboratory by the Engineer. Compressive strength shall be determined using the compressive strength of at least two information cylinders. The contractor shall be responsible for protecting the information cylinders from damage.

Prior to placement of concrete whose strength will be determined with maturity meters, the Contractor shall provide the Engineer a report of maturity relationships in accordance with CP 69. 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 sets of information cylinders or 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 information cylinder tests or maturity meter, 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.

REVISION OF SECTION 601
CONCRETE FORM AND FALSEWORK REMOVAL

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 using information concrete cylinders or by maturity meters. At the pre-pour conference, the Contractor shall submit the method of determining the structure's strength and the location that information cylinders will be taken or maturity meters placed.

If information cylinders are used they shall be cast by the Contractor and cured in the same manner as the structure. A set of information cylinders shall be taken for each concrete placement on the structure. A set of information cylinders shall be taken for any load of concrete that is being placed at the mid-span of beams and at support locations and other locations as directed by the Engineer. Casting of the information cylinders will be witnessed by the Engineer. The information cylinders shall remain in the molds and cured in the same manner as the structure until they are tested in the laboratory by the Engineer. Compressive strength shall be determined using the compressive strength of at least two information cylinders. The Contractor shall be responsible for protecting the information cylinders from damage.

Prior to placement of concrete whose strength will be determined with maturity meters, the Contractor shall provide the Engineer a report of maturity relationships in accordance with CP 69. 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 sets of information cylinders or 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.

1
REVISION OF SECTION 601
CONCRETE SLUMP ACCEPTANCE

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, an air entraining admixture may be added to an approved Class BZ mix design. A new trial mix will not be required.

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 601-3
PAY FACTORS**

Percent Total Air		Strength		
Deviations From Specified Air (Percent)	Pay Factor (Percent)	Below Specified Strength (psi) [< 4500 psi Concrete]	Pay Factor (Percent)	Below Specified Strength (psi) [≥ 4500 psi Concrete]
0.0-0.2	98	1-100	98	1-100
0.3-0.4	96	101-200	96	101-200
0.5-0.6	92	201-300	92	201-300
0.7-0.8	84	301-400	84	301-400
0.9-1.0	75	401-500	75	401-500
Over 1.0	Reject	Over 500	Reject	
			65	501-600
			54	601-700
			42	701-800
			29	801-900
			15	901-1000
			Reject	Over 1000

May 2, 2013

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) *Depositing 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

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.

February 3, 2011

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.

REVISION OF SECTIONS 613 AND 715
LED ROADWAY LUMINAIRE

Sections 613 and 715 of the Standard Specifications are hereby revised for this project as follows:

In subsection 613.02, delete (e) and replace with the following:

- (e) *Luminaire*. A complete luminaire includes the housing, lens, Light Emitting Diode (LED) luminaire, luminaire housing, driver or power generator, slip-fitting clamp or approved manufacturer mounting, all necessary internal wiring, and photoelectric control. Luminaires shall operate at either 120 VAC, 60 Hz or 277 VAC, 60 Hz. Luminaires shall meet electrical utility company requirements.

In subsection 613.02 (i), delete (4), (6), (7) and (8) and replace with the following:

- (4) Luminaire manufacturer's product information including data in Illuminating Engineering Society of North America (IESNA) format, IESNA photometric distribution type for vertical and lateral distribution (example: B2-U0-G1, Type III), and a photograph or line drawing
- (6) Luminaire Lumen Range
- (7) LED Driver or Power Supply
- (8) Lighting Control Centers and Photoelectric Control Devices

Subsection 613.02 shall include the following:

- (j) *LED Luminaire Warranty*. The Contractor shall ensure that the LED Roadway Luminaire has a minimum warranty of 10 years for all parts, materials and shipping required to repair or replace the luminaire. The Contractor shall provide the manufacturer's warranty to the Engineer prior to installing the luminaire.

The warranty shall cover all failures including:

- (1) Failure in luminaire housing, wiring, connections, drivers and photoelectric control devices.
- (2) More than 10 percent decrease in lumen output
- (3) Significant change in color

The warranty shall begin upon the date the Contractor receives the luminaire. The bill of lading shall be provided to the Engineer prior to final payment of the lighting.

- (k) *Technical Support*. During the warranty period, technical support shall be available from the manufacturer via telephone within 24 hours of the time the call is made from the Contractor, and this support shall be made available from factory certified personnel or factory certified installers at no additional charge to the Department.

In subsection 613.06, delete the first paragraph and replace with the following:

613.06 Luminaires and Lamps. Roadway Luminaires shall be mounted on the mast arm by a slip-fitter clamp or other approved device. Luminaires shall be adjusted vertically and horizontally to provide the required orientation and maximum light distribution on the roadway and to meet Illuminating Engineering Society of North America (IESNA) TM-15 upright rating of U0.

In subsection 613.06, delete the fourth paragraph and replace with the following:

Luminaires of the specified type and lumen output shall be installed as shown on the plans. The type and lumen output shall be marked on each luminaire or pole in accordance American National Standards Institute (ANSI) specifications. ANSI approved tags shall be provided and installed by the Contractor.

2
 REVISION OF SECTIONS 613 AND 715
 LED ROADWAY LUMINAIRE

Subsection 613.12 shall include the following:

Pay Item	Pay Unit
Luminaire (LED) (___ Lumens)	Each

In subsection 715.04 (a), delete 2. and 4. and replace with the following:

2. Optical Chamber. The luminaire distribution shall be equal to or less than an Illuminating Engineering Society of North America (IES) TM15-11 Backlight Uplight and Glare (BUG) ratings listed below in Table 715-1 based on initial lumens or Light Loss Factor (LLF) = 1.0. Roadway luminaires with a U value greater than U0 shall not be accepted. The optical chamber shall be completely sealed from the housing, or the housing shall be completely sealed. A seamless one piece memory-retentive gasket shall seal the optical chamber or housing against the luminaire lens door. All wires entering the optical chamber shall be gasketed at their point of entry. Socket mountings, rivets used in the construction or support of the reflector system, and all other penetrations into the optical chamber shall be completely sealed. The optical chamber shall be water tight when the luminaire door is closed.

**Table 715-1
 BACKLIGHT, UPLIGHT AND GLARE (BUG) VALUES**

Luminaire Mounting Location	Minimum Initial Luminaire Lumen Range	Backlight (B) Rating Maximum	Uplight (U) Rating Maximum	Glare (G) Rating Maximum
Non median-mounted	Less than 5,000	B2	U0	G1
	5,000 – 22,000	B3	U0	G2
	Above 22,000*	B3	U0	G3
Median-mounted	Less than 5,000	B3	U0	G1
	5,000 – 22,000	B4	U0	G2
	Above 22,000*	B4	U0	G3
*By special application only.				

4. Electrical Components. All components shall be Underwriters Laboratory (UL) listed for wet locations or by an Occupational Safety & Health Administration Nationally Recognized Testing Laboratories (OSHA NRTL). Luminaires shall operate from 120 to 277 VAC as specified on the plans or adaptable to the type of power distribution system to be used. All internal wiring and quick disconnects shall be rated for at least 600 VAC and insulated for 302°F. The dimmable driver shall be easily removable from the luminaire housing without the use of tools. The following components shall be in accordance with corresponding sections of ANSI C136.37:
 - (1) Wiring and grounding.
 - (2) Terminal blocks for incoming AC lines.
 - (3) Photocontrol receptacle.
 - (4) Latching and hinging

REVISION OF SECTIONS 613 AND 715
LED ROADWAY LUMINAIRE

In subsection 715.04, delete (b) through (e) and replace with the following:

- (b) *Roadway Luminaires*. Roadway luminaires shall be LED type with integral driver, flat lens, aluminum housing, and be UL Listed for wet locations. All luminaires for the project shall be the same type and design unless the plans specify otherwise.
- (1) The luminaire and all components shall be UL or Intertek Testing Services (ETL) listed for Wet Location and shall have minimum Ingress Protection Rating of IP66.
 - (2) Light source shall be comprised of LED modules connected to a non-integrated driver and ready for connection to a production line luminaire. Luminaires utilizing integrated driver LED light sources, screw-based or panel retrofit products shall not be accepted.
 - (3) The luminaire shall have a Type II or III distribution for non-median mounted luminaires, and Type II, III, IV or V for median mounted luminaires.
 - (4) Transmissive optical components shall be applied in accordance with LED manufacturer's Original Equipment Manufacturer (OEM) design guidelines to ensure suitability for the environment in which the luminaire is installed.
 - (5) Luminaires shall utilize an adjustable slipfitter-type mounting system for installation on 1.25-inch (1.66-inch o.d.) to 2-inch (2.375-inch o.d.) outside diameter pipe tenons. Slipfitter shall consist of a two-piece clamp and four 9/16-inch hex bolts. Slipfitter shall allow for a vertical tilt adjustment of ± 5 percent in order to mount luminaire plumb for a U0 rating. Luminaires shall be equipped with integrated leveling bubble.
 - (6) Access to all internal parts requiring replacement shall not require tools (i.e. "tool-less entry").
 - (7) The luminaire housing shall be constructed of aluminum alloy.
 - (8) Power Supply/Driver shall be provided in compliance with subsection 715.05(a). Driver must be internal and thermally separated from LED compartment.
 - (9) Dimming photocell receptacle shall conform to (d) below.
 - (10) Luminaire finish shall be corrosion resistant Super triglycidyl isocyanurate (TGIC) polyester powdercoat. Color shall be gray.
 - (i) Powder coat: Super TGIC polyester powder coat 2.5 mil nominal thickness.
 - (ii) Finish shall exceed a rating of 6 per ASTM D1654 after 1000hrs of testing per ASTM B117.
 - (iii) The coating shall exhibit no greater than 30% reduction of gloss per ASTM D523, after 500 hours of QUV testing at ASTM G154 Cycle 6.
 - (11) Effective Projected Area (EPA) for wind-loading calculations shall be no greater than 1.2 square feet.
 - (12) Luminaire weight shall not exceed 45 pounds.
 - (13) Luminaire shall be tested in accordance with IES LM79 and TM21 certifying photometric performance and rated life, respectively. LM79 (performance) and TM21 (predicted life at 55°C) testing shall both be for the same luminaire's operating drive current as specified.
 - (14) Luminaire shall have a maximum Backlight rating as shown in Table 715-1, an Uplight rating of U0, and a maximum Glare rating as shown in Table 715-1.
 - (15) Luminaire system efficacy shall be no less than 68 luminaire lumens per input watt.
 - (16) Luminaire shall have an external label per ANSI C136.15 and internal label per ANSI C136.22.

REVISION OF SECTIONS 613 AND 715
LED ROADWAY LUMINAIRE

- (c) *Light Sources.* LED luminaires shall not be retrofit to existing luminaire housing; the Contractor shall replace housing along with the luminaire as a single unit. Light sources shall be compatible with dimmable drivers supplied with the luminaires in which they are to be installed. All light sources of a similar type shall be provided by the same manufacturer.

LED light sources shall meet or exceed the following requirements:

(1) CCT, CRI and Flux:

- (i) Correlated Color Temperature (CCT) – All LED light sources shall emit white light and have a CCT no less than 2700K nominal and no greater than 4000K nominal in accordance with ANSI C78.277.
- (ii) Color Rendering Index (CRI) – All LED light sources shall have a minimum Color Rendering Index (CRI) of 70 per the LM79 test results.
- (iii) Luminous Flux – LED light sources shall not exceed the junction temperature recommended by the LED manufacturer. Luminous flux differences between LEDs shall not exceed 10 percent.

- (2) LEDs shall have a minimum rated life of 70,000 hours per IES TM-21 at 55°C at the normal operating driver current for the specific luminaire. The lumen output shall be maintained at 70 percent of initial rated lumens (L70) or greater at the rated life of the luminaire.

- (3) LEDs shall be temperature rated for operation and storage within the range of -40°C to +50°C, and shall withstand low and high frequency vibration (ANSI C136.31 Vibration Level 3G) over the rated life of the light source.

(4) Cooling System

- (i) Mechanical design of protruding external surfaces (e.g. heat sink fins) shall facilitate hose-down cleaning and discourage debris accumulation.
- (ii) The cooling system must be passive utilizing heat sinks, convection or conduction.
- (iii) Fans, diaphragms, pumps, or liquids shall not be acceptable.

(d) *Photocontrol Receptacle.*

Each roadway luminaire shall be furnished with a multi-contact twist-lock outdoor lighting dimming receptacle per ANSI C136.41.

REVISION OF SECTIONS 613 AND 715
LED ROADWAY LUMINAIRE

Delete subsection 715.05 and replace with the following:

715.05 LED Drivers. Led drivers shall conform to the following:

- (1) Dimming signal protocols are 0-10VDC or Digital Addressable Lighting Interface (DALI).
- (2) Operating voltage shall be 120/277-volt at 50/60 Hz, and shall operate normally with input voltage fluctuations of ± 10 percent, consistent with NEMA SSI-1-2010, Electronic Drivers for LED Devices, Arrays or Systems.
- (3) Minimum Power Factor (PF) shall be 0.90 at full input power and across specified voltage range.
- (4) Maximum Total Harmonic Distortion (THD) shall be 20 percent at full input power and across specified voltage range.
- (5) Factory-set drive current shall be 530mA or less unless approved by Engineer. If higher drive currents are proposed, the submittal must be accompanied with IES LM79 and TM21 test results for higher operating drive current.
- (6) Drivers shall be Restriction of Hazardous Substances (RoHS) compliant.
- (7) Rated case temperature shall conform to subsection 715.04 (c) 3.
- (8) All electronics of the power supply and the LEDs shall be protected from all electrical surges with an elevated electrical immunity rating, including but not limited to lightning strikes and stray current in rebar and concrete. Surge protection shall be integral to the LED power supply.
- (9) Luminaire, including driver, shall consume no more than 4 watts in the off state power.
- (10) Electrical immunity (including surge protection)
 - (i) Luminaire shall meet the "Elevated" requirements per IEEE C62.41.2 -2002. Manufacturer shall indicate whether failure of the electrical immunity system can possibly result in disconnect of power to luminaire.
- (11) Electromagnetic interference: Shall comply with Federal Communications Commission (FCC) 47 Code of Federal Regulations (CFR) part 15 non-consumer radio frequency interference (RFI) and/or electromagnetic interference (EMI) standards.

REVISION OF SECTION 614
ACCESSIBLE PEDESTRIAN SIGNAL

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of the construction of an accessible pedestrian signal at locations as shown on the plans.

MATERIALS

The Accessible Pedestrian Signal (APS) shall be an audible-tactile pedestrian signal system and shall consist of all electronic control equipment, mounting hardware, push buttons and signs designed to provide both a pushbutton with a raised, vibrating tactile arrow on the button as well as a variety of audible indications for differing pedestrian signal functions.

The APS shall meet the following requirements:

- (1) 2009 Manual of Uniform Traffic Control Devices (MUTCD), Chapter 4E – Pedestrian Control Features.
- (2) NEMA TS 2 Section 2.1 requirements for Temperature and Humidity, Transient Voltage Protection and Mechanical Shock and Vibration.
- (3) IEC 61000-4-4; 4-5 Transient Suppression requirements.
- (4) FCC Title 47, Part 15, Class A, Electronic Noise requirements.

The APS pushbutton enclosure shall meet the NEMA 250 – Type 4X enclosure requirement.

Upon installation the APS shall have the following functional requirements:

(a) *APS functional requirements.* The APS shall have the following functional features:

- (1) The APS shall be programmable and adjustable. Programming and adjustments shall be made using a laptop computer or vendor supplied programmer. No additional hardware or equipment shall be required. The APS shall be fully compatible with the three latest versions of the Windows operating platform. The programmable features shall be:
 - A. Push-button locator tone
 - B. Walk and Wait audible message
 - C. Audible push-button informational message
 - D. Audible crossing beacon
 - E. Vibrating tactile arrow
 - F. Independent minimum and maximum volume limits for the Locator Tone, Walk and Audible Beacons features.
- (2) All audible features shall emanate from the pedestrian pushbutton housing. The APS shall utilize digital audio technology, having a minimum 12-bit sample at a 16k Hz sample rate. Total harmonic distortion shall be less than 3 percent at 75 decibels. The APS shall provide independent ambient sound adjustment for the Locator Tone feature. The APS shall allow for Locator Tone volume to be set below the ambient noise level. The system shall have, at a minimum, three programmable locator tones. All sound levels shall adjust automatically utilizing an internally mounted, interval ambient sensing microphone, in accordance with the MUTCD.
- (3) The APS shall monitor the Walk condition for conflict operation. As a standalone unit, the APS shall disable the Walk functionality should a conflict be detected.

REVISION OF SECTION 614
ACCESSIBLE PEDESTRIAN SIGNAL

- (4) The APS system shall log cumulative call data. The data shall be date and time stamped, and shall be accessible via laptop.
- (5) The system shall have a programmable Extended Push Activation feature with the ability to extend the Walk time and provide an informational audible message. Activation shall be programmable from one to six seconds.
- (6) The system shall provide a programmable audible Wait message when the button is pushed. The message shall only annunciate once per actuation.

(b) Power Control Unit (PCU):

- (1) The PCU shall be mounted in the pedestrian signal head and shall be powered by the activation of Walk or Don't Walk using 120 Volts Alternating Current (VAC).
- (2) The PCU shall utilize separate power inputs for Walk and Don't Walk. The PCU shall not require more than four wires from the PCU to the corresponding push button.
- (3) The voltage at the push button shall not exceed 24 VAC.

(c) Push Button Assembly (PBA):

- (1) The PBA shall be a single assembly containing an ADA compliant, vibro-tactile, directional arrow button, weatherproof audible speaker and informational sign with optional placard braille messages. The PBA shall housing shall not incorporate any plastic or polycarbonate parts.
- (2) The PBA tactile arrow shall be 2 inches in length and shall be field adjustable to two directions.
- (3) The pushbutton shall utilize Piezo switch technology rated at greater than twenty million operations. Vibro-tactile operation shall pulse at 20 Hz with a minimum 0.003-inch displacement against a 2 pound applied force.
- (4) The PBA assembly shall be capable of mounting on a curved or flat surface utilizing either machine screws or bolts or banding type mounting hardware. The PBA shall accommodate mounting to a minimum 2-inch diameter pole.

CONSTRUCTION REQUIREMENTS

Prior to start of the installation of the APS, The Contractor shall submit a sample unit for testing. Installation of the APS shall not begin until written approval of the sample has been received from the Engineer. If the unit fails to pass testing, the Contractor shall repair or replace the subsequent units at his expense.

A field test of a single APS shall be performed in the presence of the Engineer. All repairs or replacements required to ensure a fully operational system shall be at the Contractor's expense.

The APS shall be installed in accordance with manufacturer's recommendations.

METHOD OF MEASUREMENT

The Accessible Pedestrian Signal (APS) will be measured as the actual number that are installed and accepted.

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REVISION OF SECTION 614
ACCESSIBLE PEDESTRIAN SIGNAL

BASIS OF PAYMENT

Payment will be made under:

Pay Item	Pay Unit
Accessible Pedestrian Signal	Each

Payment will be full compensation for all work, materials and equipment required to install a fully operational APS in accordance with these specifications.

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

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

REVISION OF SECTION 614
PEDESTRIAN PUSH BUTTON POST ASSEMBLY

Section 614 of the Standard Specifications is hereby revised for this project as follows:

Subsection 614.01 shall include the following:

This work consists of the installation of a pedestrian push button and steel post assembly at locations as shown on the plans.

Subsection 614.02 shall include the following:

Post for pedestrian push button shall be tubular steel, Schedule 80.

Concrete for foundation shall be Class B.

Pedestrian push button and sign shall meet all ADA requirements.

Wiring for pedestrian push button shall conform to manufacturer recommendations.

Subsection 614.02 shall include the following:

Steel posts and slip base assembly shall be galvanized in accordance with Section 509, unless painting is called for on the plans. Painting shall be in accordance with Section 522, Duplex Coating System. The post and slip base shall be constructed as shown on the plans.

Subsection 614.13 shall include the following:

Pedestrian Push Button Post Assembly will be measured as the actual number that are installed and accepted.

614.14 shall include the following:

Pay Item	Pay Unit
Pedestrian Push Button Post Assembly	Each

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

REVISION OF SECTION 618
PRESTRESSED CONCRETE

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.

REVISION OF SECTION 618
PRESTRESSED CONCRETE

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:

Hydraulic Cement	701.01
Fly Ash	701.02
Fine Aggregate	703.01
Coarse Aggregate	703.02
Curing Materials	711.01
Air Entraining Admixtures	711.02
Chemical Admixtures	711.03
Water	712.01

- (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

REVISION OF SECTION 618
PRESTRESSED CONCRETE

(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.
- (8) Provisions for diaphragm connections.
- (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.

REVISION OF SECTION 618
PRESTRESSED CONCRETE

- (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.

REVISION OF SECTION 618
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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.

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- (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,

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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 $\frac{1}{8}$ 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.

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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 stands 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.

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- (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 $\frac{1}{2}$ 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 $\frac{1}{4}$ 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 grout 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 $\frac{1}{8}$ 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 $\frac{1}{8}$ 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.

4. Post-tensioning Equipment and Procedure.

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.

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- (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.

Anchorage devices 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:

$$f_{cp} = 0.8 f'_{ci} \sqrt{\frac{A'_b}{A_b} - 0.2} \leq 1.25 f'_{ci}$$

After jacking:

$$f_{cp} = 0.6 f'_{ci} \sqrt{\frac{A'_b}{A_b} - 0.2} \leq 1.25 f'_c$$

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

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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:

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Table 618-1

Property	Test Value	Test Method
Total Chloride Ions	Max. 0.08% by weight of Cementitious material	ASTM C 1152
Fine Aggregate (If utilized)	Max. Size: 300 µm (No. 50 Sieve)	ASTM C 33
Volume Change at 24 hours and 28 days	0.0% to + 0.3%	ASTM C 1090 ¹
Expansion	0.0%(minimum) 2%(maximum) for up to 3 hours	ASTM C 940
Compressive Strength at 28 days (Average of 3 cubes)	7,000 psi minimum	ASTM C 942
Initial set of the grout	3 hours minimum 12 hours maximum	ASTM C 953
Bleeding at 3 hours	Maximum 0.0 % Maximum 2500 coulombs	ASTM C 940 ⁴
Permeability at 28 days	At 30 Volts for 6 hours	ASTM C 1202
FLUIDITY TEST ²		
	Efflux Time from Flow Cone	ASTM Method
(a) Immediately after mixing	11 Seconds Minimum 30 Seconds Maximum OR 5 Seconds Minimum 30 Seconds Maximum	ASTM C 939 ASTM C 939 ³
(b) 30 minutes after mixing with remixing for 30 seconds	30 Seconds Maximum OR 30 Seconds Maximum	ASTM C939 ASTM C 939 ³
Table 618-1 and footnotes continued on next page.		

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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:

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- (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

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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 not longer than 12 months, or whenever the tensioning system yields erratic results. Master gage systems shall be calibrated at intervals not 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.

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- (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

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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 $0.7 f'_c$, or the specified release strength, f'_{ci} , whichever is higher.

Where:

- f'_c = 28 Day Compressive Strength of Concrete
 f'_{ci} = Required Concrete Strength at Release of Prestress Force

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.

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- (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'_{ci} , whichever is higher.
 4. The internal and surface temperature of the concrete shall not exceed 150 ° F.

618.13 Repairs of Pretensioned 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

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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 concretious 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

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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

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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.

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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:

Pay Item	Pay Unit
Prestressing Steel Bar	Pound or MKFT
Prestressing Steel Strand	Pound or MKFT
Prestressed Concrete ___ (___)	Linear Foot or Square Foot
Prestressed Concrete Box (___)	Square Foot
Prestressed Concrete Slab (Depth _____)	Square Foot

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.

1
 REVISION OF SECTIONS 627 AND 708
 PAVEMENT MARKING PAINT

Sections 627 and 708 of the Standard Specifications are hereby revised for this project as follows:

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

627.04 Pavement Marking with Waterborne, Low Volatile Organic Compound (VOC) Solvent Base, and High Build Acrylic Waterborne Paint (High Build). Striping shall be applied when the air and pavement temperatures are no less than 45 °F for waterborne and high-build paint, and no less than 40 °F for low VOC solvent base paint on asphalt or portland cement concrete pavements. The pavement surface shall be dry and clean. Surface cleaning shall be required when there is deicing material on the road. Weather conditions shall be conducive to satisfactory results.

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

	Description	Paint		
		Waterborne	Low VOC	High Build
Alignment	Lateral Deviation	2.0 inch per 200 foot Max		
Coverage Rate	Sq. Ft. per Gallon	90-100	90-100	67-73
Thickness	Mil	16-18	16-18	22-24
Width	Inches	Per Plans +/- 0.25		
Dry Time	Minutes	5-10	5-10	5-10
Beads	Application Rate, lbs/gal	7-8		9-10

Subsection 627.13 shall include the following:

Pay Item	Pay Unit
Pavement Marking Paint (High Build)	Gallon

Delete subsection 708.05 and replace with the following:

708.05 Pavement Marking Materials. Except for pavement marking paint, pavement marking materials shall be selected from the Department's Approved Products List (APL). Prior to start of work, a Certified Test Report (CTR) for all pavement marking materials shall be submitted in accordance with subsection 106.13.

For white paint, 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. For yellow paint, the Federal Standard 595B shall be used to designate colors and the ASTM E308 shall be used to quantitatively define colors. After drying, the yellow paint shall visually match Federal Standard 595B color chip number 33538, and shall be within 6 percent of central color, PR-1 Chart, where $x = 0.5007$ and $y = 0.4555$ (The four pairs of chromaticity coordinates determine the acceptable color in terms of the CIE 1931 Standard Colorimetric System measured with Standard Illuminant D65.)

- (a) *Low VOC Solvent Base Paint.* Low VOC Paint shall be ready mixed, and shall be capable of being applied to Asphalt or Portland Cement Concrete Pavements.
- (b) *Acrylic Waterborne Paint.* Acrylic waterborne paint shall be a lead-free, 100 percent Acrylic resin polymer waterborne product. The finished product shall maintain its consistency during application at temperatures compatible with conventional equipment.

2
 REVISION OF SECTIONS 627 AND 708
 PAVEMENT MARKING PAINT

(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.

Waterborne 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
 WATERBORNE AND HIGH BUILD ACRYLIC WATERBORNE PAINT**

Property	White	Yellow	Test Method
Nonvolatile portion of vehicle (white and yellow), %	43.0	43.0	ASTM D 2205
Pigment Composition			
Percent by weight♦	60.0	60.0	ASTM D 4451 ASTM D 3723
Paint			
Titanium Dioxide Content, lb/gal	1.0	0.2	ASTM D 5381
Properties of the Finished Paint			
Total Non-volatiles, (solids) % by weight	77.0	77.0	FTMS 141C - Method 4053.1, ASTM D 2369, or ASTM D 4758
Density, lbs/gal ■	14.0-14.6	14.0-14.6	ASTM D 2205
Consistency (Viscosity) White and Yellow, Krebs-Stormer Units	85-95	85-95	ASTM D 562
Freeze Thaw Stability	Shall complete 5 or more test cycles successfully		ASTM D 2243
Fineness of Grind, Cleanliness Rating B, minimum	3	3	ASTM D 1210
Scrub Resistance	800	800	ASTM D2486
Directional Reflectance: [5 mil Wet Film]	90	50	ASTM E 1347
Dry Opacity (Contrast Ratio): [5 mil Wet Film]	0.95	0.95	ASTM D 2805
♦Percent by weight shall include percent of organic yellow pigment.			
■Density shall not vary more than 0.3 lbs. /gal between batches.			

February 17, 2012

REVISION OF SECTION 630
CONSTRUCTION ZONE TRAFFIC CONTROL

Section 630 of the Standard Specifications is hereby revised for this project as follows:

In subsection 630.16 delete the fifth paragraph.

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**

Sheeting	Type IV	Type VI (Roll-up sign material)	Type Fluorescent ¹
Application	Work Zone	Work Zone	Work Zone
All Orange Construction Signs			X
Orange Construction Signs that are used only during daytime hours for short term or mobile operations		X ⁴	X
Barricades (Temporary)	X		X
Vertical Panels	X		X
Flaggers Stop/Slow Paddle	X		X
Drums ²	X		X
Non-orange Fixed Support signs with prefix "W"	X		
Special Warning Signs			X
STOP sign (R1-1) YIELD sign (R1-2) WRONG WAY sign (R5-1a) DO NOT ENTER sign (R5-1) EXIT sign (E5-1a)	X		
DETOUR sign (M4-9) or (M4-10)			X
All other fixed support signs³	X		X
All other signs used only during working hours	X		X
All other signs that are used only during daytime hours for short term or mobile operations	X	X ⁵	X

- 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.

REVISION OF SECTION 630
SIGNS AND BARRICADES

Section 630 of the Standard Specifications is hereby revised for this project as follows:

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 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.

1
REVISION OF SECTION 703
AGGREGATE FOR BASES
(WITHOUT RAP)

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.

REVISION OF SECTION 703
AGGREGATES FOR HOT MIX ASPHALT

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 703-4
MASTER RANGE TABLE FOR HOT MIX ASPHALT**

Sieve Size	Percent by Weight Passing Square Mesh Sieves				
	Grading SF**	Grading ST	Grading SX	Grading S	Grading SG
37.5 mm (1½")					100
25.0 mm (1")				100	90 – 100
19.0 mm (¾")			100	90 – 100	
12.5 mm (½")		100	90 – 100	*	*
9.5 mm (⅜")	100	90 – 100	*	*	*
4.75 mm (#4)	90 – 100	*	*	*	*
2.36 mm (#8)	*	28 – 58	28 – 58	23 – 49	19 – 45
1.18 mm (#16)	30 – 54				
600 µm (#30)	*	*	*	*	*
300 µm (#50)					
150 µm (#100)					
75 µm (#200)	2 – 12	2 – 10	2 – 10	2 – 8	1 – 7

* 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.

REVISION OF SECTION 703
AGGREGATES FOR HOT MIX ASPHALT

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 703-4A
AGGREGATE DEGRADATION BY ABRASION
IN THE MICRO-DEVAL CP-L 4211

	Not to exceed
Combined Aggregate (Mix Design)	18
Combined Aggregate (1/10,000 tons, or fraction thereof during production)	20

July 28, 2011

REVISION OF SECTION 703
CONCRETE AGGREGATES

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.

1
REVISION OF SECTION 712
GEOTEXTILES

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

2
REVISION OF SECTION 712
GEOTEXTILES

Table 712-2
TYPICAL VALUES OF PERMEABILITY COEFFICIENTS¹

Turbulent Flow	Particle Size Range Millimeters (inches)		Effective Size	Permeability Coefficient k cm/s
	D max	D min	D 20 mm (inches)	
Derrick STONE	3000 (120)	900 (36)	1200 (48)	100
One-man STONE	300 (12)	100 (4)	150 (6)	30
Clean, fine to coarse GRAVEL	80 (3)	10 (¼)	13 (½)	10
Fine, uniform GRAVEL	8 (⅜)	1.5 (1/16)	3 (⅛)	5
Very coarse, clean, uniform SAND	3 (⅛)	0.8 (1/32)	1.5 (1/16)	3
Laminar Flow				
Uniform, coarse SAND	2 (⅛)	0.5 (1/64)	0.6	0.4
Uniform, medium SAND	0.5	0.25	0.3	0.1
Clean, well-graded SAND & GRAVEL	10	0.05	0.1	0.01
Uniform, fine SAND	0.25	0.05	0.06	40 x 10 ⁻⁴
Well-graded, silty SAND & GRAVEL	5	0.01	0.02	4 x 10 ⁻⁴
Silty SAND	2	0.005	0.01	1.0 x 10 ⁻⁴
Uniform SILT	0.05	0.005	0.006	0.5 x 10 ⁻⁴
Sandy CLAY	1.0	0.001	0.002	0.05 x 10 ⁻⁴
Silty CLAY	0.05	0.001	0.0015	0.01 x 10 ⁻⁴
CLAY (30% to 50% clay sizes)	0.05	0.0005	0.0008	0.001 x 10 ⁻⁴
Colloidal CLAY (-2 µm 50%)	0.01	10	40	10 ⁻⁹

¹ Basic Soils Engineering, R.K. Hough, 2nd Edition, Ronald Pess Co.; 1969, Page 76.

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

February 3, 2011

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.

1
 REVISION OF SECTION 713
 EPOXY PAVEMENT MARKING

Section 713 of the Standard Specifications is hereby revised for this project as follows:

Delete subsection 713.17 and replace with the following:

713.17 Epoxy Pavement Marking Material. Only epoxy pavement marking material that is on the Department's Approved Products List may be used. Batches or lots of approved products will be accepted on the project by certified test report (CTR). The CTR shall confirm that the material meets all CDOT requirements and is the same material that was preapproved in the product evaluation process.

- (a) *Formulation.* Epoxy pavement marking material shall be a two component, 100 percent solids, material formulated to provide simple volumetric mixing ratio of two volumes of component A and one volume of component B unless otherwise recommended by the material manufacturer.
- (b) *Composition.* The component A of both white and yellow shall be within the following limits:

Resin / Pigment Components (% by Weight)

Pigment	WHITE:	YELLOW:
TiO ₂ , ASTM D476, Type II	18-25	10-17
Organic Yellow		6-10
Epoxy Resin	75-82	73-84

The pigment for yellow epoxy shall contain no lead or other material such that the cured epoxy could be considered a hazardous waste under EPA or CDPHE regulations. The Contractor shall submit to the Engineer a manufacturer's certification of compliance with this requirement.

- (c) *Epoxide Number.* The epoxy number of the epoxy resin shall be the manufacturers target value ± 50 as determined by ASTM D 1652 for white and yellow component A on pigment free basis.
- (d) *Amine Number.* The amine number on the curing agent (component B) shall be the manufacturers target value ± 50 per ASTM D 2071.
- (e) *Toxicity.* Upon heating to application temperature, the material shall not produce fumes which are toxic or injurious to persons or property.
- (f) *Color.* The epoxy material, without drop-on beads, shall visually match the color chips that visually correspond to the Federal Standard Number 595B for the following colors:

White - Federal Standard No. 595B-17925.

Yellow - Federal Standard No. 595B-13538.

The mixed epoxy compound, both white and yellow, when applied to 3 inch x 6 inch aluminum panels at 20 ± 1 mil of thickness with no glass beads and exposed in the Q-panel Ultraviolet (QUV) Environmental Testing Chamber as described in ASTM G 154, shall conform to the following minimum requirements. The test shall be conducted for 72 hours at 122° F, 4 hours humidity, and 4 hours U.V., in alternating cycles. The color of the coatings shall be within ± 5 units of the Federal Standards shown above.

- (g) *Yellowness Index.* The Yellowness Index shall be tested in accordance with ASTM E-313. The prepared Q-panels shall be cured at 77° F for 72 hours prior to exposure. Immediately after this, the yellow index reading QUV at XYZ C/2° shall be measured. QUV testing shall begin after this initial measurement and shall conform to ASTM G-53. The QUV prior to testing shall not exceed 8.0. The QUV after 72-hour testing shall not exceed 20.0. The QUV after 500-hour testing shall not exceed 35.0
- (h) *Drying Time.* The epoxy pavement marking material shall have a setting time to a no-tracking condition of not more than 25 minutes at a temperature of 73° F and above.
- (i) *Curing.* The epoxy material shall be capable of fully curing under the constant surface temperature condition of 35° F and above.

REVISION OF SECTION 713
EPOXY PAVEMENT MARKING

- (j) *Adhesion to Concrete.* The catalyzed epoxy pavement marking material, when tested according to ACI Method 503, shall *have* such a high degree of adhesion to the specified (4000 psi minimum) concrete surface that there shall be a 100 percent concrete failure in the performance of this test
- (k) *Hardness.* The epoxy pavement marking materials, when tested according to ASTM D 2240, shall have a minimum Shore D Hardness value of 80. Samples shall be allowed to cure at room temperature, 75 ± 2 °F for a minimum of 72 hours and a maximum of 168 hours prior to performing the indicated test.
- (l) *Abrasion Resistance.* The abrasion resistance shall be evaluated on Taber Abrader with a 1000 gram load and CS-17 wheels. The duration of the test shall be 1000 cycles. The wear index shall be calculated based on ASTM test method C-501 and the wear index for the catalyzed material shall not be more than 80. The tests shall be run on cured samples of material which have been applied at film thickness of $15 \pm \frac{1}{2}$ mils to code S-16 stainless steel plates. The samples shall be allowed to cure at 75 ± 2 °F for a minimum of 72 hours prior to performing the indicated tests.
- (m) *Tensile Strength.* When tested according to ASTM D 638, the epoxy pavement marking materials shall have a tensile strength of not less than 6000 psi. The Type IV Specimens shall be cast in a suitable mold and pulled at the rate of $\frac{1}{4}$ inch per minute by a suitable dynamic testing machine. The samples shall be allowed to cure at room temperature (75 ± 2 °F) for a minimum of 72 hours and a maximum of 168 hours prior to performing the indicated tests.
- (n) *Compressive Strength.* When tested according to ASTM D 695, the catalyzed epoxy pavement marking materials shall have a compressive strength of not less than 12,000 psi. The cast sample shall be conditioned at room temperature, 75 ± 2 °F, for a minimum of 72 hours and a maximum of 168 hours prior to performing the tests. The rate of compression of these samples shall be no more than $\frac{1}{4}$ inch per minute.

May 2, 2013

REVISION OF SECTION 713
REFLECTORS FOR DELINEATORS AND MEDIAN BARRIER

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 T 257, with an observation angle of 0.1 degrees.

Entrance Angle Degrees	Specific Intensity Candlepower per Foot-Candle				
	Crystal	Yellow	Blue	Red	Green
0	115	70	48	25	62
20	45	25	26	10	34

**AFFIRMATIVE ACTION REQUIREMENTS
EQUAL EMPLOYMENT OPPORTUNITY**

A. AFFIRMATIVE ACTION REQUIREMENTS

Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246)

1. The Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.
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:

Goals and Timetable for Minority Utilization

Timetable - Until Further Notice			
Economic Area	Standard Metropolitan Statistical Area (SMSA)	Counties Involved	Goal
157 (Denver)	2080 Denver-Boulder	Adams, Arapahoe, Boulder, Denver, Douglas, Gilpin, Jefferson.....	13.8%
	2670 Fort Collins	Larimer.....	6.9%
	3060 Greeley	Weld.....	13.1%
	Non SMSA Counties	Cheyenne, Clear Creek, Elbert, Grand, Kit Carson, Logan, Morgan, Park, Phillips, Sedgwick, Summit, Washington & Yuma.....	12.8%
158 (Colo. Spgs. - Pueblo)	1720 Colorado Springs	El Paso, Teller.....	10.9%
	6560 Pueblo	Pueblo.....	27.5%
	Non SMSA Counties	Alamosa, Baca, Bent, Chaffee, Conejos, Costilla, Crowley, Custer, Fremont, Huerfano, Kiowa, Lake, Las Animas, Lincoln, Mineral, Otero, Prowers, Rio Grande, Saguache.....	19.0%
159 (Grand Junction)	Non SMSA	Archuleta, Delta, Dolores, Eagle, Garfield, Gunnison, Hinsdale, La Plata, Mesa, Moffat, Montezuma, Montrose, Ouray, Pitkin, Rio Blanco, Routt, San Juan, San Miguel	10.2%
156 (Cheyenne - Casper WY)	Non SMSA	Jackson County, Colorado.....	7.5%
GOALS AND TIMETABLES FOR FEMALE UTILIZATION			
Until Further Notice.....6.9% -- Statewide			

AFFIRMATIVE ACTION REQUIREMENTS
EQUAL EMPLOYMENT OPPORTUNITY

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.

AFFIRMATIVE ACTION REQUIREMENTS
EQUAL EMPLOYMENT OPPORTUNITY

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;
- c. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
- 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.

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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 the 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.

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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 though 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).

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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.

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- 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 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 through 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.

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- 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.

9. *Subcontracting.*

- 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
DISADVANTAGED BUSINESS ENTERPRISE (DBE)
REQUIREMENTS

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

DISADVANTAGED BUSINESS ENTERPRISE (DBE)
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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.

- D. *Disadvantaged Business Enterprise (DBE)*. A Colorado-certified Disadvantaged Business Enterprise listed on the Colorado Unified Certification Program (UCP) DBE Directory at www.coloradodbe.org.
- 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.

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DEFINITIONS AND REQUIREMENTS

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_dbeforums@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:

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- 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 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

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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:

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- (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

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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,

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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.

May 2, 2013

FASTER MONTHLY EMPLOYMENT REPORT

This project is partly or wholly funded with Funding Advancements for Surface Transportation and Economic Recovery (FASTER) legislation funds received from the higher vehicle registration fees and the State government. CDOT is recording the number of jobs supported by this project and the actual amount of Disadvantaged Business Enterprise (DBE) payments made.

The Contractor shall report the number of jobs supported, created, or sustained on this project using a *FASTER Monthly Employment Report*, Form 1405. The data specified below shall be reported on Form 1405. The Contractor shall ensure that each subcontractor also submits the required employment information to the Contractor in time for the Contractor to fulfill this reporting obligation. The completed Monthly Employment Report shall be submitted by email on Form 1405 to the following e-mail address:
dot_programs_projectanalysis@state.co.us

A copy shall be given to the Engineer.

To report the actual monthly amount of DBE payments made, the Contractor shall submit the actual dollar value paid to DBE firms, including the Contractor itself, if applicable. The data shall be reported on Form 1405. The dollar amount shall be a cumulative monthly total of all payments made to DBE firms for the reporting month.

Monthly Employment Reports shall be submitted by the 25th of each month. *Failure to submit the completed forms* shall be grounds for a determination by the Engineer that no further progress payments are to be made until the Contractor has submitted all outstanding forms.

The Monthly Employment Report and the instructions may be found on the CDOT Forms website at

<http://www.coloradodot.info/business/designsupport/construction-specifications/2011-Specs/standard-special-provisions/mics/faster.docx/view> The Contractor shall review the instructions regularly for any changes to the reporting requirements. <http://internal/centralfiles/FormsCatalog.htm>

The Monthly Employment Report shall be completed and submitted each month from the Notice to Proceed through project acceptance.

Making the Monthly Employment Report does not relieve the Contractor and subcontractors from any other reporting requirements.

June 20, 2014

**U.S. DEPT. OF LABOR DAVIS BACON MINIMUM WAGES
COLORADO HIGHWAY CONSTRUCTION
GENERAL DECISION NUMBER - CO140018**

NOTICE

This is a standard special provision that revises or modifies CDOT's *Standard Specifications for Road and Bridge Construction*. It has gone through a formal review and approval process and has been issued by CDOT's Project Development Branch with formal instructions for its use on CDOT construction projects. It is to be used as written without change. Do not use modified versions of this special provision on CDOT construction projects, and do not use this special provision on CDOT projects in a manner other than that specified in the instructions, unless such use is first approved by the Standards and Specification Unit of the Project Development Branch. The instructions for use on CDOT construction projects appear below.

Other agencies which use the *Standard Specifications for Road and Bridge Construction* to administer construction projects may use this special provision as appropriate and at their own risk.

Instructions for use on CDOT construction projects:

Use this standard special provision on all federal-aid projects with contracts exceeding \$2000, except for non-ARRA projects on roadways classified as local roads or rural minor collectors, which are exempt. Projects on local roads, rural minor collectors, and enhancement projects funded with ARRA funds are not exempt.

Decision Nos. CO140018 dated January 03, 2014 supersedes Decision Nos. CO130018 dated January 04, 2013. 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.	Modifications			ID
	<u>MOD Number</u>	<u>Date</u>	<u>Page Number(s)</u>	
	1	01/24/14	1	1
	2	06/20/14	2	2
General Decision No. CO140018 applies to the following counties: El Paso, Pueblo, and Teller counties.				

General Decision No. CO140018
The wage and fringe benefits listed below reflect collectively bargained rates.

Code	Classification	Basic Hourly Rate	Fringe Benefits	Last Mod
	ELECTRICIAN:			
1199	El Paso, Teller	29.55	14.69	2
1200	Pueblo	27.25	11.92	
	POWER EQUIPMENT OPERATOR:			
	Drill Rig Caisson			
1201	Smaller than Watson 2500 and similar	24.73	9.15	1
1202	Watson 2500 similar or larger	25.04	9.15	1
	Crane			
1203	50 tons and under	24.88	9.15	1
1204	51 - 90 tons	25.04	9.15	1
1205	91 - 140 tons	25.19	9.15	1

General Decision No. CO140018
The wage and fringe benefits listed below do not reflect collectively bargained rates.

	CARPENTER:			
1206	Excludes Form Work	24.15	6.25	
	Form Work Only			
1207	El Paso, Teller	19.06	5.84	
1208	Pueblo	19.00	5.88	
	CEMENT MASON/CONCRETE FINISHER:			
1209	El Paso, Teller	17.36	3.00	
1210	Pueblo	17.74	3.00	
1211	FENCE ERECTOR	13.02	3.20	
1212	GUARDRAIL INSTALLER	12.89	3.20	

General Decision No. CO140018				
The wage and fringe benefits listed below do not reflect collectively bargained rates.				
Code	Classification	Basic Hourly Rate	Fringe Benefits	Last Mod
	HIGHWAY/PARKING LOT STRIPING:			
1213	Painter	12.62	3.21	
	IRONWORKER:			
	Reinforcing (Excludes Guardrail Installation)			
1214	El Paso, Teller	20.49	1.65	
1215	Pueblo	16.69	5.45	
1216	Structural (Excludes Guardrail Installation)	18.22	6.01	
	LABORER:			
1217	Asphalt Raker	17.54	3.16	
1218	Asphalt Shoveler	21.21	4.25	
1219	Asphalt Spreader	18.58	4.65	
	Common or General			
1220	El Paso	17.05	3.69	
1221	Pueblo	16.29	4.25	
1222	Teller	16.88	3.61	
1223	Concrete Saw (Hand Held)	16.29	6.14	
1224	Landscape and Irrigation	12.26	3.16	
1225	Mason Tender - Cement/Concrete	16.29	4.25	
1226	Pipelayer	18.72	3.24	
1227	Traffic Control (Flagger)	9.55	3.05	
1228	Traffic Control (Sets Up/Moves Barrels, Cones, Installs signs, Arrow Boards and Place Stationary Flags), (Excludes Flaggers)	12.43	3.22	
1229	PAINTER (Spray Only)	16.99	2.87	

General Decision No. CO140018				
The wage and fringe benefits listed below do not reflect collectively bargained rates.				
Code	Classification	Basic Hourly Rate	Fringe Benefits	Last Mod
	POWER EQUIPMENT OPERATOR:			
1230	Asphalt Laydown	22.67	8.72	
1231	Asphalt Paver	21.50	3.50	
	Asphalt Roller			
1232	El Paso	24.42	6.96	
1233	Pueblo	23.67	9.22	
1813	Teller	24.42	6.96	
1234	Asphalt Spreader	22.67	8.72	
	Backhoe/Trackhoe			
1235	El Paso	23.31	5.61	
1236	Pueblo	21.82	8.22	
1237	Teller	23.32	5.50	
1238	Bobcat/Skid Loader	15.37	4.28	
1239	Boom	22.67	8.72	
	Broom/Sweeper			
1240	El Paso, Teller	23.43	8.04	
1241	Pueblo	23.47	9.22	
	Bulldozer			
1242	El Paso	26.56	7.40	
1243	Pueblo, Teller	26.11	6.92	
1244	Drill	17.59	3.45	
1245	Forklift	15.91	4.68	
	Grader/Blade			
1246	El Paso	22.83	8.72	
1247	Pueblo	23.25	6.98	
1248	Teller	23.22	8.72	
1249	Guardrail/Post Driver	16.07	4.41	

General Decision No. CO140018				
The wage and fringe benefits listed below do not reflect collectively bargained rates.				
Code	Classification	Basic Hourly Rate	Fringe Benefits	Last Mod
	POWER EQUIPMENT OPERATOR (con't.):			
	Loader (Front End)			
1250	El Paso	23.61	7.79	
1251	Pueblo	21.67	8.22	
1252	Teller	23.50	7.64	
	Mechanic			
1253	El Paso	22.35	6.36	
1254	Pueblo	24.02	8.43	
1255	Teller	22.16	6.17	
	Oiler			
1256	El Paso	23.29	7.48	
1257	Pueblo	23.13	7.01	
1258	Teller	22.68	7.11	
	Roller/Compactor (Dirt and Grade Compaction)			
1259	El Paso	16.70	3.30	
1260	Pueblo, Teller	18.43	4.62	
1261	Rotomill	16.22	4.41	
1262	Scraper	24.28	4.83	
	Screed			
1263	El Paso, Teller	25.22	5.74	
1264	Pueblo	23.67	9.22	
1265	Tractor	13.13	2.95	

General Decision No. CO140018				
The wage and fringe benefits listed below do not reflect collectively bargained rates.				
Code	Classification	Basic Hourly Rate	Fringe Benefits	Last Mod
	TRUCK DRIVER:			
	Distributor			
1266	El Paso, Teller	17.98	3.97	
1267	Pueblo	18.35	3.85	
	Dump Truck			
1268	El Paso, Teller	16.85	4.83	
1269	Pueblo	16.87	4.79	
1270	Lowboy Truck	17.25	5.27	
1271	Mechanic	26.69	3.50	
1272	Multi-Purpose Specialty & Hoisting Truck	17.27	3.71	
1273	Pickup and Pilot Car	13.93	3.68	
1274	Semi/Trailer Truck	16.00	2.60	
1275	Truck Mounted Attenuator	12.43	3.22	
	Water Truck			
1276	El Paso	17.24	4.15	
1277	Pueblo	20.93	4.98	
1278	Teller	17.31	4.07	

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. CO140018

1
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>
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.

ON THE JOB TRAINING

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:

Contract dollar value	Minimum total training hours to be provided on the project
Up to 1 million	0
>1 - 2 million	320
>2 - 4 million	640
>4 - 6 million	1280
>6 - 8 million	1600
>8 - 12 million	1920
>12 - 16 million	2240
>16 - 20 million	2560
For each increment of \$5 million, over \$20 million	1280

ON THE JOB TRAINING

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 $[(A \text{ hours} - B \text{ hours worked}) \times (C \text{ dollar per hour} + D \text{ fringe benefits})] = \text{Disincentives Assessed}$. 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.

PARTNERING PROGRAM

The Colorado Department of Transportation actively encourages partnering and invites the Contractor and his subcontractors and suppliers to participate in a voluntary partnering agreement for this project.

The following information summarizes the partnering process. More information is available through the Resident Engineer listed in the project special provisions.

This partnership will be structured to draw on the strengths of each organization to identify and achieve mutual goals. The objectives are effective and efficient Contract performance with reciprocal cooperation, and completion within budget, on schedule, and in accordance with the Contract.

This partnership will be bilateral in make-up and all costs associated with this partnership will be agreed to by both parties and will be shared equally. The Contractor shall assume full responsibility for all costs associated with partnering during the implementation of the partnering process. CDOT will reimburse the Contractor for the agreed amount.

The CDOT Program Engineer or the Resident Engineer will contact the Contractor within ten days after the award of this project to ask if the Contractor wants to implement this partnership initiative. If the Contractor agrees, the Contractor's on-site project manager shall meet with CDOT's Resident Engineer to plan a partnering development and team building workshop. At this planning session, arrangements shall be made to determine the facilitator and the workshop, attendees, agenda, duration, and location.

The workshop shall be held prior to the commencement of any major work item and preferably before the preconstruction conference. The following persons shall attend the workshop: CDOT's Resident Engineer, Project Engineer, and key project personnel; the Contractor's on-site project manager and key project supervision personnel; and the subcontractors' key project supervision personnel. The following personnel shall also be invited to attend as needed: project design engineer, key local government personnel, suppliers, design consultants, CDOT maintenance foreman, CDOT environmental manager, key railroad personnel, and key utility personnel. The Contractor and CDOT shall also have Regional or District managers and Corporate or State level managers on the partnering team.

Follow-up workshops may be held periodically throughout the duration of the Contract as agreed by the Contractor and the Engineer at the initial workshop. A closeout workshop shall be held to evaluate the effectiveness of the partnership.

The establishment of a partnership charter, which identifies the workshop participants' mutual goals on the project, will not change the legal relationship of the parties to the Contract or relieve either party from any terms of the Contract.

RAILROAD INSURANCE

The Contractor shall carry insurance of the following kinds and amounts:

A. CONTRACTOR'S PUBLIC LIABILITY AND PROPERTY DAMAGE LIABILITY INSURANCE.

The Contractor shall furnish evidence to the Department that with respect to the operations the Contractor performs, the Contractor carries Contractor's Public Liability Insurance providing for a limit of not less than One Million Dollars (\$1,000,000.00) for all damages arising out of bodily injuries to or death of one person and subject to that limit for each person, a total limit of Two Million Dollars (\$2,000,000.00) for all damages arising out of bodily injuries to or death of two or more persons in any one occurrence; and Contractor's Property Damage Liability Insurance providing for a limit of not less than One Million Dollars (\$1,000,000.00) for all damages arising out of injury to or destruction of property in any one occurrence and subject to that limit per occurrence, a total (or aggregate) limit of Two Million Dollars (\$2,000,000.00) for all damages arising out of injury to or destruction of property during the policy period.

If any part of the work affecting railroad property or facilities is sublet, similar insurance shall be provided by or in behalf of the subcontractor(s) involved.

B. CONTRACTOR'S PROTECTIVE PUBLIC LIABILITY AND PROPERTY DAMAGE LIABILITY INSURANCE.

The Contractor shall furnish evidence to the Department that with respect to the operations performed for the Contractor by subcontractors, the Contractor carries in its own behalf Contractor's Protective Public Liability Insurance providing for a limit of not less than One Million Dollars (\$1,000,000.00) for all damages arising out of bodily injuries to or death of one person and subject to that limit for each person a total limit of Two Million Dollars (\$2,000,000.00) for all damages arising out of bodily injuries to or death of two or more persons in any one occurrence; and Contractor's Protective Property Damage Liability Insurance providing for a limit of not less than One Million Dollars (\$1,000,000.00) for all damages arising out of injury to or destruction of property in any one occurrence, and subject to that limit per occurrence, a total (or aggregate) limit of Two Million Dollars (\$2,000,000.00) for all damages arising out of injury to or destruction of property during the policy period.

C. RAILROAD'S PROTECTIVE LIABILITY AND PROPERTY DAMAGE INSURANCE.

In addition to the above, the Contractor shall furnish evidence to the Department that with respect to the operations the Contractor or any of its subcontractors perform, the Contractor has provided for and in behalf of the Railroad Company, and each Railroad Company when more than one is involved, Railroad Protective Public Liability and Property Damage Insurance providing for a combined single limit of Two Million Dollars (\$2,000,000.00) per occurrence with an aggregate limit of six Million Dollars (\$6,000,000.00) applying separately for each annual period for:

1. All damages arising out of bodily injuries to or death of one or more persons.
2. All damages arising out of injury to or destruction of property.

D. GENERAL.

Said policy or policies of insurance shall be deemed to comply with the requirements of this Special Provision if each of said policies contains a properly completed and executed "Railroad Protective Liability Form", reference copies of which are available from the Agreements Engineer of the Colorado Department of Transportation, 4201 East Arkansas Avenue, Denver, Colorado 80222.

Certificates of insurance required under A. and B. above, and policy or policies of Insurance required under C. above shall be furnished to the Department's Agreements Engineer for transmittal to the Railroad Company's Insurance Department.

The insurance hereinbefore specified shall be carried until all work required to be performed under the terms of the Contract is satisfactorily completed as evidenced by the formal acceptance of the Department. The Railroad Company shall be furnished with the original of each policy carried in its behalf.

REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS

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.

**REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS**

FHWA-1273 -- Revised May 1, 2012

**REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS**

- I. General
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Compliance with Governmentwide Suspension and Debarment Requirements
- XI. Certification Regarding Use of Contract Funds for Lobbying

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. 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, and 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

REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS

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 Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 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. Information and procedures with regard to referring such applicants will be discussed with employees.

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.

**REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS**

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 lessors 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.

REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS

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 subcontractors 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.b. 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

REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS

(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>

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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 to civil or 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 journeyman'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

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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 journeyman 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).

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

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

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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

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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

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approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200.

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 CFR 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 any 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 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.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.

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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.epls.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

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FEDERAL-AID CONSTRUCTION CONTRACTS

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.

REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS

**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.

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SPECIAL CONSTRUCTION REQUIREMENTS
FIRE PROTECTION PLAN

- (a) *Fire Protection Plan.* Prior to start of work, the Contractor shall submit a Fire Control Plan in writing to the Engineer for approval. The plan shall include the following:
- (1) The name and contact information of a Fire Control Coordinator who shall be assigned to the project.
 - (2) A list of numbers to call in case of a fire, including 911 (or the equivalent in the area).
 - (3) A complete list, including storage locations, of all tools and equipment the Contractor will use in the event of a fire within project limits.
 - (4) Methods that will be employed if a fire is encountered or started during construction activities within the project limits.
 - (5) Specific fire prevention precautions, and the required firefighting equipment, for every activity which has the potential for starting a fire. At a minimum the plan shall address prevention planning related to use of heavy equipment, vehicles, hand tools, storage and parking areas.
 - (6) Specific precautions for fueling operations.
 - (7) Provisions for field safety meetings. The Contractor shall conduct field safety meetings (also known as toolbox or tailgate meetings) at least once per week. The Contractor shall encourage participation by all persons working at the project site. Participants shall discuss specific fire prevention precautions for construction activities.
- (b) *Equipment and Procedures.*
- (1) Fire Boxes. Fire boxes shall contain tools and equipment that shall be used exclusively for controlling or suppressing fires which occur due to construction activities on project sites. Each fire box shall contain, as a minimum, the following:
 - (1) five round-pointed shovels,
 - (2) two double-bitted axes,
 - (3) three pulaskis or mattocks, and
 - (4) two backpack pumps
 - (2) Welding. If welding at field locations is required, the welding shall be done at a location where all flammable material has been cleared away for a distance of 16 feet around the area.
 - (3) Spark Arrestors. All diesel and gasoline powered engines, both mobile and stationary, shall be equipped with serviceable spark arrestors.
 - (4) Power Saws. Each gasoline power saw shall be provided with a spark screen and a muffler in good condition. Spill-proof metal safety cans shall be used for refueling.
 - (5) Storage and Parking Areas. Batch plant areas, equipment service areas, parking areas, gas and oil drum storage areas, and explosive storage areas shall be cleared of all flammable materials for a distance of 50 feet. Small stationary engine sites shall be cleared of all flammable material for distance of 17 feet. Other mitigation methods may be used as approved by the Engineer

SPECIAL CONSTRUCTION REQUIREMENTS
FIRE PROTECTION PLAN

- (c) *Fire Control Coordinator Responsibilities.* The Fire Control Coordinator shall:
- (1) Implement the Fire Control Plan.
 - (2) Monitor, manage, and adjust the Fire Control Plan as needed as construction work progresses.
 - (3) Document in a letter to the Engineer changes to the Fire Control Plan.
 - (4) Immediately contact firefighting authorities when a fire is started due to construction activities within project limits.
 - (5) Coordinate fire control and suppression activities until authorities arrive, including the evacuation of staff.
 - (6) When the Fire Control Coordinator cannot be on the project site, he shall designate a person who is on site to serve as the Fire Control Coordinator. The Fire Control Coordinator, or his designee, shall be on site at all times that work is being performed.
- (d) *Costs.* All costs associated with the preparation and implementation of the Plan and compliance with all fire protection provisions and requirements will not be measured and paid for separately, but shall be included in the work.