

Section 10 – Geotechnical and Roadway Pavements

Geotechnical Investigations

Geotechnical investigations are provided and available in the Reference Documents. See project website at <http://www.coloradodot.info/projects/us6overgarrison>.

The Contractor has, prior to submitting its Proposal, in accordance with prudent and generally accepted engineering and construction practices, reviewed the boring logs provided in the Reference Documents, inspected and examined the Site and surrounding locations, and undertaken other appropriate activities sufficient to familiarize itself with surface conditions and subsurface conditions affecting the Project, to the extent the Contractor deemed necessary or advisable for submittal of a Proposal. As a result of such review, inspection, examination and other activities, the Contractor is familiar with and accepts the physical requirements of the Work. The Contractor acknowledges and agrees that changes in conditions at the Site may occur after the Proposal Due Date, and that the Contractor shall not be entitled to any Change Order. Before commencing any Work on a particular aspect of the Project, the Contractor shall verify all governing dimensions and conditions at the Site and shall examine all adjoining work, which may have an impact on such Work. The Contractor shall be responsible for ensuring that the Design Documents and Construction Documents accurately depict all governing and adjoining dimensions and conditions.

The Contractor shall be responsible for any supplemental subsurface investigation necessary to complete the Work. Geotechnical investigations shall comply with the requirements of the CDOT Field Materials Manual, the CDOT Pavement Design Manual, and the AASHTO LRFD Bridge Design Specifications, Section 10 in effect at the time of bidding. All supplemental investigations made by the Contractor shall be documented in a geotechnical investigation report and submitted to CDOT and the CDOT Geotechnical Program for Acceptance. Supplemental investigations (geotechnical and pavement) must be signed and stamped by a professional engineer, licensed in the State of Colorado, and with a CDOT-prequalified firm.

Roadway Embankment Requirements

The existing embankment material is classified as AASHTO A-6 and A-7-6 material with R-Value test results of approximately 5. Imported roadway embankment material shall have a minimum R-Value of 10, meet soil embankment criteria of Standard Specifications Section 203.03, and be compatible with structures constructed on and adjacent to the embankment.

Roadway Pavement Analysis and Design

CDOT has performed the US 6 pavement design [using DARWin 3.1](#) to determine the pavement type, SMA and HMA grading, design gyrations, binder requirements, pavement thickness, and minimum sub-grade stabilization requirements for new pavement construction. The Contractor shall be responsible for all ~~other~~ aspects of pavement design [for those on local roads and for any designs that differ than those shown in Tables 10.1 and 10.2-](#)

Section 10 – Geotechnical and Roadway Pavements

Construction of multiple-lift overlay greater than 18 inches in total thickness over existing pavement to achieve final pavement grade shall require submittal of a pavement design by the Contractor, in conformance with the CDOT 2015 M-E Pavement Design Manual, for acceptance by CDOT. Any overlays greater than 18 inches will require verification by the Contractor or the Contractor's representative that the additional overlay depth will not induce any immediate or long term settlement. All pavement designs for reconstructed CDOT roadways submitted by the Contractor shall utilize either the 1993 AASHTO flexible pavement design formula, a licensed version of DARWin 3.1, or DARWin ME using and the latest CDOT calibration model. Any inputs into DARWin ME that do not follow the CDOT calibration model or the level 2 values listed in the 2015 Pavement Design Manual shall be identified by the Contractor in writing and submitted to CDOT in advance for approval. A 95% Reliability is required for all pavement thickness designs. All submittals shall include a hard copy and accompanying calculations. For the ME pavement design, include the DARWin ME file. LTPPBind shall be used to determine the appropriate binder. The LTPPBind analysis shall utilize 98% reliability and slow conditions. LTPPBind output showing the selection of the binder under slow conditions shall be included.

Pavement designs for local roads shall be prepared by the contractor and shall meet the requirements of the local agency to which the road belongs.

Pavement Structure

The Pavement Structure is defined as the thickness of the Stone Matrix Asphalt (SMA), Hot Mix Asphalt (HMA) plus the Aggregate Base Course (ABC). See Reference Documents for Pavement Structure recommendation report.

Construction Requirements

The Contractor shall construct the Pavement Structure in accordance with the Technical Requirements.

All pavement shall be constructed full width, including inside and outside shoulders.

Any layer of HMA that is to have a succeeding layer placed thereon shall be completed to full width before the succeeding layer is placed.

Roadway Pavement Types

Flexible pavement consisting of SMA for the top lift and HMA for the intermediate and bottom lifts will be required on US 6.

Smoothness Requirements

Smoothness requirements for new full depth pavement construction shall be HRI Category II.

Section 10 – Geotechnical and Roadway Pavements

Overlay sections shall meet the smoothness requirements for HRI Category I.

New Hot Mix Asphalt Construction

Full depth pavement reconstruction is required for US 6.

The Contractor shall use SMA for the top lift and HMA (Grading S) (100)(PG 64-22) for the roadway HMA pavement. The Contractor shall use SMA on the bridge surface. Pavement shall comply with the specifications in this Section.

The Contractor shall use the following lift thicknesses when placing HMA pavement on prepared subgrade and base course.

Table 10.1 – Recommended HMA Pavement Lift Summary (US 6 EB and WB)

Lift Description	Lift Thickness (inches)	Grading	Binder
Top Lift	2	SMA(Fibers)(Asphalt)	PG 76-28
Intermediate Lift 3	2.5	S	PG 64-22
Intermediate Lift 2	2.5	S	PG 64-22
Intermediate Lift 1	2.5	S	PG 64-22
Bottom Lift	2.5	S	PG 64-22

Table 10.2 – Recommended HMA Pavement Lift Summary (US 6 EB Off-Ramp)

Lift Description	Lift Thickness (inches)	Grading	Binder
Top Lift	2	SMA(Fibers)(Asphalt)	PG 76-28
Intermediate Lift 2	2.5	S	PG 64-22
Intermediate Lift 1	2.5	S	PG 64-22
Bottom Lift	3.0	S	PG 64-22

Bridge deck paving shall be placed to a compacted thickness of 3 inches, or as otherwise indicated on the plans. A waterproofing membrane shall be used beneath the bridge deck paving.

The Contractor shall use HMA (Grading S)(100)(PG 64-22) for any leveling and patching required.

The nominal aggregate size of the SMA shall be ½-inch. All references to SMA shall be taken as Stone Matrix Asphalt (Fibers)(Asphalt) or SMA(Fibers)(Asphalt). SMA shall not contain any reclaimed asphalt pavement.

Section 10 – Geotechnical and Roadway Pavements

The lift thickness of the intermediate and bottom lifts shall follow the guidelines established in Table 3.7 of the 2015 CDOT Pavement Design Manual. The thickness of each overlying lift shall be equal to or less than the thickness of the lift below. Any flexible pavement alternative offered by the contractor shall indicate the type of mix, asphalt binder, and thickness of all lifts that comprise the pavement section.

The contractor shall be responsible for all detour pavement designs.

Pavement Thickness

The Contractor shall construct the Pavement Section to the thickness requirements shown on the plans for the Project, as set forth in the Table below:

Location	Required Pavement Section Thickness (inches)			Pavement Smoothness Category (i)
	SMA plus HMA	ABC Class 6		
US 6 (Full depth)	12	6		HRI Category II
EB US 6 Off-Ramp at Garrison Street	10	6		HRI Category II
Bridge	3	NA		NA

Section 10 – Geotechnical and Roadway Pavements

Deliverables

Deliverable	Acceptance or Approval	Schedule
Technical Memorandum that indicates the Contractor has reviewed and accepts the provided Geotechnical Reports and/or Pavement Report and that the Contractor has no exceptions and/or the Contractor provides the following changes. Technical Memorandum must be stamped by the Contractor’s Design Professional Engineer	Acceptance	Prior to Design
Supplemental Geotechnical Investigations	Acceptance	N/A
Alternative Pavement Design Report	Acceptance	Submitted with Design Packages
Detour Pavement Design	Acceptance	At the Pre-paving Conference and at least 14 Days prior to the use of any Detour Pavement on the Project
Paving Quality Control Plan	Acceptance	At the Pre-Paving Meeting and at least 2 weeks prior to beginning paving operations.
HMA Mix Design.	Acceptance	At the Pre-paving Conference and at least 4 weeks prior to the use of any HMA pavement on the Project. Mix Submittals shall follow all requirements in CP 52 and CP 59.
SMA Mix Design.	Acceptance	At the Pre-paving Conference and at least 4 weeks prior to the use of any SMA pavement on the Project. Mix Submittals shall follow all requirements in CP 52 and CP 59.

Project: US 6 over Garrison Street
Project Sub Acct. No: 19478
August 25, 2014
Technical Requirements – Addendum 1

Section 10 – Geotechnical and Roadway Pavements

Project Special Provisions

REVISION OF SECTION 106 CONFORMITY TO THE CONTRACT OF HOT MIX ASPHALT

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

Subsection 106.05 shall include the following:

For this project, Contractor process control testing of hot mix asphalt is mandatory.

Project: US 6 over Garrison Street
Project Sub Acct. No: 19478
August 25, 2014
Technical Requirements – Addendum 1

Section 10 – Geotechnical and Roadway Pavements

REVISION OF SECTION 202 REMOVAL OF ASPHALT MAT

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

Subsection 202.01 shall include the following:

This work includes removal and disposal of existing asphalt mat within the project limits as shown on the plans or at locations directed by the Engineer.

In subsection 202.02 delete the seventh paragraph and replace with the following:

The existing asphalt mat shall be removed in a manner that minimizes contamination of the removed mat with underlying material. The removed mat shall become the property of the Contractor and shall be either disposed of outside the project site, or used in one or more of the following ways:

1. Used in embankment construction in accordance with subsection 203.06.
2. Placed in bottom of fills as approved in advance by CDOT.
3. Recycled into the hot mix asphalt in accordance with CP52.
4. Placed in the subgrade soft spots as approved in advance by CDOT.

Subsection 202.11 shall include the following:

The removal of the existing asphalt mat will be measured by the square yard of mat removed to the required depth and accepted.

Section 10 – Geotechnical and Roadway Pavements

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 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 CDOT. 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 CDOT, 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 CDOT.

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.

Section 10 – Geotechnical and Roadway Pavements

-2-
**REVISION OF SECTION 202
REMOVAL OF ASPHALT MAT (PLANING)**

If the Contractor fails to adequately clean the roadway, work shall cease until CDOT 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 CDOT 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.

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 CDOT. 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 CDOT 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.

Section 10 – Geotechnical and Roadway Pavements

-3-
**REVISION OF SECTION 202
REMOVAL OF ASPHALT MAT (PLANING)**

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

All material generated by the planning 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.

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:

Macrotexture testing, macrotexture 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.

Project: US 6 over Garrison Street
Project Sub Acct. No: 19478
August 25, 2014
Technical Requirements – Addendum 1

Section 10 – Geotechnical and Roadway Pavements

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) shall meet the gradation requirements and have a resistance value of at least 78 respectively when tested by the Hveem Stabilometer method.

Recycled Asphalt Pavement (RAP), asphalt millings, or asphalt in any form whatsoever shall not be substituted for ABC Class 6.

Project: US 6 over Garrison Street
Project Sub Acct. No: 19478
August 25, 2014
Technical Requirements – Addendum 1

Section 10 – Geotechnical and Roadway Pavements

REVISION OF SECTION 401 PLANT MIX PAVEMENT 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, CDOT, in cooperation with the Contractor and the Region Materials Engineer, may waive the pneumatic tire roller requirement. Pnuematic tire rollers shall not be used on SMA pavement. Steel wheel rollers shall not be used in vibratory mode when compacting SMA on bridge decks.

Section 10 – Geotechnical and Roadway Pavements

REVISION OF SECTION 304 & 403 WEIGHT TICKET COLLECTION

Section 304 and 403 of the Standard Specifications is hereby revised for this project as follows:

Subsection 304.08 and 403.05 shall include the following:

The Contractor shall collect the original 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 Contractor's representative assigned this project function shall not be responsible for any other duties. The scale tickets shall be available on site for CDOT personnel to inspect.

At the close of each workday, the Contractor shall provide CDOT envelopes, which contain that 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 shall 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.
5. Asphalt Paving Inspector Daily Report (CDOT Form 282) shall be completed, in its entirety, by the contractor as work progresses.

Project: US 6 over Garrison Street
Project Sub Acct. No: 19478
August 25, 2014
Technical Requirements – Addendum 1

Section 10 – Geotechnical and Roadway Pavements

-2-
**REVISION OF SECTION 304 & 403
WEIGHT TICKET COLLECTION**

Each day, the Contractor shall provide a vehicle identification sheet that contains the following information for each vehicle:

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

Should the Contractor fail to weigh each vehicle daily, CDOT may reject HMA loads until the Contractor complies with these requirements. All costs incidental to the foregoing requirements shall be included in the original contract prices for the project.

Section 10 – Geotechnical and Roadway Pavements

**REVISION OF SECTION 401 AND 403
 HOT MIX ASPHALT**

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

In Subsection 401.22 under Basis Of Payment, delete the fifth paragraph.

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			
		S (100)			Patching
Air Voids, percent at: N (initial) [for information only] N (design)	CPL 5115	3.5 – 4.5			3.5 – 4.5
Lab Compaction (Revolutions): N (initial) [for information only] N (design)	CPL 5115	8 100			8 100
Stability, minimum	CPL 5106	30			30
Aggregate Retained on the 4.75 mm (No. 4) Sieve with at least 2 Mechanically Induced fractured faces, % minimum	CP 45	70			70
Accelerated Moisture Susceptibility Tensile Strength Ratio (Lottman), minimum	CPL 5109 Method B	80			80
Minimum Dry Split Tensile Strength, kPa (psi)	CPL 5109 Method B	205 (30)			205 (30)

Section 10 – Geotechnical and Roadway Pavements

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
Voids Filled with Asphalt (VFA), %	AI MS-2	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
<p>Note: AI MS-2 = Asphalt Institute Manual Series 2</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>*Fractured face requirements for SF may be waived by RME depending on project conditions.</p>					

Section 10 – Geotechnical and Roadway Pavements

-3-
**REVISION OF SECTIONS 401 AND 403
 HOT MIX ASPHALT**

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 ¾ inch or smaller are considered a coarse gradation if they pass below the maximum density line at the #8 screen.

All mix designs shall be run with a gyratory compaction angle of 1.25 degrees and properties must satisfy Table 403-1. CDOT Form #43 will establish construction targets for Asphalt Cement and all mix properties at Air Voids up to 1.0% 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 (¾)	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.			

Section 10 – Geotechnical and Roadway Pavements

-4-

REVISION OF SECTIONS 401 AND 403 HOT MIX ASPHALT

The Contractor shall prepare a quality control plan outlining the steps taken to minimize segregation of HMA. This plan shall be submitted to CDOT and approved prior to beginning the paving operations. When CDOT 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. The WMA shall utilize additives from the Approved Products List. 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. Any delays to the project due to WMA submittal and review shall be considered within the Contractor's control and will be non-excusable.

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

The Contractor shall use an approved anti stripping additive. The amount of additive used shall be a minimum of 0.5 percent by weight of the asphalt cement. The additive shall be added at the refinery or at the hot plant. 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.

Acceptance samples shall be taken at the location specified in either Method B or C of CP 41, as determined by the Region Construction and Materials personnel.

Aggregate, asphalt cement, 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 Work.

Section 10 – Geotechnical and Roadway Pavements

REVISION OF SECTION 401, 403, AND 703 STONE MATRIX ASPHALT PAVEMENT

Sections 401 and 703 of the Standard Specifications are hereby revised for this Project as follows:

Subsection 401.02 shall include the following:

Recycled Asphalt Pavement (RAP) shall not be used in Stone Matrix Asphalt (SMA) mix.

Subsection 401.09 shall include the following:

Each SMA load shall be completely covered and securely fastened with a full tarp.

Subsection 401.16 shall include the following:

The SMA mixture shall be transported and placed on the roadway without drain-down or flushing. All flushed areas behind the paver shall be removed immediately upon discovery. If more than 50 square feet of flushed SMA pavement is ordered removed and replaced in any continuous 500 linear feet of paver width laydown, operations shall be discontinued until the source of the flushing has been found and corrected. CDOT shall designate the depth and area of all flushed areas requiring removal and replacement. All costs associated with the removal and replacement of the flushed areas shall be at the Contractor's expense.

Subsection 401.17 shall include the following:

Rollers shall not be used in a vibratory mode on SMA unless they are first used successfully in the demonstration control strip specified in subsection 403.03. Pneumatic wheel rollers shall not be used on SMA mix.

The relative compaction for all SMA mixtures will be measured from roadway cores in accordance with CP 44, Method B, unless the SMA mixture is being placed on a structure (bridge deck) in which case nuclear gauge measurements may be used. When cores are used, the Contractor shall provide all labor and equipment for the coring operation and filling the core holes. When nuclear density gauges are used, the tests will be performed in accordance with CP 81 and CP 82.

In-place density for SMA not placed on a bridge shall be 93 to 97% of the SMA mix maximum specific gravity as measured according to CP 51.

Section 10 – Geotechnical and Roadway Pavements

-2-

REVISION OF SECTION 401, 403, AND 703 STONE MATRIX ASPHALT PAVEMENT

At a minimum frequency of once per day, the in-place density for SMA placed on the bridge deck shall be measured according to CP 81. The in-place density of SMA shall be a minimum of 94 percent of the SMA mix maximum specific gravity as measured according to CP 51

Subsection 401.22 shall include the following:

The specifications for gradation acceptance shall be applied for all SMA placed on the project.

Subsection 703.06 shall include the following:

Mineral filler for the Stone Matrix Asphalt pavement shall be limestone dust and shall meet the requirements of this subsection and the following:

Plasticity Index (AASHTO T90) 4% Maximum

The Contractor shall submit hydrometer analysis (AASHTO T88) for the mineral filler used in the SMA mix.

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

Subsection 403.01 shall include the following:

This work includes placing a Stone Matrix Asphalt (SMA) pavement as shown on the plans.

Subsection 403.02 shall include the following:

The SMA gradation for this Project shall be ½ inch.

Mixture design and field control testing of SMA shall be performed using SuperPave (CPL 5115, 100 Gyrations)

Section 10 – Geotechnical and Roadway Pavements

-3-

**REVISION OF SECTION 401, 403, AND 703
 STONE MATRIX ASPHALT PAVEMENT**

The Contractor shall submit a mix design meeting the appropriate specification requirements for the following to CDOT at the Pre-paving Conference.
 The SuperPave SMA mix design shall conform to the requirements of Table 403-1a:

Table 403-1a		
Property	Test Method	Value for SMA
Air Voids, percent at: N(Design)	CPL 5115	3.0 – 4.0
Lab compaction (Revolutions) N(Design)	CPL 5115	100
Accelerated Moisture Susceptibility, tensile strength Ratio, (Lottman), minimum	CPL 5109, Method B	70
Minimum Dry Split Tensile Strength, psi	CPL 5109, Method B	30
Grade of Asphalt Cement		PG 76-28
Voids in the Mineral Aggregate (VMA) %, minimum	CP 48	17
Draindown at Production Temperature	AASHTO T305	0.3 maximum
% VCA ¹ _{MIX}	AASHTO R 46	Less than VCA _{DRC} ²
Note: The current version of CPL 5115 is available from CDOT		
Note: Copies of AASHTO R 46 and M 325 can be obtained from CDOT		
Note: ¹ Voids in the Coarse Aggregate		
Note: ² Dry-rodded condition		

Form 43 will establish construction targets for asphalt cement and all mix properties at air voids up to 1.0% below the mix design optimum.

A minimum of 1% hydrated lime by weight of the combined aggregate shall be added to the aggregate for all Stone Matrix Asphalt.

Section 10 – Geotechnical and Roadway Pavements

-4-

**REVISION OF SECTION 401, 403, AND 703
 STONE MATRIX ASPHALT PAVEMENT**

The SMA mix design must be Approved by CDOT before any pavement is placed on the project. In addition, the Contractor shall provide field control testing during production of the SMA mix and for the demonstration control strip. The Contractor shall perform the following tests and provide the results to CDOT during production:

For the SMA mix design, the Contractor shall perform the following tests and provide the results to CDOT during production:

Superpave Mix Property	Frequency
Draindown (AASHTO T 305)	1/1000 tons or fraction thereof
Percent Voids in the total mix @ N _(design)	1/1000 tons or fraction thereof
VMA (Percent Voids in the Mineral Aggregate) @ N _(design)	1/1000 tons or fraction thereof
Lottman, CPL 5109, Method B	1/5000 tons or fraction thereof
Dry Tensile Strength, CPL 5109	1/5000 tons or fraction thereof
Percent AC & Aggregate Gradation CP 5120	1/1000 tons or fraction thereof

CDOT approved Warm Mix Asphalt (WMA) may be allowed on this project in accordance with CP-59. The WMA shall utilize additives from the Approved Products List. 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. Any delays to the project due to WMA submittal and review shall be considered within the Contractor’s control and will be non-excusable.

Subsection 403.03 shall include the following:

The mineral filler for SMA shall be stored in a separate silo and added automatically in the correct proportion. The mineral filler addition equipment shall be electronically or mechanically interlocked to the aggregate feed sensors so that the proper amount of mineral filler is added whenever SMA is produced.

Section 10 – Geotechnical and Roadway Pavements

-5-

REVISION OF SECTION 401, 403, AND 703 STONE MATRIX ASPHALT PAVEMENT

The SMA mineral filler shall be added at the same point the asphalt cement is added to the aggregate.

Tack coat between the existing pavement and Stone Matrix Asphalt pavement shall be placed at a rate between 0.03 and 0.05 gallons per square yard.

Before proceeding with SMA placement, the Contractor shall demonstrate the ability to produce and place a satisfactory mix in a Demonstration Control Strip (DCS). The Contractor will coordinate with the Quality Control Manager on the proposed location of the DCS. The DCS shall consist of a minimum quantity of 500 tons placed in one lane, full width. Within the last 200 tons of SMA placed in the DCS, the Contractor and CDOT shall determine properties (VMA, Voids, in-place density, AC content, and gradation of the project produced SMA mix used in the DCS and provide the results to the Contractor's Quality Control Manager. The Contractor may proceed with full production if all mixture properties are within the specified tolerances and the project compaction is established and approved by CDOT.

If a DCS will be placed on the actual roadway, it shall be full width and shall extend for a minimum distance of 150 feet. The location of the DCS shall be no closer than 100 feet to the expansion joint of any bridge with concurrent deck rehabilitation or construction. To determine the in-place density and roller pattern, one core shall be taken at three random locations within the last 200 tons of the DCS. As part of the Contractor's QMP, the coring locations shall be determined using a stratified random sampling process. The cores shall be immediately submitted to the Contractor's Quality Manager and will be used for determining acceptance of the DCS. Densities of the random samples will be determined by cores according to CP 44. Coring shall be performed by the Contractor under the Quality Manager's observation.

The DCS will be designated as a separate process.

Subsection 403.04 shall include the following:

Stone Matrix Asphalt will be measured by the actual number of tons that are completed and accepted.

Subsection 403.05 shall include the following:

Project: US 6 over Garrison Street
Project Sub Acct. No: 19478
August 25, 2014
Technical Requirements – Addendum 1

Section 10 – Geotechnical and Roadway Pavements

-6-

REVISION OF SECTION 401, 403, AND 703 STONE MATRIX ASPHALT PAVEMENT

Mix design, furnishing, hauling, preparing, and placing all materials, including aggregates, asphalt cement, limestone dust, hydrated lime, tack coat, and approved demonstration control strip; labor, equipment tools, setting of lines and guides where specified, and all other work necessary to complete the item will not be paid for separately but shall be included in the work.

Stone Matrix Asphalt will be measured by the actual number of tons that are completed and accepted.

Project: US 6 over Garrison Street
Project Sub Acct. No: 19478
August 25, 2014
Technical Requirements – Addendum 1

Section 10 – Geotechnical and Roadway Pavements

REVISION OF SECTIONS 403 AND 620 HOT MIX ASPHALT TESTING, IGNITION FURNACE

If Reclaimed Asphalt Pavement is to be included in the Hot Mix Asphalt supplied on this project then the following shall apply:

Section 620.03 of the Standard Specifications is hereby revised for this project as follows:

In addition to the details shown in the plans for this project the field laboratory Class 2 shall include a forced air ignition furnace as described in CPL 5120. The Forced Air Ignition Furnace shall be installed per manufacturer's recommendations.

The 403 Pay Item of the Quality Assurance Schedule in the Field Materials Manual is hereby revised for this project as follows:

Asphalt content shall be measured following CPL 5120. Residual aggregate obtained by this method shall be used for gradation analysis according to CP 31.

10.3.8 Detour

Section 621 is hereby added to the Standard Specifications for this Project and shall include the following:

621.01 This work consists of constructing detours as shown in the plans for all phases of construction on US 6 and all applicable side streets; maintenance of the detours; removal of the detours; and removal and replacement of appurtenances required to construct and operate the detours including but not limited to guardrail, curb and gutter, detour pavement, embankment material and unclassified excavations.

621.02 All materials required for detour shall comply with project standard specifications and special provisions.

The Contractor shall be responsible for quality control required to assure adequate quality of embankment material, aggregate base course, HMA used in the construction of the detour.

621.03 The detour locations and dimensions for all phases of construction shall be as shown on the plans.

If the materials and thickness furnished for the detour pavement 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. All necessary signs, pavement markings and other traffic control devices shall be provided in accordance with the traffic control plan.

621.04 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 CDOT at the expense of the Contractor.

Section 10 – Geotechnical and Roadway Pavements

-2-

REVISION OF SECTIONS 403 AND 620 HOT MIX ASPHALT TESTING, IGNITION FURNACE

The Contractor shall have a maintenance plan for all hours of the day (7 days a week) for executing a long term patch of damaged detour pavement, and have forces available to perform this work within 2 hours of notice of such damage. The Contractor shall designate a person to be “on call” during all non-working hours, including no work periods as a point of contact for this work.

If CDOT determines the detour has deteriorated to the point where the safety of the traveling public is compromised (i.e. potholes), the lane(s) in question shall be closed and the Contractor shall be directed to execute their maintenance plan. If the Contractor is unresponsive to this order by CDOT, CDOT maintenance forces will be mobilized to close the lane and maintain the closure until such time as the Contractor is available to perform this work. CDOT Maintenance forces will be responsible for the lane closure only, and only until such time as the Contractor arrives on site and relieves them. CDOT Maintenance will not be responsible for repair of any of the contract installed detour. All time and expense for CDOT Maintenance work will be tracked by CDOT and deducted from money due to the Contractor. Any lane closures that are required outside of the allowable lane closure hours will be charged as 'working time violation' as established in this contract.