

City and County of Denver

State of Colorado



CONSTRUCTION SPECIFICATIONS

University and Wewatta over Cherry Creek Rehabs

Structure No.'s:

D-01-CC-017 : WB WEWATTA STREET OVER CHERRY CREEK

D-01-CC-019 : EB WEWATTA STREET OVER CHERRY CREEK

D-01-CC-281: NB UNIVERSITY BLVD OVER CHERRY CREEK

D-01-CC-282A : SB UNIVERSITY BLVD OVER CHERRY CREEK

AUGUST 2026

GENERAL CONTRACT CONDITIONS

The City and County of Denver (CCD), Department of Aviation, Department of Public Works, “Standard Specifications for Construction General Contract Conditions”, 2011 editions, including supplements or amendments and hereinafter modified shall be used for this project.

STANDARD CONSTRUCTION SPECIFICATIONS

The Standard Specifications for Construction for this Project shall consist of the applicable sections and subsections, numbered Section 200 through 700, of the 2023 Colorado Department of Transportation’s *Standard Specifications for Road and Bridge Construction* and as hereinafter modified shall be used for this project.

The Colorado Department of Transportation (CDOT) General Provisions consists of Sections 100 through 109 of the CDOT Standard Specifications for Road and Bridge Construction. Division 100 is hereby incorporated as revised in these Specifications.

The CCD General Contract Conditions shall prevail over any conflicting provision of the CDOT Standard Specifications for Road and Bridge Construction.

The CCD Project Special Conditions shall prevail over any conflicting subsections of the CCD General Conditions and the Division 100 General Provisions of the CDOT Standard Specifications for Road and Bridge Construction.

The Contractor will also be responsible for adhering to the current editions of the following manuals:

1. CDOT Bridge Design Manual,
2. Storm Drainage Design and Technical Criteria,
3. Sanitary Sewer Design Technical Criteria Manual,
4. Transportation Design Signal, Sign & Marking Standards,
5. MGPEC Pavement Design Standards and Construction Specification Manual,
6. Wastewater Capital Projects Standard Construction Specifications,
7. Denver Water Engineering Standards,
8. Denver Water Capital Project Construction Standards.

The following Project Special Provisions take precedence over the Specifications, Plans and supplemental or amended referenced “Standard Specifications for Road and Bridge Construction” adopted in 2025 by the CDOT, which is to be used to control construction of this project.

SPECIAL CONTRACT CONDITIONS

Special Contract Conditions are listed in the Master On-Call Bridge and Structural Construction Services Contract.

STANDARD CONSTRUCTION DETAILS

Applicable City and County of Denver standard details are required to be used by the Contractor. For other applicable details, except as modified or altered by the general notes on the Contract Drawings or by the revisions to Technical Specifications and Contract Documents, it is the intent of the City to use the CDOT M&S Standards, most recent edition as well as the applicable details from the most recent editions of the following:

1. City and County of Denver's Transportation Standards and Details,
2. CDOT Bridge Detail Manual.

Drainage and sanitary related appurtenances shall be constructed as shown in the most recent edition of the CCD Department of Transportation and Infrastructure documents listed under Standards, Details, Manuals, Guidelines.

The Contractor will also be responsible for adhering to the current editions of the following Standard Detailed Drawing Documents as applicable:

1. Wastewater Management Standard Detail Drawings,
2. Denver Water's Capital Projects Standard Drawings,
3. Storm Drainage Design and Technical Criteria.

Details contained in the Plans prevail over the CDOT and CCD standard drawings.

PROJECT SPECIAL PROVISIONS

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CDOT STANDARD SPECIAL PROVISIONS (2025)

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COMMENCEMENT AND COMPLETION OF WORK (WORKING HOURS, SCHEDULE)

PROJECT COST PROPOSAL

The Contractor Proposal Request Pricing Worksheet shall be submitted, and the Contractor shall provide a listing of all subcontractors anticipated to perform work, their M/WBE status, the dollar amount and percentage of work to be awarded to each subcontractor.

DESCRIPTION OF WORK

The Contractor agrees to and shall furnish all labor, tools, supplies, equipment, materials and everything necessary for and required to do, perform and complete all of the Work described, drawn, set forth, shown and included in said Contract Documents.

The work for this project consists of Bridge Preventative Maintenance for the WB Wewatta Street over Cherry Creek Bridge, the EB Wewatta Street over Cherry Creek Bridge, the NB University Boulevard over Cherry Creek Bridge and the SB University Boulevard over Cherry Creek Bridge. Specific “construction limits” for the sites are defined as shown in the general layout on the plan set. The work shall include furnishing and placing an approved asphalt mix design and an approved polyester polymer concrete to the extents of each structure as detailed on the plan set. Impacts to existing landscaping, concrete, sidewalk, streetlights, roadway, utilities, etc. that occur beyond the right-of-way or limits of disturbance shall be repaired by the Contractor at their own expense. Impacts to existing bridge rails, concrete, sidewalk, ramps, curbs, gutters, etc. that occur within the right-of-way, but are not specifically designated to be removed by the contract drawings or by the Project Manager, shall be repaired by the Contractor at their own expense.

The project includes two (2) bid schedules; Bid Schedule A - WB Wewatta Street over Cherry Creek Bridge & EB Wewatta Street over Cherry Creek Bridge and Bid Schedule B - NB University Boulevard over Cherry Creek Bridge and SB University Boulevard over Cherry Creek Bridge.

CONTRACT TIME

The Contractor shall commence work under the Contract per the City General Contract Conditions. The Contractor shall complete all work within **sixty (60)** Consecutive Calendar Days in accordance with the “Notice to Proceed.”

The City may consider assessing calendar days for any day, exclusive of Saturdays, Sundays, and Holidays, on which weather and other conditions not under control of the Contractor will not permit construction operations to proceed with the normal working force engaged in performing those items controlling the completion of the work. The Contractor must submit a written request to the Project Manager for consideration of assessment of a weather day or any delays outside of the control of the Contractor.

The Contractor shall furnish their bond rider within 14 working days after notice of being the apparent low bidder. The Contractor shall be deemed non-responsive if this is not supplied within the requested time frame.

LIQUIDATED DAMAGES

The Parties recognize and agree that time is of the essence on this Contract. If Substantial Completion is not reached within the Contract Time allotted, liquidated damages will be assessed by the City to

the contractor in the amount of **five hundred dollars (\$500.00)** for each calendar day that expires after the time specified for completion of the project until the Work is complete. Completion for the purposes of General Contract Conditions Section 602 shall include all work completed per the Contract and any executed change orders and any executed amendments.

CONSTRUCTION SCHEDULE

The Contractor shall submit a construction schedule in accordance with Title 3, Section 306 of the City and County of Denver Standard Specifications for Construction, General Contract Conditions. The schedule shall include 3 days of down time (float) for utility conflicts and delays.

The minimum salient features to be shown on the Contractor's Critical Path Schedule and submitted to the Project Manager within 10 days of issuance of Notice to Proceed are:

1. Mobilization
2. Construction Traffic Control
3. Erosion Control
4. Removal of Asphalt Mat & Waterproofing Membrane
5. Removal of Concrete Pavement
6. Concrete Deck Repairs
7. Removal and Replacement of Expansion Joints
8. Waterproofing Membrane
9. Thin Bonded Epoxy Overlay
10. Hot Mix Asphalt
11. Pavement Markings

The Contractor will not be compensated for administrative, or management costs incurred during down time for utility or other delays.

No additional payment will be made for out-of-sequence work.

WORKING HOURS

For information on working hours refer to Section 306 of City and County of Denver's "Standard Specifications for Construction, General Contract Conditions" 2011 edition.

INSPECTION

All inspection requests during normal contract working hours require a minimum of twenty-four (24) hour advanced written notice to the Project Inspector. All requests for inspection or testing outside of normal contract working hours shall be in accordance with the General Contract Conditions and require forty-eight (48) hour advanced notice to the Project Manager and Project Inspector for written approval.

WORK RESTRICTIONS FOR CITY HOLIDAYS

Work shall not occur on holidays listed below. Work shall cease at 12:00 p.m. (noon) the day before the holiday or on the Friday before a Monday holiday. Work may resume at 9:00 a.m. the day after the holiday or the Monday after a Thursday and/or Friday holiday. All travel ways shall be open to the public and clear of obstructions during the holiday non-working periods listed below.

Holiday
New Year's Day
Martin Luther King Jr. Day
Presidents' Day
Sí Se Puede Day (Observed)
Memorial Day
Juneteenth
Independence Day
Labor Day
Indigenous People's Day
Veterans Day
Thanksgiving Day
Christmas Day

WORK RESTRICTIONS FOR CITY SPONSORED OR SANCTIONED EVENTS

Work may be restricted by City sponsored or sanctioned events. The Project Manager will inform the Contractor of such events a minimum of two weeks prior to said event.

WORK RESTRICTIONS FOR CITY NOISE ORDINANCE AND STREET OCCUPANCY PERMIT

Work shall be in conformance with the City's Noise Ordinance and the Contractor's Street occupancy permit.

END SECTION

COMMENCEMENT AND COMPLETION OF WORK (WORKING HOURS, SCHEDULE)

REVISION OF SECTION 101 DEFINITIONS AND TERMS

Revise Section 101 of the Standard Special Provisions for this project as follows:

Subsection 101.02 shall be revised as follows:

Department or State Department of Transportation. Refers to the City and County of Denver.

Engineer. References to the “Engineer” within the Project Special Provisions and plans will refer to the CCD Project Manager.

Force Account Work. Force and Allowance Account work shall be in accordance with the Provisions of the Special Provisions.

Project Engineer. The City and County of Denver’s duly authorized representative who is in direct charge of the work and is responsible for the administration and satisfactory completion of the project under contract.

Project Manager. References to the “Project Manager” within the Project Special Provisions and Plans will refer to the CCD Project Delivery Manager.

Unsuitable Materials. Unsuitable Materials refers to organic, rock and other unsuitable soil materials that cannot be compacted to 95 percent of standard proctor density (AASHTO T-99), at optimum moisture $\pm$ 2 percent for clay soils and 95 percent of standard proctor density (AASHTO T-180), at optimum moisture $\pm$ 2 percent for granular soils.

END REVISION OF SECTION 101 DEFINITIONS AND TERMS

REVISION OF SECTION 102 BIDDING REQUIREMENTS AND CONDITIONS

Revise the subsections of Section 102 of the Standard Specifications as follows. All subsections not referenced below are deleted.

Subsection 102.03 (*Interpretation of Quantities in Proposal Form*) is included verbatim.

Subsection 102.05 (*Examination of Plans, Specifications, Special Provisions, and Site of Work*) is replaced with the following:

102.05 The bidder is expected to examine the site of the proposed work, the proposal, plans, specifications, supplemental specifications, special provisions, and contract forms, before submitting a proposal. The submission of a proposal will be considered conclusive evidence that the bidder has made this examination and is aware of the conditions to be encountered in performing the work according to the Contract.

END REVISION OF SECTION 102 BIDDING REQUIREMENTS AND CONDITIONS

**REVISION OF SECTION 103
AWARD AND EXECUTION OF CONTRACT**

Delete Section 103.

**END REVISION OF SECTION 103
AWARD AND EXECUTION OF CONTRACT**

REVISION OF SECTION 104 SCOPE OF WORK

Revise the subsections of Section 104 of the Standard Specifications as follows. All subsections not referenced below are deleted.

Subsection 104.04 (*Maintaining Traffic*) is included only as applicable for this project based on the Revision of Section 630 Construction Zone Traffic Control and the General Contract Conditions.

Subsection 104.05 (*Rights in and Use of Materials Found on the Work*) is included verbatim. The following paragraph shall be added:

Re-use of Soils shall be in accordance with the Denver Department of Environmental Health, “Guidance for Reuse of Soil on City Projects”, dated October 05, 2017. Document can be found here: https://www.denvergov.org/content/dam/denvergov/Portals/771/documents/EQ/Land%20Use%20and%20Planning/2019/Soil_Reuse_Guidance.pdf.

Subsection 104.7 (*Value Engineering Change Proposals by the Contractor*) is included verbatim.

END REVISION OF SECTION 104 SCOPE OF WORK

REVISION OF SECTION 105 CONTROL OF WORK

Revise the subsections of Section 105 of the Standard Specifications as follows. All subsections not referenced below are deleted.

Subsection 105.02 (*Plans, Shop Drawings, Working Drawings, Other submittals, and Construction Drawings*) is deleted except the following table shall be added:

Table 105-1 CONTRACTOR SUBMITTALS (Including Contractor Qualifications)					
Section No.	Description	Type	Contractor P.E. Seal Required?	Specialty Unit Review	Review Time (Working Days)
202	Bridge Removal Plan	Other	Yes	Staff Bridge	10
206	Shoring	Working Drawing	Yes*	Staff Bridge	10
502	Piling Equipment Testing	Other	No	No	10
502	Welding	Qualifications	No	No	10
503	Assembly and Placement of Reinforcing Steel	Shop Drawing	Yes	Staff Bridge	30
503	Drilled Shafts	Qualifications	No	No	30
504	Soil Nail Wall	Qualifications	No	No	15
504	Soil Nail Wall (Contractor Alternative & Sacrificial)	Shop Drawing	Yes*†	Geotechnical	10
504	Hybrid Wall (Contractor Alternative)	Shop Drawing	Yes*	Staff Bridge	10
504	MSE Wall	Qualifications	No	No	10
504	MSE Walls (Contractor Alternative)	Shop Drawing	Yes	Staff Bridge/ Geotechnical	15
504	MSE Walls (Default Design)	Shop Drawing	No	Staff Bridge	15
504	Geomembrane and Joints	Working Drawing	No	No	10
508	Timber Structures	Shop Drawing	No	Staff Bridge	20
509	Steel Structures	Shop Drawing	Yes*	Staff Bridge	20
509 and 618	Erection Plan	Other	Yes	Staff Bridge	5
509	Fracture Critical Plan	Other	No	Staff Bridge	15
512	Bearing Devices Type II	Shop Drawing	No	Staff Bridge	15
512	Bearing Devices Type III	Shop Drawing	Yes	Staff Bridge	15
514	Pedestrian and Bikeway Devices	Working Drawing	No	No	10
Table 105-1 CONTRACTOR SUBMITTALS					

(Including Contractor Qualifications) Continued					
518	Elastomeric Expansion Devices	Working Drawing	No	No	10
518	Expansion Devices: 0-4"	Shop Drawing	Yes	Staff Bridge	15
518	Modular Bridge Expansion Joint Design	Other	Yes	Staff Bridge	10
518	PPC End Dam	Qualifications	No	No	15
601 and 618	Precast Panel Deck Forms	Working Drawing	No	Staff Bridge†	10
601	Permanent Steel Bridge Deck Forms	Shop Drawing	Yes	Staff Bridge	10
601	Falsework	Working Drawing	Yes	Staff Bridge†	10
602	Reinforcing Steel	Working Drawing	No	No	10
603	Precast Culvert	Shop Drawing	Yes*	Staff Bridge	20
606	Bridge Railing	Working Drawing	No	Staff Bridge†	10
607	Sound Barriers(Alternative)	Shop Drawing	Yes	Staff Bridge	15
607	Sound Barriers (Default Design)	Working Drawing	No	Staff Bridge†	10
613	Light Standards (Low Mast)	Working Drawing	Yes	Traffic	10
613	Light Standards (High Mast)	Working Drawing	Yes	Traffic	10
614	Overhead Sign Structures	Shop Drawing	Yes*	Staff Bridge/ Traffic	15
614	Variable Message Signs (Cabinet and tilting bracket)	Working Drawing	Yes	Traffic	10
614	Traffic Signal Pole (Mast Arm)	Shop Drawing	No	Staff Bridge/ Traffic	15
614	Traffic Signal Pedestal Pole	Working Drawing	Yes	Traffic	10
614	Traffic Signal Equipment	Working Drawing	No	Traffic	10
618	Prestressed Concrete (Pre-tensioned)	Shop Drawing	Yes*	Staff Bridge	20
618	Prestressed Concrete (Post-tensioned)	Shop Drawing	Yes*	Staff Bridge	10
618	Steel Diaphragms between Prestressed Girders	Working Drawing	No	Staff Bridge	10
622	Buildings	Shop Drawing	Yes	Staff Bridge	Varies
628	Prefabricated Pedestrian Bridges	Shop Drawing	Yes*†	Staff Bridge	20
641	Shotcrete	Qualifications	No	No	10
Table 105-1 CONTRACTOR SUBMITTALS (Including Contractor Qualifications)					

Continued					
641	Shotcrete	Shop Drawing	No	Geotechnical	10
715	Anchor Bolts	Working Drawing	No	Staff Bridge†	10
Project Specials	As noted in project specials	Qualifications	No	Varies	Varies, 10 min.
Project Specials	As noted in project specials	Varies	Varies	Varies	Varies
* An electronic PE seal is required where the Contractor has provided the design for the item, or performed engineering to modify the details shown on the plans. The PE seal is not required where complete details are provided on the plans. † Independent design check required for rating per Bridge Rating Manual. ‡ Submittal only, no review required. Table 105-1 may not be all inclusive. The Contractor shall provide all submittals required by the Contract, including those not listed in the table.					

Subsection 105.03 (*Conformity to the Contract*) is included verbatim.

Subsection 105.04 (Conformity to the Contract of Superpave Performance Graded Binders) is included verbatim.

Subsection 105.05 (Conformity to the Contract of Hot Mix Asphalt) is included verbatim.

Subsection 105.06 (Conformity to the Contract of Portland Cement Concrete Pavement) is included verbatim.

Subsection 105.07 (*Conformity to the Roadway Smoothness Criteria*) is included verbatim, except references to submitting information to a CDOT email address shall be removed and replaced with the City Project Manager email address.

Subsection 105.12 (*Cooperation Between Contractors*) shall include the following:

All provisions of the General Contract Conditions, including those of Title 7, shall fully apply.

Other construction agencies may be working near the project limits. The Contractor for this project shall conduct and coordinate the work with these contractors so as not to interfere with or hinder the progress and completion of the work being performed by other agencies or contractors. The Contractor shall contact all contractors working near the project limits and assign contact personnel between them. The Contractor shall notify the Engineer in writing of these contacts and of what arrangements have been made.

All traffic control conflicts that arise between the needs of the various construction contractors or other agencies shall be brought to the attention of the Engineer. The Engineer shall determine the method of resolution in such instances. In all instances, the Contractor must possess a valid Revocable Street Occupancy Permit issued by the City of Denver in order to occupy or perform any work within the Right-of-Way. See Revision of Section 630 Construction Zone Traffic Control for further information.

The Contractor shall coordinate all lane closures to ensure that minimum lane requirements are met.

Claims filed for impact from outside contractor presence due to the Contractor's failure to coordinate will not be recognized or considered.

All costs subsidiary and incidental to the foregoing requirements shall be included in the original contract prices for the project and will not be paid separately. All of the Contractor's costs of whatsoever nature required to satisfy all of the above requirements shall be included in the work and no additional payment will be made.

Subsection 105.13 (*Construction Stakes, Lines and Grades*) is included verbatim.

Subsection 105.19 (*Maintenance During Construction*) is included verbatim, except reference to subsection 107.17 of the standard specifications shall be removed and replaced with General Contract Conditions 803, 1904, and 2101.

Subsection 105.20 (Failure to Maintain Roadway or Structure) is included verbatim.

END REVISION OF SECTION 105

CONTROL OF WORK

REVISION OF SECTION 106 CONTROL OF MATERIAL

Revise the subsections of Section 106 of the Standard Specifications as follows. All subsections not referenced below are hereby deleted.

For all subsections included below, the General Contract Conditions and the City and County of Denver, “Minimum Frequency of Materials Sampling and Testing Standard”, dated December 8, 2010, shall be followed for this project and the specifications below followed to supplement.

Subsection 106.03 (*Samples, Tests, Cited Specifications*) is included verbatim.

Subsection 106.04 (*Qualifications of Testing Personnel and Laboratories*) is included verbatim.

Subsection 106.05 (*Sampling and Testing of Hot Mix Asphalt*) is included verbatim, except that for this project, Contractor process control testing of hot mix asphalt is voluntary.

Subsection 106.06 (*Sampling and Testing of Portland Cement Concrete Paving*) is included verbatim.

Subsection 106.07 (*Material Inspection at Plant*) is included verbatim.

Subsection 106.08 (*Storage of Materials*) is included verbatim, except reference to subsection 109.07 of the standard specifications shall be removed and replaced with General Contract Condition 906.

Subsection 106.09 (*Handling Materials*) is included verbatim.

Subsection 106.10 (*Department Furnished Materials*) is included verbatim.

Subsection 106.12 (*Certificates of Compliance*) is included verbatim.

Subsection 106.13 (*Certified Test Report*) is included verbatim.

END REVISION OF SECTION 106 CONTROL OF MATERIAL

REVISION OF SECTION 107 LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

Revise the subsections of Section 107 of the Standard Specifications as follows. All subsections not referenced below are deleted.

Replace Subsection 107.02 (*Permits, Licenses, and Taxes*) with the following:

Unless otherwise specified, the Contractor shall procure all permits and licenses; pay all charges, fees, and taxes, including permits procured for this project by others; and give all notices necessary and incidental to the due and lawful prosecution of the work. The costs of these permits will not be paid for separately, but shall be included in the work.

Prior to beginning work, the Contractor shall furnish the Engineer with a written list of all permits required for the proper completion of the contract. The list shall clearly identify the types of permits that must be obtained before work on any particular phase or phases of work can be started. Copies of the fully executed permits shall be furnished to the Engineer upon request. The contractor shall obtain and comply with the provisions of all required permits and variances, including those listed below, at no additional cost to the project. Additional permits not specifically listed here may be required and procurement of and compliance with such permits is the responsibility of the Contractor at no additional cost to the project.

Permits, Clearances, Etc.	Required by:	Responsible Party	Notes
Construction Activities Stormwater Discharge Permit (CASDP)	CCD	Contractor (Not Required)	Permit obtained by Owner. Contractor to transfer permit from Owner. Contractor shall comply with permit requirements.
Noise Variance	CCD	Contractor	The Contractor shall be responsible for obtaining a variance as needed during construction.
Revocable Street Occupancy Permits	CCD	Contractor	These include the Method of Handling Traffic, which the Contractor is entirely responsible for creating, submitting, and obtaining the City's approval on.
CDPHE Construction Dewatering Permit	CDPHE	Contractor	Contractor to obtain permit if Contractor determines to use Dewatering based on means and methods. Contractor shall comply with permit requirements.
CCD Street Cut and ROW Occupancy Permit	CCD	Contractor	Apply for all permits through the City's E-Permit system.

All of the Contractor's costs of whatsoever nature required to obtain and comply with the requirements of all permits, whether they are listed in this Section or not, shall be included in the Work, and no additional payment will be made.

Subsection 107.06 (*Safety, Health, and Sanitation and Performance of Safety Critical Work*) Included Verbatim.

Subsection 107.07 (*Performance of Safety Critical Work*) Included Verbatim.

Subsection 107.19 (*Furnishing Right of Way*) is included verbatim.

Subsection 107.20 (*Personal Liability of Public Employees*) is included verbatim.

END REVISION OF SECTION 107

LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

REVISION OF SECTION 108 PROSECUTION AND PROGRESS

With the exception of Section 108.06 (*Character of Workers; Methods and Equipment*) Included Verbatim, remove Section 108 of the Standard Specifications in its entirety and replace with the following:

Requirements and Provisions:

1. The Traffic Control Plans are subject to DOTI Street Occupancy Permit(s) as outlined in Revision of Section 630, Construction Traffic Control, and Revision of Section 107.02, Permits, Licenses and Taxes.
2. No additional payment will be made for any provisions taken by the Contractor because of any weather conditions encountered during the duration of the Project. All of the Contractor's costs of whatsoever nature for any provisions required or taken for placement of concrete during cold and warm/hot weather will be included in the cost of the Work, and no additional payment will be made.

All costs subsidiary and incidental to the foregoing requirements shall be included in the original contract prices for the project and will not be paid separately. All of the Contractor's costs of whatsoever nature required to satisfy all of the above requirements shall be included in the Work, and no additional payment will be made.

END REVISION OF SECTION 108 PROSECUTION AND PROGRESS

REVISION OF SECTION 109 MEASUREMENT AND PAYMENT

Revise the subsections of Section 109 of the Standard Specifications as follows. All subsections not referenced below are deleted.

Subsection 109.01 (*Measurement of Quantities*) is included verbatim.

Subsection 109.04 (Compensation for Changes and Force Account Work) is included verbatim.

END REVISION OF SECTION 109 MEASUREMENT AND PAYMENT

REVISION OF SECTION 202 REMOVE CONCRETE PAVEMENT (PLANING)(SPECIAL)

Revise Section 202 of the Standard Specifications for this project to include the following:

DESCRIPTION

This work consists of removing the failing epoxy overlay on the southbound Wewatta St Bridge by saw cutting and precise milling or grinding to provide a smooth (0.2 percent maximum grade break) transition between the end of deck and 3/4-inch Polyester Concrete overlay.

The maximum depth of concrete milling on the bridge deck shall be 1/2 inch from top of concrete, except at the locations where concrete planing taper is required at the ends of the bridge.

CONSTRUCTION REQUIREMENTS

Contractor shall provide a method statement with equipment specifications for review by the Engineer prior to beginning work.

The equipment for removing the pavement surface shall be capable of removing a thickness of concrete material to 3/4 inch, and providing a tapered transition from the maximum thickness to 0 inches. The grinding or milling length shall be a minimum of 30 feet longitudinally, or as specified in the plans, and is based on a maximum allowable grade break of 0.2 percent for a 3/4-inch depth. The equipment shall also be capable of grinding or milling to the full required depth flush with the face of curb or barrier.

Grind or mill the surface to the depth, width, grade, and cross-slope shown on the plans or as directed by the Engineer. The removal process shall produce a surface that is true to grade and uniform in appearance. After removal, the concrete surface shall have no depressions or misalignment of slope exceeding 1/8 inch in 12 feet when measured with a 12-foot straightedge.; re-grind all areas of deviation at no additional cost.

Do not allow the slurry and residue resulting from the removal operation to flow across lanes occupied by the traffic and remove continuously during the removal operation, leaving the pavement clean. The Contractor shall dispose of the removed material off site at no additional cost.

The removal edge parallel to the existing expansion joints and end dams shall be saw cut to a depth of 3/4 inches, or as shown in the plans, to provide a smooth, clean and uniform removal line. Complete sawing of concrete to a true line, with a vertical face, unless otherwise specified.

After removal is complete, the Contractor shall sound the ground area for delamination per ASTM D4580, Procedure B Chain Drag. The Contractor shall mark the areas of deteriorated concrete to be removed as directed by the Engineer. Remove unsound concrete per Project Special Provision, Section 202 - Removal of Portions of Present Structure (Class 1, 2, and 3).

The Contractor shall take all steps necessary to prevent saw cutting, milling or grinding operations from damaging concrete, reinforcing steel, drains, inlets, or other assets not designated for removal. Any damage caused by the Contractor to assets not intended for repair shall be repaired in kind by the Contractor at the Contractor's expense using means and methods approved by the Engineer with no allowance for contract time extension.

If existing concrete header end dams are to remain at the existing elevation at expansion joints, the approach shall have a temporary HMA taper after overlay removal. The taper length shall be as defined in the plans or as accepted by the Engineer. Place the final roadway surface within 28 calendar days of removing existing overlay.

METHOD OF MEASUREMENT

Remove Concrete Pavement (Planing) (Special) will be measured by the quantity completed to the required depth and accepted.

Any concrete removed beyond the limits and depths shown on the plans will not be measured and shall be replaced with Polyester Concrete material at the Contractor's expense.

BASIS OF PAYMENT

The accepted quantities of Remove Concrete Pavement (Planing) (Special) will be paid for at the contract unit price.

Payment will be made under:

Pay Item

Pay Unit

Remove Concrete Pavement (Planing) (Special)

Square Yard

Payment for Remove Concrete Pavement (Planing) (Special) will be total compensation for all labor, equipment, materials, tools, and incidentals required to complete the work, including debris handling and disposal of materials.

Removal of existing pourable joints and saw cutting along the existing expansion joints and end dams will not be paid for separately but shall be included in the work.

Removal of unsound concrete material removed beyond the designated grinding depths will be paid for per Project Special Provision 202 - Removal of Portions of Present Structure (Class 1, 2, and 3).

END REVISION OF SECTION 202

REMOVE CONCRETE PAVEMENT (PLANING)(SPECIAL)

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

Revise Section 202 of the Standard Specifications for this project to include the following:

DESCRIPTION

This work consists of removing all asphalt material and removing the waterproofing membrane from the surface of the concrete bridge deck and approach slabs.

CONSTRUCTION REQUIREMENTS

Remove all asphalt material and waterproofing membrane (if present) from the surface of the bridge deck and approach slabs. The surface shall be relatively smooth upon completion of removal operations. Remove and ground smooth jagged or broken edges or otherwise unsmooth areas.

The Contractor is responsible for cleaning and maintaining the deck before and during new surface treatment placement.

Before beginning removal operations, the Contractor shall submit a removal plan for approval. This plan shall include as a minimum:

- A) Methods of removal including confined areas that are unreachable with large equipment.
- B) The type and number of all equipment to be used. If cold milling is used to remove the final 1/2-inch of asphalt, provide appropriate information to demonstrate the equipment complies with the requirements of this specification.
- C) The width, location, and phasing of removal passes along with the proposed schedule for these passes.

Remove the existing asphalt by cold milling to within 1/2 inch of the concrete deck. Then, remove the remaining 1/2 inch of asphalt and any existing membrane by any one or combinations of the following three methods:

- A) Scraping with a loader equipped with a smooth-edged bucket (no teeth).
- B) Diamond grinding.
- C) Cold milling with equipment that has the capabilities and features as described below.
 - 1) Cold milling equipment must be able to:
 - a. Remove concrete to a depth of 1/4 inch.
 - b. Provide a surface relief no greater than 1/4 inch.
 - c. Provide a 5/32-inch grade tolerance.
 - 2) Cold milling equipment must have the following features:
 - a. Three or four riding tracks.
 - b. An automatic grade control system with electronic averaging has three sensors on each equipment side.
 - c. A conveyor system that leaves no debris on the bridge.
 - d. A drum that operates in an up-milling direction.
 - e. Bullet tooth tools with tungsten carbide steel cutting tips.
 - f. A maximum tool spacing of 1/4 inch.
 - g. A maximum operating track pair or set (axle) weight of 47,000 pounds, or as equivalent to the Tandem Axle Group as shown on the Colorado Bridge Weight

- Limit Map, White (10 feet less than or equal to d less than or equal to 12 feet, with d the spacing between axle groups).
- h. A maximum track unit weight of 5,875 pounds per foot.
 - i. New tooth tools at the start of the job.

(a) For all cold milling operations, the Contractor shall:

1. Saw cut the outline of the asphalt surfacing to be removed to a depth of 1/2 inch.
2. Provide personnel on each side of the milling drum to monitor milling activities. Maintain constant radio communication with the operator during milling activities.
3. Verify the depth of the asphalt surfacing:
 - Every 50 feet at one location on each shoulder.
 - In the traveled way.
 - As shown in the plans.

The Contractor's Engineer shall rate the bridge or complete a comparative analysis for the proposed milling machine, using the Colorado Bridge Weight Limit Map, if:

- The proposed milling machine exceeds the maximum operating one-track weight or maximum track-weight per foot; or
- It does not conform to the configuration assumptions used in determining weight limit assumptions.

The Contractor shall provide a stamped, certified letter and the accompanying rating or analysis for the Engineer's review.

Use a small-width rotomill two-foot head maximum) and low-impact hand tools in confined areas where access is difficult for the primary removal equipment.

In the transverse direction, extend removal to the face of the barriers. The removal depth near the face of the barriers shall be consistent with the remainder of the bridge deck.

Hydrodemolition and pressure jetting will not be permitted for removal operations.

After cold milling is complete, the Contractor shall ensure that the coarse aggregate remaining at the removal depth is firmly embedded and removed if not.

The Contractor shall prepare the bridge deck surface for placement of the new overlay. Remove all construction debris, wearing surface material, and residual materials from the scarification process from the bridge deck.

To remove the final 1/2 inch of asphalt, if cold milling is used, the Contractor shall furnish a documented history of successfully performing cold milling on bridge decks with similar equipment to that described. The documentation shall include three projects within the past five years, the equipment used, and specifics regarding the bridges.

The Contractor shall furnish a documented history of successfully performing cold milling on bridge decks with similar equipment to that described. The documentation shall include three projects within the past five years, equipment used, and specifics regarding the bridges.

If mechanical milling results in exposing the reinforcing steel, stop the operation immediately and adjust the depth of removal. Repair or replace any damaged or dislodged reinforcing steel due to Contractor negligence during the operation, at the Contractor's expense.

The Contractor shall take necessary precautions to protect the expansion devices, barriers, and drains from damage. Repair all damage to the bridge expansion devices, barriers, drains, or any other property of CDOT resulting from removal operations at the Contractor's expense without time extension and per Engineer's approval.

The Contractor shall take precautions to protect the bridge deck from damage that would not ordinarily occur with these removal methods, including damage to deck reinforcing and post-tensioning. Repair any damage resulting from removal operations at the Contractor's expense without time extension and per Engineer's approval.

The Contractor shall protect live traffic and waterways below from any falling debris in work areas.

After completing of each day's work, vertical edges greater than 3/4 inch in height caused by planing shall be:

- Longitudinal edges - Taper parallel to the direction of traffic to not less than a 3:1 (horizontal: vertical) slope.
- Transverse edges - Taper perpendicular to the direction of traffic to not less than a 50:1 (horizontal: vertical) slope.

Complete all removal operations parallel to the travel lanes unless otherwise directed by the Engineer.

METHOD OF MEASUREMENT

Removal of Asphalt Mat (Planing) (Special) will be measured by the actual quantity completed to the required depth and accepted, by the square yard.

BASIS OF PAYMENT

The accepted quantities of Removal of Asphalt Mat (Planing) (Special) will be paid for at the contract unit price.

Payment will be made under:

PAY ITEM

PAY UNIT

Removal of Asphalt Mat (Planing) (Special)

Square Yard

Payment for Removal of Asphalt Mat (Planing) (Special) will be total compensation for all labor, materials, tools, equipment, and incidentals required to remove the asphalt and any waterproofing membrane as designated in the plans, specified in these special provisions, and directed by the Engineer.

Asphalt depth verification will not be measured and paid for separately; include it in the work.

Methods to prevent debris from falling from the structure, methods to protect the traveling public using the structure, adjacent to the structure, and from airborne debris will not be paid for separately; include it in the work.

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

REVISION OF SECTION 202 REMOVAL OF PAVEMENT MARKINGS

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

In Subsection 202.11, remove the second paragraph and replace with the following:

Removal of pavement marking will not be measured and paid for separately but will be considered included in the unit cost for new pavement markings.

Sandblasting or other surface preparation that may be required to prepare pavement surfaces for the application of new pavement markings will not be measured and paid for separately but will be considered included in the unit cost for new pavement markings.

Painting existing markings black or any other color shall not be considered an acceptable method of removal.

END REVISION OF SECTION 202 REMOVAL OF PAVEMENT MARKINGS

REVISION OF SECTION 202 REMOVAL OF PORTIONS OF PRESENT STRUCTURE (CLASS 3)

Revise Section 202 of the Standard Specifications for this project to include the following:

DESCRIPTION

This work consists of saw cutting, removing, and disposing of existing deteriorated bridge deck concrete, additional asphalt, and waterproofing membrane as directed by the Engineer. Removal operations shall be conducted so that the traveling public is protected, and so that interference with the traveling public using the structure is minimized.

Perform the applicable classes of removal as defined in the plans. The Engineer will determine the locations and limits of removal.

CONSTRUCTION REQUIREMENTS

A) General:

At least 10 working days before beginning removal, the Contractor shall submit a method statement to the Engineer with details of the removal operations including the means, methods, sequence of removal, tools, and equipment to be used.

The Contractor's Method Statement shall also include proposed methods used to:

- Determine the locations and limits of deteriorating concrete.
- Prevent debris from falling to the ground or waterways below the structure.
- Protect the traveling public using the structure, and adjacent to the structure, from airborne debris generated by the removal operations.

The Engineer must approve all removal operations, methods, and equipment before the work begins.

The Contractor shall control dust and run-off per applicable governmental regulations. The Contractor is responsible for disposing per regulation of all material removed, including but not limited to, material collected by vacuuming the deck.

Before removal of concrete, sound the bridge deck for delamination per ASTM D4580, Procedure B Chain Drag. Mark the areas of deteriorated concrete to be removed as directed by the Engineer. Removal and patching areas not designated for removal by the Engineer will not be measured or paid for.

Remove the existing concrete as shown as directed by the Engineer. Saw cut along the removal limits before removal. Removal operations shall not occur before approval of the Engineer. Concrete sawing shall be done to a true line, with a vertical face, unless otherwise specified. Feathered edges will not be acceptable. The depth of the saw cut shall be approximately 3/4-inch.

The Contractor shall remove and repair only the amount of work that can be completed and reopened to traffic within the designated lane closure times as specified in the Traffic Control Plan.

The Contractor shall take all steps necessary to prevent cutting or otherwise damaging reinforcing steel, including any vertical stirrups, and structural steel including welded shear connectors projecting into the bridge deck. Repair and replace all bars or shear connectors damaged by the Contractor's operations at the Contractor's expense using means and methods approved by the Engineer with no allowance for contract time extension.

Following the removal of the concrete, straighten all exposed non-epoxy reinforcing steel to remain in place as required and thoroughly cleaned to sound metal by sandblasting per subsection 202. Do not sandblast epoxy coated reinforcing steel, if present, but clean with hand tools. Repaint epoxy coating on reinforcing steel, if damaged, with epoxy paint, before placement of the concrete.

Following sandblasting, the condition of all exposed reinforcing bars will be inspected by the Engineer. If, in the opinion of the Engineer, the loss of original cross-sectional area of the bar due to deterioration is 25 percent or more, the Contractor shall add additional bars to replace the section area loss due to deterioration, as approved by the Engineer. Lap Splice newly added bars as shown in the plans. Use a mechanical splice if the required lap splice length cannot be used. The mechanical splice shall develop at least 125 percent of the specified yield strength of the bar. Maintain all minimum clearances as defined in the plans. As an alternative, the Contractor may remove additional sound concrete to achieve the required lap length. Payment for additional removals and repairs will be based on the unit price for the appropriate class of removal and repair method.

Secure all reinforcing steel to adjacent bars or to the bridge deck as provided in subsection 602.

Thoroughly clean all areas of the prepared surface contaminated by oil or other materials detrimental to bonding by a method approved by the Engineer.

B) Surface Preparation Equipment

Pneumatic hammers heavier than nominal 15-pound class will not be permitted. Pneumatic hammers and chipping tools shall not be operated at an angle exceeding 60 degrees relative to the surface of the slab. Such tools may be started in the vertical position but must be immediately tilted to a 60-degree operating angle.

Provide hand tools such as hammers and chisels for removing final particles of loose, unbonded concrete. Only short, one-handed hammers with a maximum head weight of five pounds will be allowed unless Class 3 Removal is designated. Use hydraulic demolition with the Engineer's approval.

Sandblasting equipment shall meet the requirements of subsection 202.

C) Class 3 Removal:

Removal of Portions of Present Structure (Class 3) shall consist of removing existing bridge deck concrete within the limits shown on the plans, or as designated by the Engineer. The concrete within the designated limits shall be removed full depth from the top of bridge deck to bottom of bridge deck.

The Contractor shall take all precautions necessary to prevent damage to diaphragms and girders below the removal limits and to minimize spalling on the bottom of the bridge deck slab adjacent to the removal boundaries.

The Contractor shall implement a containment system that prevents debris from falling to the ground or waterways below the structure.

The Contractor is responsible for disposing of all removed material and debris.

METHOD OF MEASUREMENT

Removal of Portions of Present Structure will be measured by the actual quantity completed and accepted to the required depth for each class. Each area of bridge deck removal will only be measured once as Class 3; measurement of removal areas will not overlap.

Removal and repairs beyond the minimum required lap length of reinforcing steel will not be measured or paid for separately, but will be at the Contractor’s expense.

Removal of additional asphalt and waterproofing membrane, cleaning of prepared surfaces contaminated by oil or other materials detrimental to bonding will not be measured and paid for separately but shall be included in the work.

BASIS OF PAYMENT

Planned deck rehabilitation quantities are approximate. The actual accepted quantities of Removal of Portions of Present Structure will be paid for at the contract unit price. Payment will be made under:

<u>PAY ITEM</u>	<u>PAY UNIT</u>
Removal of Portions of Present Structure (Class 3)	Square Yard
Payment for Removal of Portions of Present Structure will be total compensation for all labor, materials, tools, equipment, and incidentals required to complete the item including but not limited to:	
• Saw cutting. • Removal of concrete to the required depth. • Sandblasting or hand cleaning reinforcing steel including epoxy repair. • Disposal of removed materials and debris.	

Methods to prevent debris from falling from the structure, and methods to protect the traveling public using the structure, or adjacent to the structure, from airborne debris will not be paid for separately; include it in the work.

Cleaning, straightening, and repairing epoxy coating of existing reinforcing steel will not be paid for separately; include it in the work.

Sounding and marking repair areas will not be paid for separately; include it in the work.

Removal of conduit impacted by the concrete removal shall not be paid for separately; include it in the work.

Payment for the new reinforcement steel will be made per Section 602. Payment for the Mechanical splice will be as the weight of reinforcing steel for the designated lap splice for that bar size.

END REVISION OF SECTION 202

REMOVAL OF PORTIONS OF PRESENT STRUCTURE (CLASS 3)

REVISION OF SECTION 202 REMOVAL OF PORTIONS OF PRESENT STRUCTURE (SPECIAL)

Revise Section 202 of the Standard Specifications for this project to include the following:

DESCRIPTION

This work consists of removing a mostly failed poly overlay on the northbound University Blvd bridge. The remaining portions of the overlay are loosely bonded to the bridge's concrete deck. Removal shall be restricted to hand tools or light non-destructive methods such as a skid steer with a bucket attachment to scrape the overlay off. No milling or methods that have the potential to grind into the concrete deck shall be allowed, except for tapers at the bridge's expansion joints and deck drains.

The work also consists of removing existing pourable joint material before grinding.

CONSTRUCTION REQUIREMENTS

Contractor shall provide a method statement with equipment specifications for review by the Engineer prior to beginning work.

Contractor shall use hand tool and or light machinery methods to remove the loosely bonded poly overlay. Light machinery shall be defined as a skid steer with a bucket to scrape the material off or equivalent approved method. No milling or grinding shall be allowed on the concrete deck to remove the existing overlay.

After removal is complete, the Contractor shall sound the ground area for delamination per ASTM D4580, Procedure B Chain Drag. The Contractor shall mark the areas of deteriorated concrete to be removed as directed by the Engineer. Remove unsound concrete per Project Special Provision, Section 202 - Removal of Portions of Present Structure (Class 1, 2, and 3).

If existing concrete header end dams are to remain at the existing elevation at expansion joints, the approach shall have a temporary HMA taper after overlay removal. The taper length shall be as defined in the plans or as accepted by the Engineer. Place the final roadway surface within 28 calendar days of removing existing overlay.

METHOD OF MEASUREMENT

Removal of Portions of Present Structure (Special) will be measured by the quantity completed to the required depth and accepted.

Any concrete removed beyond the limits and depths shown on the plans will not be measured and shall be replaced with Polyester Concrete material at the Contractor's expense.

BASIS OF PAYMENT

The accepted quantities of Removal of Portions of Present Structure (Special) will be paid for at the contract unit price.

Payment will be made under:

Pay Item

Pay Unit

Removal of Portions of Present Structure (Special)

Square Yard

Payment for Removal of Portions of Present Structure (Special) will be total compensation for all labor, equipment, materials, tools, and incidentals required to complete the work, including debris handling and disposal of materials.

Removal of existing pourable joints and saw cutting along the existing expansion joints and end dams will not be paid for separately but shall be included in the work.

Removal of unsound concrete material removed beyond the top surface of the deck will be paid for per Project Special Provision 202 - Removal of Portions of Present Structure (Class 1, 2, and 3).

Additional removals at bridge deck drains, expansion joints, or inlets in approach slabs will not be paid for separately but shall be included in the work.

END REVISION OF SECTION 202

REMOVAL OF PORTIONS OF PRESENT STRUCTURE (SPECIAL)

REVISION OF SECTION 202 REMOVAL OF EXPANSION DEVICE

Revise Section 202 of the Standard Specifications for this project to include the following:

DESCRIPTION

This work shall consist of removing existing bridge expansion devices per these specifications and conforming to the lines and details shown on the plans or as approved by the Engineer. This work shall include:

- Saw cutting,
- Removing concrete,
- Removing reinforcing steel as shown in the plans,
- Protecting and straightening existing reinforcing steel to remain,
- Protecting all utilities within the removal area,
- Sandblasting or hand-cleaning reinforcing steel, including epoxy repair,
- Containing and disposing of removed materials and debris.

CONSTRUCTION REQUIREMENTS

At least 10 working days before beginning removal, the Contractor shall submit a method statement to the Engineer with details of the removal operations, including the means, methods, sequence of removal, tools, and equipment to be used. The Engineer must approve all removal operations, methods, and equipment before the work begins.

Remove the existing concrete as shown on the plans or as directed by the Engineer. The Contractor shall saw cut along the removal limits before removal. Removal operations shall not occur before approval of the Engineer. Unless otherwise specified, the complete concrete sawing to a true line, with a vertical face. Feathered edges will not be acceptable. The depth of the saw cut shall be 3/4-inch minimum.

The Contractor shall take all steps necessary to minimize spalling on the face of the existing concrete adjacent to the removal boundaries. Do not use pneumatic hammers heavier than a nominal 15-pound class for removals adjacent to the removal boundaries. Use hand tools such as hammers and chisels to remove particles of loose, unbonded concrete. Sandblast exposed concrete surfaces within the removal limits to remove all final fractured or loose particles. Any damage caused by the Contractor to any portion of the structure not intended for repair shall be repaired in kind by the Contractor at the Contractor's expense using means and methods approved by the Engineer with no allowance for contract time extension.

The Contractor shall take all steps necessary to prevent cutting or otherwise damaging reinforcing steel intended to remain in place and all utilities within the removal area. Any reinforcing bars or utilities damaged by the Contractor's operation shall be repaired or replaced in kind at the Contractor's expense using means and methods approved by the Engineer with no allowance for contract time extension. Include containment or protection required to keep debris from falling below the work area in the work cost.

After removing the concrete, straighten all exposed non-epoxy reinforcing steel to remain in place as required and thoroughly cleaned to sound metal by sandblasting. Sandblasting equipment shall be capable of removing rust scale from non-epoxy reinforcing bars. If present, do not sandblast epoxy-coated reinforcing steel; clean it with hand tools. If damaged, repaint the epoxy coating on reinforcing steel with epoxy paint before placing the concrete.

The Contractor is responsible for the disposal of all removed material and debris.

METHOD OF MEASUREMENT

Removal of Expansion Device will be measured by the actual quantity removed and accepted, from face-of-curb to face-of-curb along the joint.

BASIS OF PAYMENT

The accepted quantities of Removal of Expansion Device will be paid at the contract unit price.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Removal of Expansion Device	Linear Foot

Payment for Removal of Expansion Device will be total compensation for all labor, materials, tools, equipment, and incidentals necessary to complete the item, including:

- Saw cutting,
- Removing concrete as shown in the plans,
- Removing reinforcing steel as shown in the plans,
- Sandblasting or hand-cleaning, including epoxy coating repair,
- Removing expansion device,
- Protecting and straightening existing reinforcing steel to remain,
- Protecting all utilities within the removal area, and
- Containing and disposing of removed materials and debris.

END REVISION OF SECTION 202

REMOVAL OF EXPANSION DEVICE

REVISION OF SECTION 208 EROSION CONTROL

PART I: DEFINITIONS

Definitions used for this Section shall consist of those listed in Title 1 of the City and County of Denver “Standard Specifications for Construction, General Contract Conditions”, 2011 edition.

Definitions used for this Section hereby incorporate those identified within the City and County of Denver Construction Activities Stormwater Manual (CASM).

Additional Definitions applicable to this Section are listed heretofore:

Basis of Payment: The terms under which “Work” is paid, as a designated “Pay Item” in accordance with the quantity measured and the “Pay Unit.”

Best Management Practices (BMPs): Schedules of activities, prohibitions of practices, installation of devices, maintenance procedures, and other management practices deployed to stabilize the construction site to prevent or reduce the pollution of State Waters (see definition below). Stormwater BMPs can be classified as "structural" (i.e., devices installed or constructed on a site) or "non-structural" (procedures, such as modified landscaping practices).

Colorado Department of Health and Environment (CDPHE): State of Colorado, Water Quality Control Division responsible for issuance of State Construction Stormwater Permit.

Construction Activities Stormwater Discharge Permit (CASDP): Permit issued by the City for compliance with City & County of Denver Revised Municipal Code and Department of Transportation and Infrastructure (DOTI) Rules & Regulations concerning the discharge of pollutants in storm generated runoff from construction sites to Municipal Separate Storm Sewer System (MS4, see definition below) or State Waters, via the Municipal Separate Storm Sewer System (MS4).

Construction Activities Stormwater Manual (CASM): City and County of Denver Construction Activities Stormwater Manual (CASM), 2010 edition.

Colorado Department of Transportation (CDOT): State agency that has published standards for Erosion Control with accompanying Erosion Control Supervisor certification courses.

Erosion Control Supervisor (ECS): The Erosion Control Supervisor is assigned by the Contractor to perform duties as described in this Section. The ECS shall be properly trained in BMPs per requirements of Part V below and shall be under the direction of a Professional Engineer licensed in the State of Colorado when performing any modifications to the Project Stormwater Management Plan (SWMP), as required by CDPHE.

Final Stabilization: Point of construction when all ground surface disturbing activities at the site have been completed and uniform vegetative cover has reached 70% of pre-disturbance vegetative cover (as judged by comparison to nearest fallow vegetation), or equivalent permanent features have been employed. At this point, all temporary BMPs can be removed, all construction and equipment maintenance wastes have been disposed of properly; and all elements of the Stormwater Management Plan have been completed.

Major SWMP Modification: Changes to the original SWMP that removes or adds additional area to the Project or modifies the hydrology or drainage of the Project. A Major SWMP Modification requires the

submission of revised Stormwater Management Plan (SWMP) elements to the Permit Authority for review and approval. Any adjustments to a SWMP must be performed either by or under the direction of a Professional Engineer licensed in the State of Colorado.

Minor SWMP Modification: Modification to the SWMP that does NOT increase the scope or change hydrology of the Project but: modifies/improves specific BMPs in use at site, indicates progression in phasing of the Project, or specifies relocation of previously approved BMPs within the Project. Any adjustments to a SWMP must be performed either by or under the direction of a Professional Engineer licensed in the State of Colorado.

Municipal Separate Storm Sewer System (MS4): A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

- a) owned or operated by a State, city, town, county, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of stormwater or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or a designated and approved management agency under Section 208 of the Federal Clean Water Act that discharges to State Waters;
- b) designed or used for collecting or conveying stormwater;
- c) which is not a combined sewer; and
- d) which is not part of a Publicly Owned Treatment Works (POTW).

Permit Authority: The Department authorized by the City to review and process CASDP Applications for Capital and/ or governmental sponsored Projects. The responsible City department serving as the Permit Authority is the Engineering, Regulatory and Analytics Office. As a clarification, the Development Services Department of the City serves as the point of intake and permit processing center.

Permit Enforcement Authority: The Department authorized by the City to inspect and enforce CASDP Rules and Conditions for all construction Projects within the City's MS4 Boundary. The responsible City department serving as the Permit Enforcement Authority is the Wastewater Management Division of the Department of Transportation and Infrastructure.

State Construction Stormwater Permit: Colorado Revised Statutes require that all construction sites/development Projects, which, by definition, disturb one or more acres in area, shall be covered by a State issued general permit for construction activities. Information on the application requirements for the State permit can be obtained by phone at 303-692-3500; or by visiting their offices located at 4300 Cherry Creek Drive South, Denver, CO 80246 - 1530. or on the Web at: <https://www.colorado.gov/pacific/cdphe/news/water-quality-permits>

State Waters: Any and all surface waters which are contained in or flow in or through this State, not to include waters in sewage systems, waters in treatment works of disposal systems, waters in potable water distribution systems, and all water withdrawn for use until use and treatment have been completed.

Examples of State Waters include, but are not limited to, perennial streams, intermittent or ephemeral gulches and arroyos, ponds, lakes, reservoirs, irrigation canals or ditches, wetlands, stormwater conveyances (when they discharge to a surface water), and groundwater.

Stormwater Management Plan (SWMP): The Stormwater Management Plan contains the requirements necessary to accomplish all the following:

The SWMP establishes a minimum standard to construct, install, maintain, and remove required BMPs

during the life of the Contract to prevent or minimize pollution of stormwater due to erosion, sediment transport, and construction related pollutant generated during all phases of the Project. A SWMP consists of the following elements:

- (i) CASDP Narrative Worksheet with Narrative Report. The Narrative Report and supporting documents should fully address the methods to be used to prevent sediment, debris, and other pollutants from entering the MS4 and/ or State Waters in and around the Project area. Proposed structural and non-structural BMPs should be described with sufficient implementation detail to ensure that the logical phases of the proposed construction Project meet the performance standards listed in the CASM.
- (ii) Proposed site drawings and Best Management Practice (BMP) installation details as they apply to the site conforming to the Urban Storm Drainage Criteria Manual, Vol. 3, "Best Management Practices", most current version as issued by the Urban Drainage and Flood Control District (UDFCD), or those established by the City's Department of Transportation and Infrastructure. If erosion control drawings were included within the bid documents for the Project, they shall be used for bid purposes and initial planning/ deployment of BMPs on the Project. If provided drawings are signed/ sealed by a Professional Engineer, they have been pre-approved by the Permit Authority and may be used without revision for purposes of submitting for CASDP. If provided drawings do not have signature/ seal of Professional Engineer licensed by the State of Colorado, they will require revision by the Contractor with Professional Engineer signature/ seal prior to submission to the City and County of Denver for CASDP.
- (iii) Supporting documentation related to proposed BMPs that are not currently identified in UDFCD Vol. 3 or as otherwise published by the City.

Any preparation of or adjustments to a SWMP must be performed either by or under the supervision of a Professional Engineer licensed in the State of Colorado. SWMP elements submitted to the City shall also meet currently established criteria of the CDPHE as the SWMP must meet all local, State and Federal requirements.

Substantial Completion of Erosion Control: Point of construction when permanent BMPs have been installed, initial growth is in place, and the site is waiting for vegetative cover to reach 70% of pre-disturbance vegetative cover.

PART II: DESCRIPTION

This Work shall consist of constructing, installing, maintaining, and removing when required, BMPs during the life of the Contract until Final Stabilization to prevent or minimize erosion, sedimentation, and pollution of any waters including storm, drainageways, MS4, State Waters, and/ or wetlands. Work under this Section includes the Contractor obtaining required Permits, utilizing SWMP elements provided in the Contract, and/ or SWMP elements specifically prepared by the Contractor as defined herein. The work shall also consist of providing on-going maintenance and monitoring of the SWMP as may be necessary due to the specific and/or dynamic needs of the Project as well as meet all requirements set forth within the CASM.

The Contractor shall coordinate the construction of temporary BMPs with the construction of permanent BMPs to assure economical, effective, and continuous erosion and sediment control and water pollution prevention throughout the construction period until Final Stabilization is achieved.

When a provision of this Section or an order by the Permit Enforcement Authority requires that an action be immediate or taken immediately, it shall be understood that the Contractor shall at once begin effecting completion of the action and pursue it to completion in a manner acceptable to the Permit Enforcement Authority, and in accordance with applicable Permitting requirements.

PART III: MATERIALS

The materials to be used for BMPs shall conform to each specific detail as set forth within the Project SWMP or as noted on the Contract Drawings.

PART IV: EROSION CONTROL PERMIT STATUS

The current SWMP status for the Project is as follows:

A SWMP is currently **NOT** required for this project as the proposed disturbed area and/ or proximity to stream does not meet the minimum criteria for requiring a CASDP. However, the responsibilities for minimizing sediment pollution from the Project have not been waived, and as such, the City hereby requires the Contractor to perform as specified in the following notes. **Because a SWMP and CASDP are not necessary for the Project, all cost for performance of the following notes shall not be paid for separately but shall be included in the work, except for Street Sweeping.**

“A CASDP Permit will **NOT** be required for this project, however, the Contractor and/or their authorized agents shall ensure that all potential pollutants generated during demolition, excavation, trenching, boring, grading, or other construction Work associated with this permit, be prevented from discharge to stormwater conveyance systems in the vicinity of the Project.

The Contractor and/or their authorized agents shall remove all sediment, mud, construction debris, or other potential pollutants that may have been discharged to or, accumulate in the flow lines of storm drainage appurtenances and public rights of ways of the City and County of Denver as a result of construction activities associated with this Project. All removals shall be conducted in a timely manner. The Contractor shall be held responsible for remediation of any adverse impacts to the MS4, State Waters, waterways, wetlands, and or other public or private properties, resulting from work done as part of this Project.

The Contractor and/or their authorized agents shall insure that all loads of cut, and fill material imported to or exported from the Project shall be properly covered to prevent loss of the material during transport on public rights of way.” (Sec.49-552; Revised Municipal Code)

Approved erosion and sediment control ‘Best Management Practices’ shall be maintained and kept in good repair for the duration of the Project. All necessary maintenance and repair shall be completed immediately upon discovery of any deficiency or defect.

The Contractor and/or their authorized agents shall implement the following Best Management Practices (BMPs) on site during construction. Best Management Practice (BMP) installation details and maintenance shall conform to the Urban Storm Drainage Criteria Manual, Vol. 3, “Best Management Practices”, most current version as issued by the Urban Drainage and Flood Control District (UDFCD), or those established by the City’s Department of Transportation and Infrastructure.

1. **VEHICLE TRACKING CONTROL:** This BMP is required at all access points to a construction site that are used by vehicular traffic or construction equipment.
2. **INLET PROTECTION:** This BMP is required on all existing or proposed storm sewer inlets in the vicinity of the construction site that may receive site runoff. The BMP must be appropriate to the type of storm inlet and appropriate for the ground surface at the inlet.
3. **INTERIM SITE STABILIZATION:** This BMP is required to provide a measure for preventing the discharge of sediment from construction sites where over lot grading or other site disturbance has occurred. This BMP is particularly necessary on sites where construction activities/disturbance will be limited to small areas of the project site. Acceptable BMPs

include:

- a) Preserving existing vegetation
 - b) Seeding and planting
 - c) Mulching
 - d) Mulching and seeding
 - e) Temporary/Permanent re-vegetation operations
 - f) Chemical soil stabilizer application (requires Permit Enforcement Authority approval)
4. **WASTE MANAGEMENT/CONTAINMENT:** This BMP requires that all construction wastes, fuels, lubricants, chemical wastes, trash, sanitary wastes, contaminated soils or debris shall be contained on site, protected from contact with precipitation or surface runoff, periodically removed from the construction site, and properly disposed of.
5. **SPILL PREVENTION /CONTAINMENT:** This BMP defines the measures proposed for preventing, controlling, or containing spills of fuel, lubricants, or other pollutants; and protecting potential pollutants from contact with precipitation or runoff.
6. **CHUTE WASHOUT CONTAINMENT:** Water used in the cleaning of ready mixed concrete truck delivery chutes shall be discharged into a predefined, bermed containment area on the job site. The required containment area is to be bermed so that wash water is totally contained. Wash water discharged into the containment area shall be allowed to infiltrate or evaporate. Dried concrete waste shall be removed from the containment area and properly disposed of. The direct or indirect discharge of water containing waste concrete to the storm sewer system is prohibited (Sec.56-102a, c; Revised Municipal Code, City and County of Denver).
7. **STREET SWEEPING:** This BMP requires that paved surfaces which are adjacent to construction sites be swept in a timely manner when sediment and other materials are tracked or discharged on to them. Either sweeping by hand or use of street sweepers is acceptable. Street sweepers using water while sweeping is preferred in order to minimize dust. Flushing off paved surfaces with water is prohibited.
8. **PERIMETER CONTROL:** This BMP requires that a construction site install a perimeter control measure along the edge of the construction site, to prevent, or filter the discharge of surface runoff from the construction site. The type of perimeter control used shall be determined based on-site conditions and location. Maintenance and repair of the control measure shall occur as needed, in a timely manner.
9. **STOCKPILES:** Soils that will be stockpiled for more than thirty (30) days shall be protected from wind and water erosion within fourteen (14) days of stockpile construction. Stabilization of stockpiles located within 100 feet of an MS4 or State Waters, or with slopes 3 to 1 or greater shall be completed within seven (7) days following stockpile construction. Stabilization and protection of the stockpile may be accomplished by any of the following: Mulching, Temporary/Permanent Revegetation Operations, Chemical Soil Stabilizer Application (requires Permit Enforcement Authority approval), or erosion control matting/Geotextiles. If stockpiles are located within 100 feet of top of bank of an MS4 or State Waters, a drainageway or the site perimeter, additional sediment controls shall be required.
10. **SAW CUTTING OPERATIONS:** The Contractor shall protect all storm sewer facilities adjacent to any location where pavement cutting operations involving wheel cutting, saw cutting, or abrasive water jet cutting are to occur. The Contractor shall remove and properly dispose of all waste products generated by said cutting operations on a daily basis or as needed throughout the workday. The discharge of any water contaminated by waste products from cutting operations to the storm sewer system is prohibited. (Sec.56-102a, c; Revised Municipal Code, City and County of Denver)."

PART V: CONSTRUCTION REQUIREMENTS

A) SCHEDULES:

At least 10 working days prior to the beginning of any construction work, the Contractor shall submit

for approval a schedule for accomplishment of temporary and permanent BMPs shown in the SWMP. This schedule shall specifically indicate the sequence of clearing and grubbing, earthwork operations, and construction of temporary and permanent BMPs. The schedule shall include BMPs for all areas within the Project boundaries, including but not limited to, haul roads, borrow pits, and storage and other staging sites. Work shall not be started until the BMP schedule has been approved in writing by the Project Manager, and on-site pre-construction inspection is performed and approved by CCD's NPDES inspector. Once the work has started, and during the active construction period, the Contractor shall update the schedule for all BMPs on a regular basis, and as required to keep the SWMP in compliance.

B) CONSTRUCTION IMPLEMENTATION: The Contractor shall incorporate into the Project all BMPs that are appropriate for the current phase of work, as outlined in the accepted schedule.

C) UNFORSEEN CONDITIONS: The Contractor shall direct the ECS (under the supervision of a Professional Engineer licensed in the State of Colorado) to design and implement BMPs for correcting conditions unforeseen during design of the Project, or as possible for emergency situations, which arise during construction. The Project's SWMP, UDFCD Vol 3 standards and details, and CDOT's "Erosion Control and Storm-Water Quality Guide," and any approved modification to these documents as proposed by the Contractor, shall be used as reference documents for the purpose of designing appropriate BMPs. Measures and methods proposed by the Contractor to deal with unforeseen conditions shall be reviewed and approved in writing by the Permit Enforcement Authority and the Project Manager prior to implementation and construction.

In an emergency situation, the Contractor shall use best judgment for immediately responding to the emergency situation as it arises and shall notify the Permit Enforcement Authority and ECS of the emergency situation and BMPs employed in response as soon as practical after installation.

D) PERMITS:

The Contractor shall obtain all required permits for the Project including those required by federal, state, and local agencies. The Contractor shall obtain (or transfer from the City when specified) required erosion control and water quality permits and shall be responsible for compliance with all requirements under any such permits.

E) EROSION CONTROL SUPERVISOR:

Contractor shall assign to the Project an employee or subcontractor to serve as Erosion Control Supervisor (ECS). The ECS shall be a person other than the Contractor's superintendent, foreman, or equivalent supervisory position. The ECS shall be experienced in aspects of BMP construction and have satisfactorily completed a Colorado DOT, or equivalent ECS training program authorized by the City. Proof that this requirement has been met shall be submitted to the Project Manager at least ten working days prior to the beginning of any soil disturbance work. A list of authorized ECS training programs is available from the City upon request. Additionally, per definition, the ECS shall be under the direction of a Professional Engineer licensed in the State of Colorado when performing any modifications to the Project Stormwater Management Plan (SWMP).

The ECS shall be responsible for oversight of the implementation, maintenance, and revision of the SWMP for the duration of the Project. CCD requires the ECS to fulfill responsibilities as outlined by CDPS such as having financial control and authority to implement BMPs. The ECS's responsibilities shall be as follows:

- 1) Ensure compliance with all water quality permits or certifications in effect during the construction work.
- 2) Supervise the installation, construction, and maintenance of all BMPs specified in the Contract and coordinate the construction of BMPs with all other construction operations.

- 3) Direct the implementation of suitable BMPs as necessary to correct unforeseen conditions or emergency situations. Direct the dismantling of those features when their purpose has been fulfilled due to completion of each Project phase unless the Permit Enforcement Authority agrees that the features be left in place.
- 4) Attend the preconstruction conference, erosion control preconstruction inspection, Project scheduling meetings, weekly construction/ field meetings, substantial completion and final stabilization inspections, and other meetings regarding construction that could impact water quality.
- 5) Evaluate all non-stormwater coming onto the site, such as springs, seeps, and landscape irrigation return flow. If such flow is identified, the ECS shall propose appropriate SWMP modifications to the Contractor to protect off-site water from becoming contaminated with sediment or other pollutants.
- 6) Coordinate with the Contractor to implement necessary actions to reduce anticipated or presently existing water quality or erosion problems resulting from construction activities.
- 7) Coordinate with the Contractor to ensure all labor, material, and equipment deployed to meet SWMP requirements is judged appropriately.
- 8) During construction, update and record the following items in the SWMP as changes occur:
 - (i) Construction boundaries (may require Major SWMP Modification)
 - (ii) Areas of disturbance (may require Major SWMP Modification)
 - (iii) Areas used for storage of construction materials, equipment, soils, or wastes.
 - (iv) Location of any dedicated asphalt or concrete batch plants.
 - (v) Location of construction offices and staging areas.
 - (vi) Location of work access routes during construction.
 - (vii) Location of borrow and waste.
 - (viii) Location of temporary and permanent stabilization

The ECS shall start a new site map before the current one becomes illegible. All site maps shall remain with the SWMP paperwork.

- 9) Amend the SWMP whenever there are: additions, deletions, or changes in locations of BMPs. SWMP revisions shall be recorded immediately. Items shall be dated and signed at time of occurrence. Specifically, amendments shall include the following:
 - (i) A change in design, construction, operation, or maintenance of the site which would require the implementation of new or revised BMPs; or
 - (ii) Changes when the SWMP proves to be ineffective in achieving the general objectives of controlling pollutants in stormwater discharges associated with construction activity.
 - (iii) Changes when temporary BMPs are no longer necessary from changes in Project phase and are removed. All inspection and maintenance activities or other repairs shall be documented.

All inspection and maintenance activities or other repairs shall be documented. The SWMP and documentation shall be kept on the Project site at all times.

- 10) Modify the site map with arrows to indicate direction of surface and storm water flowing across the Project site.
- 11) When adding or revising BMPs in the SWMP, amend the narrative to explain what, when, where, why, and how the BMP is being used, and add a detail to the SWMP.
- 12) If using existing topography, vegetation, etc. as a BMP, label it as such in the SWMP site map; amend the Narrative to explain when, why, and how the BMP is being used in the SWMP.
- 13) Record on the SWMP and implement the approved plan for concrete and asphalt saw cutting, grinding, and milling containment and removal.
- 14) Update the potential pollutants list in the SWMP throughout construction meeting CASDP requirements.
- 15) Spills, leaks, or overflows that result in the discharge of pollutants shall be documented on the inspection form. The ECS shall record the time and date, weather conditions, reasons for spill, and how it was remediated. The ECS shall immediately report to the Contractor and Project Manager

the following instances of noncompliance:

- (i) Noncompliance which may endanger health or environment.
 - (ii) Spills or discharge of hazardous substance or oil which may cause pollution of the City MS4 or State Waters.
 - (iii) Discharge of stormwater which may cause an exceedance of a water quality standard.
- 16) Perform a thorough inspection of the stormwater management system at least every seven (7) days and within 24 hours after any precipitation or snowmelt event with the potential to cause surface erosion. If no land disturbing construction activities are present during a storm event, post-storm event inspections shall be conducted prior to commencing any new land disturbing construction activities, but no later than seventy-two (72) hours following the storm event. The inspection records shall be kept on-site in a written or previously approved format. Inspections shall be conducted during the progress of the work, during work suspensions, or until Final Stabilization of all disturbed areas is approved by Permit Enforcement Authority and shall include the following services at a minimum:
- (i) The construction site perimeter, disturbed areas, and areas used for material storage that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. BMPs identified in the SWMP shall be observed to ensure that they are operating correctly.
 - (ii) The description of potential pollutant sources, and the BMPs identified in the SWMP, shall be revised and modified as appropriate based on the results of the inspection as soon as practicable after such inspection. Modification to the SWMP shall be implemented in a timely manner and in accordance with applicable Permit requirements.
 - (iii) The operator shall keep a record of inspections. Uncontrolled releases of sediment or polluted storm water or measurable quantities of sediment found off the site shall be recorded with a brief explanation as to the measures taken to prevent future releases as well as any measures taken to clean up the sediment that has left the site. Inspection records shall be made available to the City upon request. Note: documentation of uncontrolled releases at site DOES NOT alleviate any State or Federal requirements for reporting of discharges or upset conditions. Care shall be taken to ensure compliance with all regulatory requirements at site.
 - (iv) Seven (7) day inspections are required during construction and at all times until Final Stabilization has been achieved. Seeding and mulching of disturbed areas does NOT count as final stabilization until such time as 70% pre disturbed vegetative cover has been achieved. Sites with growth in place sufficient to deter erosion that have not yet achieved final stabilization may petition the City to grant an alternative inspection schedule while awaiting additional growth for final stabilization. These inspections must be conducted in accordance with the above paragraphs.

F) APPLYING BMPs TO STABILIZE SITE:

The duration of the exposure of incomplete construction to the effects of weather shall be as short as practicable. BMPs such as: seeding, surface roughening, mulching, applying tackifier, use of geotextiles and matting, permanent landscaping, or other selected BMPs shall be applied within fourteen (14) calendar days of completion of grading/soil disturbance activities to stabilize the construction site unless disturbed area is within 100 feet of an MS4 or State Waters or has slopes of 3 to 1 or greater in which case BMPs shall be implemented within seven (7) calendar days of completion of grading activities. Disturbed areas where work is temporarily halted shall be temporarily stabilized within seven (7) days after the activity ceased unless work is to be resumed within thirty (30) calendar days after the activity ceased.

Clearing and grubbing operations shall be scheduled and performed to minimize both the area of the Project disturbed at a given time and the amount of time that disturbed areas remain open. BMPs such as temporary seeding are required between successive construction stages when disturbed areas will

not be stable or active for thirty (30) calendar days or more. No payment will be made for additional work required because the Contractor has failed to properly coordinate the BMP schedule, thus causing previously stabilized areas to be disturbed by operations that could have been performed prior to the stabilization. Upon failure of the Contractor to coordinate the permanent BMPs with the grading operations in a manner to effectively control erosion and prevent water pollution, the Permit Enforcement Authority can suspend the Contractor's grading operations and the Project Manager can withhold monies due to the Contractor on current estimates until such time that all aspects of the work are coordinated in an acceptable manner.

G) WORK OUTSIDE LIMITS OF CONSTRUCTION: Non-contiguous areas outside the limits of construction that are used by the Contractor that include, but are not limited to, borrow pits, haul routes, storage and disposal areas, field offices, maintenance, batching areas, etc., shall have appropriate BMPs implemented by the Contractor at the Contractor's expense. Should said areas meet applicable CASDP Permit criteria, the Contractor shall obtain a separate CASDP or amend existing CASDP for each area as applicable at no additional expense to the City.

H) MAINTENANCE: The Contractor shall continuously maintain erosion and sediment control BMPs on a daily basis or as directed by the ECS so that they function properly during and after construction (including work suspensions) until Final Stabilization has been approved by the Permit Enforcement Authority. Maintenance includes, but is not limited to, the following items:

- (i) From the time seeding and mulching work begins until the date the Project has reached Substantial Completion of Erosion Control, the Contractor shall keep all seeded areas stabilized at all times. Any damage to seeded areas or to mulch materials shall be promptly repaired.
- (ii) All inspection sediment removal, and BMP maintenance activities to comply with all Federal, State & Local erosion control permit requirements until Final Stabilization is reached.
- (iii) All removal and replacement of existing BMPs due to damage to same suffered either by the contractor, outside agencies, the public, or acts of God.
- (iv) All required mechanical and/ or manual street sweeping.
- (v) Discretionary changes required of any regulatory enforcement officer.

If the Contractor fails to maintain the BMPs in accordance with the Contract, or as directed, the City may at the expiration of a period of 48 hours, after having given the Contractor written notice, proceed to maintain BMPs as deemed necessary. The cost thereof will be deducted from any compensation due, or which may become due to the Contractor under this Contract.

I) MINOR SWMP MODIFICATIONS: Shall be made in the field by the Contractor and thoroughly documented in the Contractor's SWMP narrative and drawings. Should the Permit Enforcement Authority deem minor field modifications inadequate, the Contractor may be required to a) make specific modifications as requested by the Permit Enforcement Authority or b) return to the original approved design specifications. Minor SWMP Modifications are allowed, covered under the original CASDP, and required as part of standard maintenance and operation.

J) MAJOR SWMP MODIFICATION: The City reserves the right to require changes in the Work or Project Limits that may require a Major Modification to the SWMP and/ or CASDP due to unforeseen circumstances. Should this occur, the Contractor will be responsible for the following (as applicable) and applying for CASDP amendment:

- (i) Make required revisions to comply with changing Federal or State rulemaking if it occurs within timeframe of the Project
- (ii) Make required revisions due to unforeseen or unplanned conditions leading to deficient Drawings/ SWMP (hazardous materials encountered, landfills, expansion of work limits, etc.)
- (iii) Prepare revised SWMP elements endorsed by a Professional Engineer licensed in the State of Colorado.

K) SUBSTANTIAL COMPLETION OF EROSION CONTROL: When a CASDP is required for the Project, Substantial Completion of the Project as defined by the City and County of Denver General Contract Conditions cannot be reached until Substantial Completion of Erosion Control has been granted. Granting of Substantial Completion of Erosion Control must be requested by the Contractor and be approved by the Permit Enforcement Authority in the form of a “Certificate of Substantial Completion of Erosion Control”.

L) FINAL STABILIZATION: Granting of Final Stabilization must be requested by the Contractor and be approved by the Permit Enforcement Authority. Other permanent soil stabilization techniques may be proposed, in writing, by the Contractor and used upon approval, in writing, by the Project Manager and Permit Enforcement Authority.

The Contractor shall follow the following procedures for approval of Final Stabilization:

- (i) The Contractor shall file Inactivation Request for Construction Activities Stormwater Discharge Permit (available within CASDP guidance documents) with the Permit Enforcement Authority.
- (ii) The Contractor shall coordinate with the Permit Enforcement Authority to hold a Final Inactivation Inspection.
- (iii) If passing, the Permit Enforcement Authority transmits a letter of approval for Final Stabilization.
- (iv) If not passing, the Permit Enforcement Authority transmits a letter of denial for Final Stabilization with associated inspection report to Contractor.
- (v) Stabilization, inspection and maintenance requirements shall continue until confirmation of having met final closure requirements have been granted in writing by the Permit Enforcement Authority.

When Final Stabilization has been reached, the Permit Enforcement Authority shall issue a “Certificate of Final Stabilization”.

(vi) Once the Inactivation request is approved by the City and County of Denver, the contractor can apply to close the State Stormwater Permit.

M) FINAL ACCEPTANCE:

CASDP obligations (including reaching Final Stabilization) may hinder the ability to reach Final Acceptance for the overall Project as defined in the City General Contract Conditions.

PART VI: CONSTRUCTION OF BMPS

BMPs shall be constructed so that they conform to all requirements as set forth within the Project SWMP. They shall meet all requirements set forth within each BMP detail and shall be installed and maintained so that they function in an effective and operable manner.

PART VII: METHOD OF MEASUREMENT

Because a SWMP and CASDP are not necessary for the Project, all cost for BMP’s, except for street sweeping, will not be paid for separately, but shall be included in the work.

Removal and disposal of sediment, concrete & trash that is or is not generated by construction activities will not be measured separately but shall be included in the work.

PART VIII: BASIS OF PAYMENT

Work to furnish, install, maintain, replace (if not due to contractor negligence), remove, and dispose of BMPs specified in the Contract will be not be paid for but shall be included in the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Sweeping (Sediment Removal)	HR

If the Contractor fails to complete construction within the approved contract time, payment will not be made for Section 208 pay items for the period of time after expiration of the approved contract time. These items shall be provided at the Contractor’s expense.

The cost for any corrective actions required by the State or City due to contractor’s failure to obtain or comply with applicable Permits will be borne by the Contractor, including fines and penalties. In the case of failures on the part of the Contractor in controlling erosion, sedimentation, and/or water pollution, the City may provide the necessary corrective actions. All corrective action costs, including Project engineering costs, will be charged to the Contractor, and appropriate deduction will be made from the Contractor’s monthly pay estimate.

The sole remedy for additional costs associated with installation of BMPs as required by regulatory agencies to ensure compliance with local and State requirements shall be included in the work, except for street sweeping as provided in the Bid Schedule of this Contract.

The Contractor however may submit a separate itemized Change Order for any required Major SWMP Modification proposed by the City during the course of the Project.

Additional stabilized construction/ staging area proposed by the Contractor beyond the area included in the Bid shall be installed per requirements of the Permit Authority and Permit Enforcement Authority without any additional compensation.

Storm drain inlet protection will not be paid for separately but shall be included in the work, including, but not limited to all work, materials, and equipment required to complete the work, including surface preparation, maintenance throughout the Project, and removal upon completion of the work. Aggregate will not be measured and paid for separately but shall be included in the work.

Sweeping, when used as a BMP as shown in the Contract, will be measured by the number of hours that a pickup broom or motorized equipment capable of collecting sediment, authorized by the Project Manager, is used to remove sediment from the roadway or other paved surfaces. Operator will not be measured and paid for separately but shall be included in the work.

Stakes, anchors, connections, geotextile, riprap and tie downs used for temporary slope drains will not be measured and paid for separately but shall be included in the work.

END OF REVISION OF SECTION 208

EROSION CONTROL

REVISION OF SECTION 250 ENVIRONMENTAL HEALTH AND SAFETY MANAGEMENT

Section 250 of the Standard Specifications is hereby appended for this project as follows:

Subsection 250.03 shall include the following:

(e) References.

The following reports are made part of this project. The Contractor is instructed to become familiar with the provisions of these documents, which are part of the design specifications:

“City and County of Denver Standard Materials Management Plan,” prepared by the Denver Department of Public Health & Environment Environmental Quality Division, dated November 13, 2019.

“Regulated Asbestos-Contaminated Soil Standard Operating Procedure,” prepared by the Denver Department of Public Health & Environment Environmental Quality Division, dated May 2, 2019.

The Denver Department of Public Health & Environment environmental documents can be found at:

<https://www.denvergov.org/content/denvergov/en/environmental-health/our-divisions/environmental-quality/land-use-and-planning.html>

Go to “Environmental Review and Assessment” and “About Us”.

- (f) The Contractor shall identify a point of contact responsible for compliance with environmental provisions. The point of contact may be the Environmental Professional (as defined in the appended Materials Management Plan [MMP]), Health and Safety Officer, project Supervisor, or another responsible person. The environmental point of contact must have the appropriate training to understand this Specification, as well as the various documents described herein and appended to the specifications. The environmental point of contact will be responsible for coordinating compliance with those portions of the Contract and specifications that have impacts on environmental and/or permit compliance, as well as local, state, and federal environmental regulations. The Contractor should expect that this person will coordinate with the Engineer as necessary regarding compliance.
- (g) Workers shall be alert during excavation for any visual or olfactory signs of impacts. If impacted soil and/or groundwater is encountered, work will stop immediately, and the procedures outlined in the CDOT Specification Section 250, this revision to Section 250, and subsection 107.25.8 shall be followed.
- (i) Procedures for the management of hazardous materials during project activities are included in the City and County of Denver Standard MMP, appended to the Specifications.
- (j) Procedures for the management of Regulated Asbestos-contaminated Soil (RACS) are included in the City and County of Denver Regulated-Asbestos Contaminated Soil Standard Operating Procedure (RACS SOP), appended to the Specifications.

- (k) All personnel that will be conducting any subsurface work/earth disturbing activities will be required to complete a 15-minute training video and pass the exam on RACS. The Contractor and all personnel (doing earth work) shall maintain the certification records and will submit to the City Project Manager a valid certification upon demand. The certification will need to be renewed every two (2) years. The training video can be accessed at:

1. <https://www.denvergov.org/content/denvergov/en/environmental-health/our-divisions/environmental-quality/land-use-and-planning/racs.html>

- (l) Disturbances of Bridges - Regulated Building Material Inspection

The existing bridge structures will be modified as part of this project. The Contractor shall engage a CABI to conduct a pre-demolition survey of the structures to evaluate and quantify regulated building materials including asbestos, lead-based paint, chromium-containing paint, Polychlorinated Biphenyls (PCB)-containing caulking, or other considerations. This should be focused on those materials that are expected to be disturbed by the work. The results of this survey shall be presented to the Engineer in a Technical Report that details what materials were found, material quantities, and applicable abatement of regulated materials required prior to demolition. The Contractor will secure appropriate permits for abatement, if required. The Contractor is encouraged to conduct the asbestos inspection immediately upon project award.

The Regulated Building Material Inspection will be paid for under the pay item "Health and Safety Management" and will be paid for on a lump-sum basis. Costs shall include all labor and materials needed to conduct the work.

- (m) Per Executive Order No. 123, Chapter 5, the Contractor shall recycle construction and demolition debris when possible. All metal project components (e.g., light poles, metal railing) removed for this project shall be recycled. The recycling facility must be notified that metal project components could contain lead. The Contractor should treat painted components as lead-containing or lead-based or chromium-containing until laboratory sampling confirms otherwise. Regardless of metal content, the future Contractor must comply with Occupational Safety and Health Administration (OSHA) Regulation 1926.62 for worker safety. OSHA regulations do not define a minimum concentration of lead or chromium as a threshold for action. The potential for metal-containing paint and regulatory requirements is hereby disclosed to the Contractor so that the Contractor may avoid accidental disturbance or worker exposure, and for the Contractor to follow applicable regulations. The Contractor shall avoid sanding, cutting, burning, or otherwise causing the release of metal from paint.

Costs for managing metal project components covered with lead paint shall not be paid for separately but shall be included in the cost of the work.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Subsection 250.09 shall include the following:

<u>PAY ITEM</u>	<u>PAY UNIT</u>
Environmental Health and Safety Management	LS

Environmental Health and Safety Management (Lump Sum) includes:

- All work listed in Section 250.09 and paid for as stated in Section 250.10 of the Standard Specifications.
- Mitigation of any known hazardous materials that are impacted by the project as shown on the plans, specifications, and documents listed above.
- Performing any work required as stated in Section 250 of the Standard Specifications that is not specifically listed in the plans, specifications, and documents listed above.

Health and Safety Officer includes all work listed in Section 250.09 and paid for as stated in Section 250.10 of the Standard Specifications as directed by the Engineer.

Environmental Allowance Account (See Specification “Allowance Account Item”)

Environmental Health and Safety Management (Allowance Account) item includes any necessary work and materials for mitigating unexpected encounter of hazardous materials not identified in the plans, specifications, or documents listed above at the Engineer’s direction. Payment will be made based on time and materials used to perform the work. All items shall be pre-approved by the Engineer in writing prior to execution of the work or they will be at no cost to the project.

The following items, if needed, will be paid for from the Environmental Allowance Account:

Health and Safety Officer

The Contractor will assign a health and safety officer (HSO) to provide project support in accordance with the requirements in the MMP. The HSO will meet the definition of an HSO as described in CDOT’s Specification 250, including, but not limited to: “having at least two years of field experience in chemical related health and safety. The HSO shall be either a Certified Industrial Hygienist, Certified Hazardous Material Manager, Professional Engineer, Certified Safety Professional, or Registered Environmental Manager meeting the criteria set forth in 29 CFR 1926.” The HSO will be paid under the pay item “Health and Safety Officer” and will be measured on an hourly basis.

Environmental Professional

Prior to implementation of the MMP, the awarded Contractor will retain an Environmental Professional to independently verify that the requirements of MMP are followed in a Quality Assurance (QA) role. The Environmental Professional must be a competent individual with at least two years of experience in the field-identification of suspected regulated materials and potential environmental hazards (e.g., abandoned underground storage tanks, asbestos, uncontrolled fill), as well as appropriate characterization, management, and disposal methods for impacted materials. The Environmental Professional will have a minimum training requirement of 40-Hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations Training and current 8-hour OSHA annual update. Ideally, the Environmental Professional will also meet the requirements of a Certified Asbestos Building Inspector, as described in the MMP and below, and fill both roles

concurrently to provide project efficiency. The Environmental Professional is not required to be on-site on a full-time basis but should be available to quickly mobilize to the work site in the event the Contractor identifies suspicious materials, such as stained or odorous soil or soil containing debris, trash, suspected asbestos, etc. Costs should include all associated expenses to carry out the work.

Certified Asbestos Building Inspector (CABI) Support

The Contractor shall provide a CABI who will be required to be on site during soil-disturbing activities if buried debris, solid waste, or other suspicious materials that could be associated with asbestos are encountered. The CABI shall meet the training requirements of Section 5.5.3(D) of the Colorado Solid Waste Regulations. The CABI must be employed independently of the Contractor (i.e., the CABI cannot be an employee of the Contractor). The CABI will also be trained and certified in accordance with Air Quality Control Commission Regulation No. 8 (5 CCR 1001-10, Part B), for the identification of asbestos-containing materials and the collection of samples to evaluate asbestos content. The CABI must have worked on at least three different asbestos-in-soil projects and with a minimum of 40 hours of experience as a CABI. The CABI must have sufficient experience to identify historical urban fill and RACS in the field. Depending on the project schedule, a minimum of one CABI will be overseeing excavation work, and it may be necessary to engage multiple CABIs if areas of known historical fill or debris are identified at multiple excavation areas. The basis of payment for the CABI is on an hourly basis. The Contractor should expect that the CABI will be on site 100% of the time during soil-disturbing activities should suspect materials, debris, construction and demolition debris, HUF, or other suspected materials are encountered. When the Contractor is working in “clean” soil - that is, soil that does not contain debris, the CABI is not required to be present. See the RACS SOP for detailed information regarding the CABI’s responsibilities. Costs should include all associated expenses to carry out the work.

The Contractor is permitted (and encouraged) to retain a CABI that can fill the role of the Environmental Professional concurrently, as this would be a cost-saving measure.

Asbestos and Chemistry Analytical Costs

If required, to evaluate chemical characteristics in soil and/or groundwater samples, or asbestos content in suspect materials, soil and/or suspect material samples shall be analyzed by a NELAC (or equivalent certified laboratory). The Contractor should include costs for up to five (5) chemical samples and twenty (20) asbestos samples.

Solid Waste Excavation, Loading, and Transportation

Materials as described in the MMP that are not considered hazardous waste, may be transported and disposed as non-hazardous solid waste to the Denver-Arapahoe Disposal Site. Tipping fees associated with disposal at the Denver-Arapahoe Disposal Site will be paid for separately by the Owner. The Owner will work to establish a Waste Profile and will supply the Contractor with Waste Manifests that must accompany each load destined to Denver-Arapahoe Disposal Site.

Air Monitoring Specialist:

An Air Monitoring Specialist, who is also a CABI as described above, must oversee the RACS management, in accordance with the RACS SOP. The Contractor should expect that the Air Monitoring Specialist will be on site 100% of the time during RACS Excavation and Loading activities (i.e., excavation and loading of 1% by volume of solid waste, as described below). Costs would include all associated labor and expenses to carry out the work, as described in the RACS SOP, including samples, field equipment, instrumentation, etc.

RACS Excavation, Loading, and Transportation:

Once RACS has been confirmed, and management required, all costs, including those related to excavation and loading and transportation, shall be included with this pay item. This includes, but is not limited to, setting up a regulated work area, decontamination of equipment and personnel, health and safety, etc., as well as construction costs such as excavation, loading and transportation. Materials determined to be RACS must be handled according to the RACS SOP and disposed of at the

Denver-Arapahoe Disposal Site. Tipping fees associated with disposal at the Denver-Arapahoe Disposal Site will be paid for separately by the owner.

Regulated Building Material Abatement - Bridges

Using information collected during the Regulated Building Material Inspection of the bridge structures, the Contractor will provide a lump-sum bid to conduct all necessary removal/abatement of regulated materials prior to demolition or other disturbances.

END REVISION OF SECTION 250

ENVIRONMENTAL HEALTH AND SAFETY MANAGEMENT

REVISION OF SECTION 403 HOT MIX ASPHALT

Revise Section 403 of the Standard Specifications for this project as follows:

Subsection 403.02 shall be deleted and replaced with Municipal Government Pavement Engineers Council (MGPEC) *Item 20 - Asphalt Pavement Materials 2024* as provided in Appendix A.

**END REVISION OF SECTION 403
HOT MIX ASPHALT**

REVISION OF SECTION 408
JOINT SEALANT

Revise Section 408 of the Standard specifications for this project as follows:

Subsection 408.01 shall include the following:

This work consists of furnishing and installing hot poured joint sealant in single or multiple path saw cuts on hot mix asphalt overlay per these specifications and in conformity with the lines and details shown on the plans or as directed by the Engineer.

This work also includes removing the joint seal and cleaning the joint when replacing existing joints at the top surface of the concrete deck and approach slab.

Subsection 408.03 shall include the following:

To replace existing joints at the top surface of the concrete deck and approach slab, remove all joint seal material and debris, and clean the joint before the hot compressed air lance cleaning associated with the new joint material.

The saw cut’s location, width, and depth for the joint sealant shall conform with the plans or as directed by the Engineer.

Delete subsection 408.04 and replace with the following:

Joint sealant will be measured by the actual curb-to-curb quantity completed and accepted. Joint sealant will be paid for as the single length for multiple saw cuts and seals per joint.

Delete subsection 408.05 and replace with the following:

The accepted quantities of Joint Sealant will be paid for at the contract unit price.

Payment will be made under:

<u>PAY ITEM</u>	<u>PAY UNIT</u>
Joint Sealant	Linear Foot

Payment for Joint Sealant will be total compensation for all labor, materials, tools, equipment, and incidentals required to complete the item.

Saw cutting, removal, and cleaning will not be paid for separately but shall be included in the work.

END REVISION OF SECTION 408
JOINT SEALANT

REVISION OF SECTION 518 BRIDGE EXPANSION DEVICE

Revise Section 518 of the Standard Specifications for this project as follows:

In subsection 518.04, delete the second paragraph and replace with the following:

The device shall consist of a continuous premolded elastomeric expansion joint seal (also called neoprene gland) and steel extrusions as shown on the plans, required by the manufacturer, or specified herein for attaching the elastomeric expansion joint seal to the anchored steel extrusions. The expansion device shall have a rated range of movement of 4 inches including rotations.

In subsection 518.04, delete the fourth paragraph and replace with the following:

Structural steel extrusions for strip seal expansion devices shall conform to the specifications of ASTM A709 Grade 36 or Grade 50W, steel extrusions for modular expansion devices and cover plates shall conform to the specifications of ASTM A709 Grade 50 or Grade 50W, whereas other structural steel shall conform to the specifications of ASTM A709 Grade 36, Grade 50 or Grade 50W. Fabrication and welding of structural steel shall conform to the requirements of Section 509. The material designations for all steel components shall be shown in the Contractor's shop drawings.

In subsection 518.09, delete the first and second paragraph and replace with the following:

The Contractor shall furnish shop drawings in conformity with subsection 105.02 for all elastomeric expansion devices bid under this section. Shop drawings shall specifically identify each piece, location of welding, bends in the extrusions, galvanizing, and installation hardware. The manufacturer's instructions for proper installation of the expansion joint device shall be included in the shop drawings. Shop drawings which lack manufacturer's installation instructions will be returned for resubmittal.

Where applicable according to the plans, details of the expansion device through cover plates, and connections shall be shown on the shop drawings.

Subsection 518.09 shall include the following:

The installation of the new bridge expansion device shall conform to the staged construction required by the Lane Closure Policy unless otherwise directed or approved by the Engineer.

Subsection 518.13 shall include the following:

The cost for the technical representative of the manufacturer shall be included in the work.

END REVISION OF SECTION 518 BRIDGE EXPANSION DEVICE

REVISION OF SECTION 519 THIN BONDED OVERLAY (POLYESTER CONCRETE)

Add Section 519 to the Standard Specifications for this project as follows:

DESCRIPTION

519.01 This work consists of furnishing and placing a Polyester Polymer Concrete (PPC) overlay system with a High Molecular Weight Methacrylate (HMWM) resin primer on bridge concrete surfaces. The surface of the concrete shall be prepared and the PPC overlay system shall be applied in accordance with these specifications in conformity with the lines, grades, thickness, and typical cross-sections shown on the plans or as approved by the Engineer.

PPC shall be used as the patching material for Class 1 removals as shown on the plans. Polyester concrete shall not be used as the patching material for Class 2 or Class 3 deck removal areas.

MATERIALS

519.02 The Contractor shall submit a Certified Test Report from independent accredited laboratories for each of the materials associated with the polyester concrete overlay in accordance with subsection 106.13.

The PPC shall consist of polyester resin binder and aggregate as specified herein. It shall also include a compatible primer which, when mixed with other specified ingredients and applied as specified herein, is capable of producing a polyester concrete meeting the requirements of this specification.

519.03 Polyester Resin Binder. Polyester resin binder shall have the following properties:

- (1) Be an unsaturated isophthalic polyester-styrene co-polymer. The resin content shall be 12 percent +/- one percent of the weight of the dry aggregate.
- (2) Contain at least one percent by weight gamma-methacryloxypropyltrimethoxysilane, an organosilane ester silane coupler.
- (3) Be used with a promoter that is compatible with suitable methyl ethyl ketone peroxide and cumene hydroperoxide initiators.
- (4) Have the values for the material properties in accordance with Table 519-1.

Accelerators or inhibitor may be required to achieve proper setting time of polyester concrete. They shall be used as recommended by the overlay System Provider.

Table 519-1

POLYESTER RESIN BINDER PROPERTIES (Tested each lot sent to the job)

<i>Property</i>	<i>Test Method</i>	<i>Requirement</i>
Viscosity*	ASTM D2196	0.1x10 ⁻⁵ to 2.9x10 ⁻⁵ psi sec (0.075 to 0.20 Pa) RVT No.1 Spindle, 20 RPM at 77 °F
Specific Gravity*	ASTM D1475	1.05 to 1.10 at 77 °F
Elongation	ASTM D638	35% minimum Type I specimen, thickness 0.25 ± 0.03 inches at Rate = 0.45 inch/minute
Elongation	ASTM D618	Sample Conditioning: 18/25/50+5/70
Tensile Strength	ASTM D618	Sample Conditioning: 18/25/50+5/70
Tensile Strength	ASTM D618	Sample Conditioning: 18/25/50+5/70

*Test shall be performed before initiator is added.

519.04 High Molecular Weight Methacrylate (HMWM) Primer. Primer for the concrete surface shall be a wax-free, low odor, high-molecular-weight methacrylate primer, and consist of a resin, initiator, and promoter. The primer shall conform to Table 519-2 and the promoter shall be as recommended by the System Provider.

Initiator for the methacrylate resin shall consist of a metal drier and peroxide. If supplied separately from the resin, the metal drier shall not be mixed with the peroxide directly. The containers shall not be stored in a manner that allows leakage or spilling to contact the containers or materials of the other.

Table 519-2
HIGH MOLECULAR WEIGHT METHACRYLATE RESIN PROPERTIES (Tested yearly)

Property	Test Method	Requirement
Viscosity*	ASTM D2196	4.0x10 ⁻⁵ psi (0.025 Pa) maximum (Brookfield RVT with UL adapter, 50 RPM at 77 °F)
Volatile Content*	ASTM D2369	30% maximum
Specific Gravity*	ASTM D1475	0.90 minimum at 77 °F
Flash Point	ASTM D3278	180 °F minimum
Vapor Pressure*	ASTM D323	0.04 inch Hg maximum at 77 °F
PCC Saturated Surface-Dry Bond Strength (Adhesive)	Colorado Procedure - Laboratory 4302	700 psi minimum at 24 hours and 70 ± 1 °F (with polyester concrete at 12% resin content by weight of the dry aggregate)

*Test shall be performed before initiator is added.

519.05 Aggregates. Polyester concrete aggregate shall have the following properties:

- (1) The aggregate shall not have more than 45 percent crushed particles retained on the No. 8 sieve when tested in accordance with AASHTO Test Method T335.
- (2) Fine aggregate shall consist of natural sand.
- (3) The aggregate shall have a weighted-average aggregate absorption of no more than 1.0 percent when tested under AASHTO Test Methods T84 and T85.
- (4) At the time of mixing with resin, the aggregate shall have a moisture content of not more than one half of the weighted-average aggregate absorption when tested under AASHTO Test Method T255.
- (5) The aggregate shall meet the requirements for aggregate gradation in Table 519-3.

Table 519-3
AGGREGATE GRADATION (Tested yearly)

Sieve Size	Percent Passing
3/8"	100
No. 4	62-85
No. 8	45-67
No. 16	29-50
No. 30	16-36
No. 50	5-20
No. 100	0-7
No. 200	0-3

Sand for abrasive sand finish shall have the following properties:

- (1) The sand shall be commercial-quality blast sand.
- (2) At least 95 percent of the sand shall pass the No. 8 sieve and at least 95 percent shall be retained on the No. 20 sieve when tested under AASHTO Test Method T27
- (3) The sand shall have an average absorption of not more than 1 percent when tested under AASHTO Test Method T85.

519.06 Composite System. The composite material shall meet the requirements of Table 519-4.

Table 519-4
COMPOSITE PROPERTIES (Tested every two years)

Property	Test Method	Requirement
PPC (Bond Strength)	Colorado Procedure - Laboratory 4302	500 psi minimum at 24 hours and 70 °F (without primer, at 12% resin content by weight of the dry aggregate, on Saturated Surface Dry Specimen)
Abrasion Resistance	Colorado Procedure - Laboratory 4301	<2g weight loss (at 12% resin content by weight of the dry aggregate)
Modulus of Elasticity	ASTM C469	1,000,000 psi to 2,000,000 psi (at 12% resin content by weight of the dry aggregate)

CONSTRUCTION REQUIREMENTS

519.07 The Contractor shall submit the Overlay System, System Provider Qualifications, Contractor Qualifications, System Provider Technical Representative Qualifications, Overlay Placement Plan, Equipment, Certificates of Compliance with laboratory testing for each property, and any other relevant documents for the overlay system at least 15 working days prior to the Polyester Overlay Pre-Paving Conference and delivery of any of the overlay materials. These submittals shall be approved by the Engineer.

- (a) *Overlay System.* The Contractor shall submit two copies of the System Provider's material information, written installation instructions, material safety data sheets, and independent test results for approval.
- (b) *System Provider Qualifications.* The Contractor shall install an overlay system with all components provided through a single System Provider, with documented experience successfully supplying five projects of similar size and scope within the past five years. The Contractor shall submit documentation of the System Provider's project experience including the following:
 - (1) Project construction date
 - (2) Overlay quantities.
 - (3) Reference name and contact information of owner's representative.
- (c) *Contractor Qualifications.* The Contractor shall submit documentation of completing five successful projects placing polyester polymer concrete systems on bridge decks or concrete pavement to established grade lines using similar equipment as specified herein within the past five years. The documentation of Contractor's qualifications shall include the following:
 - (1) Project construction date
 - (2) Overlay quantities.
 - (3) Reference name and contact information of owner's representative.
- 1) The Contractor shall arrange for a qualified System Provider Technical Representative with five years of documented experience with PPC to be on-site throughout the duration of the PPC operation to provide technical support for the materials. Once the Contractor has demonstrated an acceptable experience level with the PPC, the requirement to have the Technical Representative continuously on-site during the PPC operation may be reduced at the Engineer's discretion.
- (d) *System Provider Technical Representative Qualifications.* The System Provider Technical Representative shall have a minimum of five years of experience with PPC and be knowledgeable in all aspects of the work, including all materials to install the overlay system. The Technical Representative shall have experience on a minimum of five successful projects of similar size and scope within the past five years. The Contractor shall submit documentation of the System Providers Technical Representative's experience including the following:
 - (1) Years of experience working with polyester concrete
 - (2) Project construction dates
 - (3) Overlay quantities.
 - (4) Reference name and contact information for owner representatives.

The Technical Representative shall be available on-site while the Contractor is placing the overlay system to facilitate the installation of polyester concrete to provide technical support for the materials. This includes, but is not limited to, trial slab preparation and PPC application, deck surface preparation and PPC application, and PPC cure. Once the Contractor has demonstrated an acceptable experience level with the PPC, the requirements for the on-site Technical Representative may be reduced at the Engineer's discretion.
- (e) *Overlay Placement Plan.* The Contractor shall submit an Overlay Placement Plan that includes the following:
 - 2) (1) Schedule of overlay work and testing for each bridge
 - 3) (2) Staging plan describing overlay placement sequence including:
 - 4) A. Paving widths

- 5) B. Anticipated paving lengths.
- 6) C. Paving directions:
 - 7) i. Contractor shall pave from high side of the bridge to the low side.
 - 8) ii. No gaps between passes will be allowed.
- 9) D. Joint locations: Cold joints between passes shall be within 1 foot of the lane lines.
- 10) E. Location of proposed trial overlay(s)
- 11) (3) Description of equipment used for:
 - 12) A. Surface preparation including grinding and shot blasting.
 - 13) B. Applying HMWM resin
 - 14) C. Measuring, mixing, placing, and finishing the polyester concrete overlay
 - 15) D. Applying sand
 - 16) E. Method of protecting and finishing inlets and bridge drains
- (4) Method for preventing leakage of primer onto areas of deck that have not received surface preparation.
- (5) Method for isolating expansion joints including pourable joints at the abutment and over the piers.
- (6) Method for measuring and maintaining overlay thickness and profile.
- (7) Tining plan showing tining locations and describing methods that will be used for hand tining. Mainline tining shall be automated with the finisher.
- (8) Cure time for polyester concrete.
- (9) Storage and handling of HMWM resin and polyester concrete components.
- (10) Procedure for disposal of excess HMWM resin, polyester concrete, and containers.
- (11) Procedure for cleanup of mixing and placement equipment.
- (f) *Equipment.* The Contractor shall submit documentation of certification of scales that will be used to calibrate the mobile mixing truck. The certification shall be dated within one month of the start of the placing of the Overlay System. A new certification shall be done if any adjustments are made to the scales.

The Contractor shall submit a documented history of the use of the paving machine to successfully place Polyester Polymer Concrete overlays on major bridge projects for review and approval by the Engineer.

- (g) *Materials Samples.* Samples of materials, from the same lots used for the project, for all components of the overlay system shall be submitted to the Engineer a minimum of seven working days prior to the overlay application. Samples shall be representative of the materials to be used in the overlay application and shall consist of one 4-liter sample for each liquid and a 5-pound sample for each dry component. The Contractor shall perform a minimum of one gradation analysis per project of combined sand and aggregate taken from the belt during production. Additional gradations may be required as directed by the Engineer.

519.08 Polyester Overlay Pre-Paving Conference. A Pre-Paving Conference shall be held before any overlay paving operations begin. Attendees shall include all parties involved in the work.

519.09 Trial Application. Prior to constructing the overlay, one or more trial applications shall be placed on a concrete base to determine the initial set time and to demonstrate the effectiveness of the mixing, placing, and finishing equipment proposed. The set time shall be determined when the in-place PPC cannot be deformed by pressing with a finger, indicating the resin binder is no longer in a liquid state. Each trial application shall be the planned paving width and a minimum of 20 feet long,

with the same thickness as the specified overlay. The trial applications shall be tined as per the tining requirements in this specification for the final application. The trial applications shall replicate field conditions and be constructed using all the equipment that is used in the production work including the paving machine and volumetric mixer. The location of the trial applications shall not be on the bridge deck or approach slab and shall be approved by the Engineer. Trial applications shall be properly disposed of off-site by the Contractor.

The number of trial applications required shall be as many as necessary for the Contractor to demonstrate the ability to construct an acceptable trial overlay section and competency in ability to perform the work. Overlay pull bond testing shall be performed in accordance with the acceptance testing described herein. Acceptable test results shall be achieved on a trial application before the installation may proceed. The methods, installer, or overlay system may be rejected after three trial applications if not shown to be adequate or in compliance with this specification as ordered by the Engineer.

519.10 Equipment. All equipment for cleaning the existing concrete surface and mixing and applying the overlay system shall be in accordance with the System Provider's recommendations as approved by the Engineer prior to commencement of work.

(a) *Measuring Equipment.*

The following equipment shall be used:

- (1) Certified Scales used to calibrate the mobile truck mixing equipment.
- (2) Means to measure the resin levels in the tank of the mobile truck mixer during paving operations and access to the resin tank.

(b) *Mixing Equipment.* A continuous mixer shall be used for all polyester concrete overlay applications. The Contractor shall submit a written calibration plan that is specific to the Contractor's continuous mixing truck(s). The calibration plan shall be submitted a minimum of seven days prior to use of the mixer(s).

The continuous mixer shall:

- (1) Employ an auger screw/chute device.
- (2) Be equipped with an automatic metering device that measures and records aggregate and resin weights and/or volumes. Record weights or volumes at least every five minutes, including time and date. Submit recorded volumes at the end of the work shift.
- (3) Have a visible readout gage that displays weights or volumes of aggregate and resin being recorded.
- (4) Produce a satisfactory mix consistently during the entire placement.
- (5) Be calibrated by certified scales provided by the Contractor. Calibration shall be verified by demonstrating that the computer tickets from the metering device are within two percent of the certified scale weights. With DOTI witnessing, the Contractor shall produce three consecutive batches of aggregate that have batch tickets and actual material weights that are within two percent of each other, and three consecutive batches of resin that have scale weight tickets and actual material weights that are within two percent of each other. The calibration shall be verified at the beginning of the project, and the calibration shall be done every 60 days.

A portable mechanical mixer of appropriate size for proposed batches, as recommended by the System Provider and approved by the Engineer, may be used for all PPC patching applications and for smaller area applications of less than 4,000 square feet per bridge or pavement section.

- (a) **Finishing Equipment.** A track driven self-propelled slip-form paving machine, which is modified or specifically built to effectively place the PPC overlay in a manner that meets these specifications, shall be used for all polyester concrete overlay applications.

17)

The paving machine shall:

- (1) Employ a vibrating pan to consolidate and finish the PPC.
- (2) Be fitted with hydraulically controlled grade automation to establish the finished profile. A 30-foot ski grade control device shall be used in all locations unless approved by the Engineer or noted herein. When grade corrections, uneven grades or inconsistent thicknesses are necessary as shown in the plans, placement of the overlay to the profile and cross-section shall be controlled by taut reference stringlines on both sides of the paver. The grade automation sensor shall be constructed to work with string-line control. It is acceptable to match grade when placing lanes adjacent to previously placed PPC.
- (3) Be equipped with controls capable of maintaining the screed at the specified transverse slope.
- (4) Have sufficient engine power and weight to provide adequate vibration of the finishing pan while maintaining consistent forward placement speed.
- (5) Have mainline tining automated with the finisher.
- (6) Be capable of forward or reverse motion.

Finishing of patches of Class 1 deck removal areas shall be completed using hand finishing tools and shall be flush with the top of the existing deck surface.

519.11 Surface Preparation. Existing bridge decks shall be repaired prior to the application of the polyester concrete overlay as shown in the plans and as determined in the field.

Spalled and delaminated areas of the deck shall be removed down to sound concrete. All removed areas shall be patched prior to overlay to provide a uniform thickness.

Patching mortars with magnesium phosphate will not be allowed on decks receiving a polyester concrete overlay. Existing mortars over 28 days old may remain in place if determined to be sound and acceptable by the Engineer.

All cement-based deck patching material, including mortar and concrete, shall attain a minimum compressive strength of 3,000 psi, cure a minimum five days, and pass the Deck Patch Moisture Transmission Test prior to placing the polyester concrete overlay.

For newly constructed bridge decks and approach slabs, the deck shall cure a minimum of 28 days and attain the required Field Compressive Strength per Section 601 prior to overlay placement.

The surface of concrete substrate shall be prepared for application of the overlay by shot blasting in order to remove all existing grease, slurry, oils, paint, dirt, striping, cure compound, membrane, and all other contaminants that could interfere with the proper adhesion of the overlay system. Steel shot shall comply with SSPC-AB3 and recycled steel shot shall comply with SSPC-AB2.

The final prepared surface shall adhere to the following requirements:

- (1) The areas to be overlaid shall be cleaned by shot blasting. Areas not accessible by shot blast shall be abrasive blast. Cleaning shall not commence until all work involving the repair of the concrete deck surface has been completed and the deck is dry. All contaminants shall be picked

up and stored in the vacuum unit and no dust shall be created during the blasting operation that will obstruct the view of motorists in adjacent roadways. The travel speed and/or number of passes of the shot blasting unit shall be adjusted so as to result in all weak or loose surface mortar being removed and the aggregates of the concrete being exposed, as well as a visible change in the concrete color. Cleaned surfaces shall not be exposed to vehicular traffic unless approved by the Engineer. If the deck becomes contaminated before placing the overlay, the Contractor shall shot blast or abrasive sandblast the contaminated areas, per recommendation of the System Supplier's Technical Representative, and to the satisfaction of the Engineer at no additional cost to the project.

- (2) All loose particles shall be removed prior to the overlay placement by magnets and compressed air and vacuuming such that no trapped particles remain. Power washing will not be allowed.
- (3) The areas to be overlaid shall be blown off with compressed air just prior to placement of the primer and shall be completely dry.

519.12 Application of Overlay. Methods shown in this specification are typical of general installations and may be modified per the System Provider's recommendations as approved by the Engineer. The application of the overlay shall not begin until the deck patches have cured for five days, completely surface dry in accordance with ASTM D4263 or have a moisture content of five percent or less when measured by a moisture meter approved by the Engineer. Actual surface conditions at the time of overlay placement shall be evaluated based on more than just time to dry. The surface shall be free of any standing water or darkening of the surface that would indicate locations of previously standing water. The entire surface to receive PPC overlay shall uniformly appear light in color and show no further lightening when drying methods such as compressed air or propane torch are applied. There shall be no evidence of moisture in substrate cracks. The concrete surface temperature shall be between 40 °F rising and 100 °F falling, or per System Provider's recommendation, whichever is higher or lower, respectively. Stockpiled materials shall not be stored on the bridge deck.

- (a) **HMWM Primer Application.** Immediately before placing primer, all exposed surfaces shall be completely dry and blown clean with oil-free compressed air. Exposed surfaces shall be protected from precipitation and heavy dew during and after the application of the primer.

After the exposed surfaces have been prepared and allowed to dry, primer shall be applied in accordance with the System Provider's recommendations. Primer shall be placed within five minutes of mixing at approximately 90 square feet per gallon, or at the rate recommended by the System Provider.

Primer shall be uniformly spread to completely cover surfaces to be overlaid. Primer shall be applied with push brooms or rollers. Care shall be taken to avoid excess application that results in puddling. Excess material shall be removed or distributed to meet the required application rate. Primer shall be reapplied to any areas that appear dry after 15 minutes of absorbing the material. Primer shall not be allowed to leak onto areas that have not received surface preparation.

Polyester Concrete Application. The polyester concrete shall be applied after 15 minutes and within two hours after the primer has been applied. The polyester concrete shall be placed prior to gelling or 15 minutes following addition of initiator, whichever occurs first, or within a more restrictive range if recommended by the System Provider.

The polyester resin binder shall be initiated and blended completely. Aggregate shall be added and mixed for at least two minutes when a portable mechanical mixer is used.

Polyester concrete shall have an initial set time of at least 30 minutes and at most 120 minutes when tested using an initial-setting time. The set time shall be determined in the field when the in-place PPC cannot be deformed by pressing with a finger, indicating that the resin binder is no longer in a liquid state. If the initial set is not within 30 to 120 minutes, the material shall be removed and replaced. Shorter set times may be required if suggested by the System Provider and approved by the Engineer.

The overlay shall be consolidated and finished to the required grade and cross-section using a PPC paver as defined herein.

Although the paver should yield a finished surface, additional finishing may be necessary. PPC shall be finished as necessary through traditional concrete finishing methods, producing a slight resin bleed indicating complete consolidation of aggregates.

A surface friction sand finish of at least 2.2 pounds per square yard shall be broadcast onto the glossy surface immediately after finishing and before resin gelling occurs. Surface friction sand shall be broadcast after finishing and prior to tining by hand; if the tining device is mounted directly to the paving machine the surface friction sand shall be broadcast after tining. To ensure adequate pavement friction, the completed PPC overlay surface shall be free of any smooth or "glassy" areas such as those resulting from insufficient quantities of surface aggregate. Any such surface defects shall be repaired by the Contractor in the manner recommended by the System Provider and approved by the Engineer at no additional cost to the project.

The overlay shall be longitudinally tined unless Plans indicate that the overlay shall be textured per subsection 601.15(e)2.

Tining shall produce grooves of 1/8 inch by 1/8 inch spaced at 3/4 to 1 inch apart. Tining grooves shall be neat in appearance and uniform in depth. Tining devices shall be maintained clean and free from encrusted mortar, polyester resin, sand and polyester concrete to ensure uniform groove thickness.

Unless indicated on the plans, tining shall run parallel with the direction of traffic and shall extend across the entire applied deck surface except for 1 foot next to the curb. The tining shall not be performed too early whereby the grooves may close up, or too late whereby the grooves are of inadequate depth.

Polyester concrete overlay edges shall be tapered if the overlay is not completed within the allowable lane closure time and is more than 3/4 inch higher in elevation than the adjacent pavement.

If the overlay thickness is greater than 3/4 inch in height, longitudinal polyester concrete tapered edges parallel to the direction of traffic shall be tapered to not less than a 4:1 (horizontal: vertical) slope. Transverse temporary asphalt tapered edges perpendicular to the direction of traffic shall be tapered to not less than a 50:1 (horizontal: vertical) slope. Longitudinal polyester tapers may remain and be overlaid with polyester concrete overlay. Transverse temporary asphalt tapers shall have a bond breaker and be completely removed prior to overlay placement.

- (b) *Saw Cut Joints.* Saw cutting and sealing of all joints shall be done according to the joint specifications and the details in the plans. The time of sawing shall be determined by the Contractor to prevent random cracking and raveling from the sawing. The time will be dependent upon weather conditions, temperature, and other factors affecting the setting of the polyester concrete. If uncontrolled cracking occurs, the Contractor shall repair the crack as recommended by the System Provider and as approved by the Engineer.
- (c) *Curing.* The Contractor shall protect the overlay from moisture for a minimum of four hours. The Contractor shall allow the overlay to cure sufficiently before subjecting it to loads or traffic of any nature that may damage the overlay. Cure time depends upon the ambient and deck temperatures. The overlay shall be considered cured to a firm, hard state when four hours have passed or a minimum reading of 25 on a properly calibrated Schmidt hammer.

519.13 Acceptance Testing. Acceptance of the deck patch, surface preparation, and thin bonded overlay will be determined by the Engineer based on materials sampling, moisture transmission tests, vertical axis pull bond tests, and smoothness quality testing performed by the Contractor.

- (a) *Materials Sampling.* Contractor shall provide access to equipment in order to acquire materials samples and measuring of resin binder levels in the resin tank of the mobile mixing truck.
- (b) *Deck Patch Moisture Transmission Testing.* Moisture transmission tests shall be performed by the Contractor using the Plastic Sheet Method in accordance with ASTM-D4263. This test consists of an 18 inch by 18-inch square of clear plastic sheeting that is sealed to the concrete surface with tape on all four sides. If after 16 hours any condensation is found on the underside of the plastic or if the concrete surface is darkened, the test will be considered failing. An alternative to the Plastic Sheet Method is a Moisture Meter Test, with a Moisture Meter approved by the Engineer, with a passing moisture reading on the patch or patches, of five percent or below. The patches to be tested will be approved by the Engineer.
- (c) *Overlay Pull Bond Testing.* Vertical axis pull bond tests shall be performed after 24 hours by the Contractor in accordance with ASTM C1583, Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-Off Method). A minimum of two pull bond tests shall be performed on each bridge. For bridges with deck areas greater than 15,000 square feet, additional tests shall be performed at a frequency of one test per 15,000 square feet of additional deck area, rounded up. Additional testing may be required as directed by the Engineer.

The test result shall be the average of the number of tests for each structure, drilled a minimum of 0.25 inches but no greater than 0.50 inches below the bond line.

The bond strength of the PPC overlay system on normal weight concrete shall be 250 pounds per square inch. An acceptable test will demonstrate that the overlay bond strength is sufficient by producing a concrete subsurface failure area greater than 50 percent of the test surface area. The Contractor shall repair all bond test locations with polymer overlay in accordance with this specification.

- (d) *Smoothness Quality Testing.* The finished transverse and longitudinal surface elevation of the pavement shall be measured using a 10-foot straightedge. Areas to be measured will be as 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.

519.14 Corrective Work.

- (a) *Repair of Surface Defects.* The repair materials and finishing methods for surface defects in the overlay shall be in accordance with those used for the application of the overlay. All surface defects shall be repaired to the satisfaction of the Engineer before acceptance of the work.
- (b) *Correction for Smoothness.* Areas showing high spots of more than 3/16 inch in ten feet shall be marked and diamond ground until the high spot does not exceed 3/16 inch in ten feet. Longitudinal tining shall be grooved to restore the longitudinal texture (tining). Areas showing low spots of more than 3/16 inch in ten feet shall be marked, saw cut, removed with diamond grinding, and replaced at the Contractor's expense.
- (c) *Replacement of Defective Overlay.* A defective overlay, identified by sounding for delamination or a failing pull bond test result, shall be removed and replaced at the Contractor's expense. The Contractor shall submit a written corrective work proposal to the Engineer, which shall include the methods and procedures that will be used. The Contractor shall not commence corrective work until the methods and procedures have been approved in writing by the Engineer. The Engineer's approval will not relieve the Contractor of the responsibility of producing work in conformity with the Contract.
- (d) *Defective Tining.* If the Engineer determines tining to be unacceptable on any deck surfaces measuring 30 square feet or more, based on criteria in subsection 519.12(b), the tined surface shall be repaired with resin and the repaired surface shall be textured per requirements in subsection 601.15(e)2.

METHOD OF MEASUREMENT

519.15 Furnish Thin Bonded Overlay (Polyester Concrete) will be measured by the actual quantity of polyester concrete material complete-in-place and accepted. The volume shall include material used for patching Class 1 removal areas as shown on the plans. Any additional quantities in excess of the plan thickness as required for profile adjustments shall be included in the Contractor's submittal and approved by the Engineer prior to placement.

The Contractor shall collect a weight ticket for all material placed and ensure that the following information is shown on each ticket:

- (1) Project Number
- (2) Bridge Number
- (3) Date and Time
- (4) Ticket Number
- (5) Material Type
- (6) Location of Placement (Lane and Station Limits)
- (7) Aggregate Weight
- (8) Polyester Resin Binder Weight

Tickets shall be available on-site for DOTI personnel to inspect.

Each day, the Contractor shall provide to the Engineer separate envelopes for each bridge which contains the previous day's weight tickets and the following:

- (1) On each envelope: Project Number, Bridge Number, Date of Paving, Type of Material, Daily Total, Cumulative Total, and Suppliers Name.
- (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.
- (3) 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 and the planned thickness of the mixture being placed. Any variance greater than five percent shall be indicated on the envelope with a written explanation included.

Place Thin Bonded Overlay (Polyester Concrete) will not be measured, but will be the quantities, in square yards, specified on the plans for the final surface.

BASIS OF PAYMENT

519.16 The accepted quantities will be paid 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
Furnish Thin Bonded Overlay (Polyester Concrete)	CF
Place Thin Bonded Overlay (Polyester Concrete)	SY

Construction and removal of trial applications including concrete base surfaces will not be measured and paid for separately but shall be included in the work.

Payment for Furnish Thin Bonded Overlay (Polyester Concrete) will be full compensation for all costs required to furnish the polyester concrete material, including freight, to the project site and disposal of any unused overlay material. All costs for time, labor, materials and equipment for all necessary trial slabs shall be included in the Furnish Thin Bonded Overlay (Polyester Concrete). Payment by cubic foot will be based on an average of three-unit weight tests on three separate samples. A unit weight of 135 pounds per cubic foot may be used as the basis of payment if the unit weight tests become impractical at the Engineer's discretion.

Payment for Place Thin Bonded Overlay (Polyester Concrete) will be full compensation for all labor, materials, tools, equipment and incidentals required to prepare the concrete surface and complete the overlay placement. Quantities for placement of patching areas will not be measured and paid for separately but shall be included in the work.

Costs for placement of polyester concrete material in Class 1 removal areas will not be measured and paid for separately but shall be included in the work

END REVISION OF SECTION 519
THIN BONDED OVERLAY (POLYEESTER CONCRETE)

REVISION OF SECTION 601 CONCRETE (PATCHING)

Revise Section 601 of the Standard Specifications for this project as follows:

Subsection 601.01 shall include the following:

Concrete (Patching). This work consists of furnishing and placing material in accordance with these specifications and in conformity with the lines, grades and dimensions as shown on the plans or established.

Subsection 601.02 shall include the following:

Materials for concrete patching shall be from the list shown on the department's Approved Product List, category: concrete, repair/patching, rapid set, vertical & overhead or an approved equal. This list may be viewed at the following internet link: <https://apl.codot.gov/>. Concrete patching material shall have an average compressive strength of 4500 psi at 28 days.

Concrete patching material may be extended only in accordance with the manufacturer's recommendations. The Contractor shall submit a report consisting of the mix proportions and compressive strength information. Compressive strength measurements shall be taken at one hour, three hours, six hours, 24 hours, 7 days and 28 days according to ASTM C 39 Compressive Strength of Cylindrical Concrete Specimens. Test results shall be the average of at least three specimens molded according to AASHTO T 126 Making and Curing Concrete Test Specimens in the Laboratory.

Subsection 601.12 (a) shall include the following:

Concrete patching material shall be placed in the repair areas before the expiration date of the material.

Concrete patching material shall be placed and consolidated to fill voids left at removed existing concrete. The surface of concrete patching material shall be smooth and match the surrounding concrete surfaces. Concrete patching material shall not extend above a waterproofing membrane.

Concrete patching material minimum and maximum thickness shall be per recommendation of the material manufacturer.

Concrete patching material site preparation, batching, extending with aggregate, mixing, placement, placement during cold temperatures, consolidation, and curing shall be in accordance with the manufacturer's recommendations. A mix may be extended up to 90 percent of the manufacturer's maximum extension.

Subsection 601.19 shall include the following:

Concrete (Patching) will be measured and paid for as the actual quantity placed and accepted by the Engineer.

Subsection 601.20 shall include the following:

PAY ITEM

PAY UNIT

Concrete (Patching)

Cubic Yard

Payment for Concrete (Patching) will be full compensation for all the work, materials, tools, equipment, and incidentals required to patch deck overhangs, abutments, and bridge rail. Furnishing, calibrating, and use of rebound hammers and other appurtenances including the molding, curing, and breaking of cylinders for calibration will not be measured and paid for separately, but shall be included in the work.

No additional payment will be made for any of the contractor's costs of whatsoever nature incurred because of placing concrete in cold or hot weather. All of the Contractor's costs of whatsoever nature for any provisions required or taken for placement of concrete during cold weather will be included in the cost of the Work, and no additional payment will be made for any provisions taken, including but not limited to requirements noted in Section 601.12, and cold weather provisions such as modifications to mix design for cold-weather placement, heating any ingredient or portion of the concrete, heating concrete during placement and curing, heating equipment, or any other item or cost of whatsoever nature to place and cure concrete in cold temperatures as required to complete the Work.

END REVISION OF SECTION 601

CONCRETE PATCHING

REVISION OF SECTION 626 MOBILIZATION

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

Subsection 626.01 is hereby revised to include the following:

An option shall be provided to attend all Project Meetings virtually, and the Contractor shall be equipped with appropriate computer facilities to allow and facilitate virtual attendance to all Project Meetings, including weekly Construction Progress Meetings. All of the Contractor's costs of whatsoever nature required to satisfy this requirement shall be included in the price paid for Item 626, Mobilization, and no additional payment will be made.

If multiple mobilizations are anticipated due to the phasing of the project, the Contractor shall include the requirements of the construction phasing in the bid price for Mobilization. No separate payment will be made for multiple mobilizations due to the Contractor's scheduling.

END REVISION OF SECTION 626 MOBILIZATION

REVISION OF SECTION 627 PAVEMENT MARKINGS

Section 627 of the Standard Specifications is hereby revised for this project as follows:

Subsection 627.01 is revised to include the following:

The Contractor is responsible for installation and removal of temporary pavement marking. The Contractor shall coordinate the work of the striping Contractor, including traffic control devices and flaggers.

Subsection 627.03 is revised to include the following:

The Contractor shall replace permanent pavement markings damaged or removed as a result of the work. Pavement marking material shall be new material of the same type which existed prior to the work commencing.

Section 627.08 shall include the following:

Installation of preformed plastic or preformed thermoplastic pavement markings shall be in accordance with the manufacturer's recommendations.

Subsection 627.11 is revised as follows:

Installation and removal of temporary pavement marking will not be measured and paid for separately but shall be included in the lump sum cost for Construction Traffic Control.

Subsection 627.12 shall include the following:

Removal of existing pavement marking will not be measured and paid for separately but will be considered included in the unit cost for new pavement markings.

Sandblasting or other preparation of the roadway surface required to install preformed plastic or preformed thermoplastic pavement markings in accordance with the manufacturer's recommendation shall be considered incidental to the installation of new markings and will not be measured and paid separately.

BASIS OF PAYMENT

Subsection 627.13 shall include the following:

<u>PAY ITEM</u>	<u>PAY UNIT</u>
Pavement Marking	LS

END REVISION OF SECTION 627 PAVEMENT MARKINGS

REVISION OF SECTION 630 TRAFFIC CONTROL (SPECIAL)

Section 630 of the Standard Specifications is hereby revised as follows:

Subsection 630.07 shall include the following:

Non-metallic drums or tubular markers may be substituted for vertical panel channelizing devices.

Subsection 630.10(a) shall include the following:

The Contractor shall submit a method of handling traffic (MHT) for each phase of the work that shows the Contractor's proposed phasing and traffic control devices consistent with the traffic control plan. The MHT shall be submitted to the Project Manager at least four weeks prior to starting that phase. All proposed methods of handling traffic shall be approved, in writing, by the Project Manager following approval of the Traffic Engineering Services Department.

Approval of the proposed MHT does not relieve the Contractor of liability specifically assigned to him under the contract. The Contractor shall erect and maintain warning lights, signs, barricades, and sufficient safeguards around all excavations, embankments, and obstructions.

The contractor shall notify the Project Engineer by Thursday at 3:00 P.M. which streets they intend to work on the following week. This notification will be made for all phases of construction.

Subsection 630.10(a)(10) shall include the following:

The key elements of the Contractor's MHT are outlined in subsection 630.10(a). The components of the Traffic Control Plan (TCP) for this project are included in the following:

- Title 8 of the City & County of Denver's General Conditions and Section 630 of the Standard Specifications.
- Tabulation of Traffic Engineering Items included in the plans for this project.
- Latest revised Standard Plan S-630-1, Traffic Controls for Highway Construction and Standard Plan S-630-2.

Special Traffic Control Plan requirements for this project are as follows:

1. During the construction of this project, traffic shall use the present traveled roadway unless identified on the plans or approved by the Project Manager.
2. For the bridge rehab on Wewatta St. between Speer Blvd. and 15th St., the Contractor shall maintain at least one lane of traffic in each direction on Wewatta St. at all times. The Contractor shall maintain an accessible pedestrian route at all times using the sidewalk as it exists today.
3. For the bridge rehab on University Blvd. between Cherry Creek S Dr. and Cherry Creek N Dr., the Contractor shall maintain at least two lanes of traffic in each direction on University Blvd. at all times. The Contractor shall install the pedestrian detour as shown in the plans and maintain the detour as an accessible pedestrian route at all times.
4. Work that interferes with traffic on will only be permitted during the following hours:

- a. The Contractor shall perform all the work on the roadway between the hours of 8:30 AM and 3:30 PM or as approved by the Project Manager. Weekend and nighttime work will be allowed with the prior written approval of the Project Manager.
 - b. Work will not be permitted that directly or indirectly interferes with the flow of traffic between the hours of 5:30 AM and 8:30 AM Monday through Friday; between the hours of 3:30 PM to 6:30 PM Monday through Thursday; and after 2:00 PM on Fridays unless otherwise authorized by the Project Manager.
 - c. No work on Holidays
 - d. Contractor shall not close lanes during special events. A list of special events will be provided by the Project Manager. The Contractor shall coordinate all of the work during any special event with the City and County of Denver.
 - e. The Contractor shall coordinate lane closures with adjacent projects.
 - f. The Contractor shall maintain business access during business hours.
5. 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. The Contractor is restricted from storing any materials, construction traffic control devices, signs, etc. in any median area or park area.
6. Construction equipment used on this project shall meet the same minimum exhaust requirements as those specified by the manufacturer of the equipment.
7. 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 lights on vehicles and equipment shall be visible from all directions.
8. The Contractor shall maintain access to all roadways, side streets, walkways, alleyways, driveways, and hike/bike paths at all times unless otherwise directed by the Engineer. Parking areas temporarily disturbed by construction activities shall be restored to a useable condition during non-working hours. Such temporary parking shall utilize an all-weather surface. 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.
9. The Access Maintenance Plan shall be coordinated with all affected owners and tenants. The Access Maintenance Plan shall include documentation of this 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.
10. The Contractor shall maintain continuous access throughout the project for pedestrians, bicyclists, and disabled persons. When the existing access route is disturbed by construction, a temporary all-weather access shall be provided. All temporary access shall be a minimum of 5 feet wide and meet Americans with Disabilities Act (ADA) requirements. Acceptable all-weather surfacing shall be

concrete or asphalt surface, or as approved by the Engineer. Delineation of pedestrian access through the work area shall be accomplished using temporary plastic fencing.

11. 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.
12. 12. 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.
13. Whenever the Contractor removes, obliterates, or overlays any pavement markings, they shall be replaced 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.
14. Any existing pavement markings that conflict with temporary or permanent pavement markings shall be completely removed.
15. The Contractor shall not have construction equipment or materials in the lanes open to traffic any time unless directed by the Project Manager.
16. All personal vehicle and construction equipment parking is prohibited where it conflicts with safety, access, or the flow of traffic. Landscaped areas, public park areas, and roadway shoulders shall be kept clear of parking and storage of all personal and construction equipment except where approved by the Project Manager.
17. The Contractor shall not place tack coat on any surface to be paved where traffic will be forced to travel upon fresh bituminous materials.
18. The Contractor shall be required to make arrangements with the Regional Transportation district (RTD) prior to closing any existing bus stops within the project limits. Temporary stops will be required as directed by the Engineer and as required by RTD. For bus stop/route conflicts Regional Transportation District, RTD / 1560 Broadway, Suite 700, Denver, CO 80202 shall be contacted two business days prior to start of construction.
19. The Contractor shall be required to maintain temporary drives at any existing establishment that has singular access off of the roadways, unless otherwise approved in writing by the property owner.
20. No work that 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 City & County of Denver.
21. All lane closures shall be subject to the approval of the Project Manager. 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.

22. During non-working hours, the roadways shall be restored to a safe travel condition for the free flow of 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.
23. The Contractor shall clean the roadway of all construction debris before opening it to traffic.
24. All flagging stations used at night shall be illuminated with floodlights. Street, highway lights and “high mast lighting” 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.
25. Prior to removal and resetting of any sign the Contractor and Project Manager shall prepare an inventory. Any signs damaged due to the Contractor’s operations shall be replaced in kind or repaired by the Contractor at no additional cost to the project.
26. 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.

Subsection 630.10(a)(11) shall include the following:

Contractor shall obtain all required access and construction permits from the City & County of Denver prior to initiating work along City right of way.

All lane closures require an arrow board to be installed.

Subsection 630.14 shall include the following:

The flagger’s STOP/SLOW sign paddle shall be 18 inches with letters six inches high.

Subsection 630.18 shall include the following:

Temporary pavement markings for traffic control will not be measured and paid for separately, but shall be included in the work.

END REVISION OF SECTION 630

TRAFFIC CONTROL (SPECIAL)

ALLOWANCE ACCOUNT ITEMS

DESCRIPTION

This special provision includes the City and County of Denver's estimate for Allowance Account items included in the contract. The estimated amounts will be added to the total bid to determine the amount of performance and payment bonds. Allowance Account Work shall be performed as directed by the Engineer.

BASIS OF PAYMENT

Payment will be made in accordance with the provision of the Construction General Contract Conditions, including the provision of Title 11. Payment will constitute full compensation for all work necessary to complete the item.

Allowance 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.

Allowance account items below are per bridge.

Item No.	Allowance Account Item	Quantity	Estimated Amount
700-70380	Erosion Control	A/A	\$5,000
700-70589	Environmental Health and Safety Management	A/A	\$5,000
700-90110	Electrical Repairs for Lighting	A/A	\$20,000

Allowance Account items are for work that has not already been identified or described in the plans and specifications. All Allowance Account Work shall be pre-approved by the Engineer prior to installation or the Work will be at no cost to the project.

Allowance Account descriptions are as follows:

- 700-70380** **A/A Erosion Control** - This work is described in Revision of Section 208 - Erosion Control.
- 700-70589** **A/A Environmental Health and Safety Management** - This work is described in Section 250 - Environmental, Health, and Safety Management of the Standard Specifications and Revision to Section 250 - Environmental, Health, and Safety Management.
- 700-90110** **A/A Electrical Repairs for Lighting** - This work shall include troubleshooting bridge lighting under the bridge at the regional trail. The contractor shall coordinate with Xcel Energy to determine the source location of the circuit, test the circuit to verify if it is functioning or not. If it's non-functional, the contractor shall propose a repair plan with the electrical contractor for review by the city project manager. Upon review and approval, the contractor shall repair the circuit per the approved plan.

END SECTION

REVISION OF SECTION 627 PAVEMENT MARKING

NOTICE

The Standard Special Provision (SSP) on the following page revises or modifies CDOT's Standard Specifications for Road and Bridge Construction. The Construction Engineering Services Branch has reviewed, approved, and issued it. Use as written without change. Do not use modified versions of it on CDOT construction projects. Do not use the following special provision on CDOT projects in a manner other than specified in the instructions without approval by CDOT's Standards and Specifications Unit. The instructions for use appear below.

Other agencies using the Standard Specifications for Road and Bridge Construction to administer construction projects may use this special provision appropriately and at their own risk.

Instructions for use on CDOT construction projects:

Use the following standard special provision on all projects with pavement marking paint.

SECTION 627 PAVEMENT MARKING

Revise Section 627 by removing and replacing the existing Section 627 of the Standard Specifications with the following:

DESCRIPTION

627.01 This work consists of furnishing and applying pavement marking, and furnishing, installing, and removing temporary pavement marking per these specifications, the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), the Colorado supplement thereto, and in conformity to the lines, dimensions, patterns, locations and details shown on the plans or established.

MATERIALS

627.02 Materials shall conform to the requirements of the following subsections:

Material Requirements	Subsection
Paint	708.05
Glass Beads	713.08
Modified Epoxy Pavement Marking Material	713.17
Thermoplastic Marking Material	713.12
Pavement Primer	708.07
Preformed Plastic Pavement Marking Material	713.13
Pavement Marking Tape	713.15
Pavement Marking Tape (Removable)	713.16
Raised Pavement Marker	713.18
Preformed Thermoplastic Pavement Marking Material	713.14
Methyl Methacrylate Pavement Marking Material	713.19

CONSTRUCTION REQUIREMENTS

627.03 General. All pavement markings shall be placed per the following requirements. When the term “full compliance” is used, it means the pavement markings shall meet the requirements of Standard Plan S-627-1.

- (a) *Pavement Marking Plan.* When pavement-marking location details are not provided in the Contract, the Contractor shall submit a layout of existing conditions to the Project Engineer for approval. The approved layout is to be used as the final pavement-marking plan.
- (b) *Roadways Closed to Traffic During Construction.* Full-compliance final markings shall be in place before opening the roadway to traffic.
Pavement markings on detour routes shall be full-compliance markings.
- (c) *Roadways Constructed Under Traffic.* Full compliance final pavement markings shall be placed within two weeks after final surfacing is completed. Full compliance pavement markings shall also be placed on any roadways opened to traffic when the project pavement work is discontinued for more than two weeks.
- (d) *Temporary Pavement Markings.* Temporary pavement markings and control points for the installation of those pavement markings for roadways that are being constructed under

traffic shall be installed as follows:

1. When one roadway of a normally physically divided highway is closed, and a crossover is constructed, full-compliance pavement markings shall be placed along the tapers and through the median crossovers to the two-way traffic section. Pavement markings through the two-way traffic section shall be as shown on the plans.

All temporary paved roadways shall have full-compliance centerline, lane line, and edge line markings before they are open for traffic.

Upon removal, markings applied to a final surface shall not leave a scar that conflicts with permanent markings.

2. The following criteria apply to all construction on roadways open to traffic other than (d)1. above:

Full-compliance centerline, lane line, and edge line temporary markings shall be in place at the end of each workday.

No-passing zone restrictions shall be identified by full compliance no-passing zone markings. No-passing zone markings shall be in place daily.

Temporary pavement stencils (SCHOOL, RR Xing, etc.) are not required unless specified in the plans.

Temporary pavement markings shall be installed according to the manufacturer's recommendations in such a way that the markings adequately follow the desired alignment.

3. Control Points consisting of 4-inch by 1-foot marks at 40-foot intervals may be placed as guide markers for the installation of temporary or final pavement markings. Raised flexible pavement markers may be substituted for these marks. Control points shall not be used as a substitute for any required marking.

(e) Pavement Marking for Seal Coats (Section 409).

1. Raised flexible pavement markers, suitable for use on seal coats, shall be installed as follows:

No-passing zones shall be marked with two markers placed side-by-side at 40-foot intervals throughout the zone.

Passing zones shall be marked with one marker at 40-foot centers. Closer spacing shall be used on curves, as deemed appropriate.

Raised flexible pavement markers, installed on 40-foot centers, may also be used to mark lane lines through multi-lane roadway sections. Auxiliary lanes and shoulder lines may be marked with flexible markers on 80-foot centers or as appropriate.

2. Full-compliance final pavement markings shall be placed within one week of completion of the seal coat project.

(f) Procedures for Items Paid by the Gallon

Either of the following methods are acceptable unless otherwise specified by the Project Engineer.

1. Method #1 - Use of Data Logging System (DLS)

Equipment: The Contractor shall use a “Skip-line by SPEC-RITE” Data Logger System (DLS) or equivalent DLS equipment as approved by the Project Engineer.

Calibration: Pavement marking vehicles using a Data Logging System (DLS) shall be calibrated at intervals no longer than 12 months. Calibration requirements and allowable tolerances will be determined by the equipment manufacturer. Prior to the installation of materials paid by the gallon, a copy of the most recent certification report for each DLS equipment system used shall be submitted to the Project Engineer.

Verification: A verification test section may be conducted at any time during production at the discretion of the Project Engineer. The verification test shall be performed according to Method #2 and the pavement marking shall be at least 1 mile (5,280 feet) in length, and shall be a width of four, six or eight inches. If the test section cannot be performed as a result of limitations, then method #2 shall be used to verify quantities for payment. If the calibration application rate cannot be verified, then method #2 shall be used to verify quantities for payment.

2. Method #2 - Performing Tank Stabs and Field Measurement

Tank stab measurements shall be used to verify the application rate by calculating the volume of material used over the corresponding application (square foot) area. Tank stab measurements shall be performed by the Contractor at the beginning and end of the pavement marking installation with the pavement marking vehicle parked at the same location and direction of travel for each measurement. Tank stab measurements shall be taken to the top of the fluid level from a fixed point. These measurements will be visually observed and recorded before the pavement marking operations begin, at the end of the pavement marking operations, and before and after each tank is replenished. The difference in the height of the fluid level corresponds to the volume of material used per the manufacturer’s tank conversion chart. Measurements will be recorded to the nearest 1/4 inch.

Plural component materials, such as modified epoxy pavement markings, are applied as a combination of resins and catalysts from separate tanks. Tank stabs shall be recorded for each tank and the volumes combined to determine the total volume, in gallons, applied. Pavement markings shall be field measured to determine the total area of material installed. The tank stab and field measurements will be used to verify the application rate is within the rate specified by the contract.

627.04 Pavement Marking with Low Temperature Acrylic Paint and High Build Acrylic Paint.

Striping shall be applied on asphalt or portland cement concrete pavements when the air and pavement temperatures are as follows: for high-build waterborne paint, at least 45 °F and expected to remain 45 °F or above for at least 24 hours; for low temperature waterborne paint, at least 35 °F and expected to remain 35 °F or above for at least 24 hours. The pavement surface shall be dry and clean, and free of all latent materials, per the manufacturer’s recommendations. Weather conditions shall be conducive to satisfactory results. Glass beads shall be applied into the paint by means of a low pressure, gravity drop bead applicator.

The Contractor shall use equipment that meets the following requirements, as approved:

- (1) Equipment shall permit traffic to pass safely within the limits of the roadway surface and shoulder while operating.
- (2) Equipment shall be designed for placement of both solid and broken line pavement markings with a reasonably clean-edged pavement marking of the width and location as shown on the contract and no overspray on the road surface.
- (3) Equipment shall have a glass bead dispenser directly behind and synchronized with the paint applicator. Each applicator shall have individual control and automatic skip control that will paint a strip with a gap as shown in the Contract.
- (4) The equipment may be equipped with a heat exchanger to heat the paint to reduce drying time.
- (5) The operation shall include a trailing vehicle equipped with a flashing arrow board.

The Contractor shall prevent traffic from crossing a wet pavement marking. Pavement markings that have been marred or picked up by traffic before they have dried shall be repaired at the Contractor's expense. Removal of paint material from vehicles that encountered wet paint shall be at the Contractor's expense.

The water-based paint pavement markings shall fall within the following minimum and maximum ranges:

**Table 627-1
Application Rates and Tolerances for Pavement Markings**

Description	Units	Pavement Marking Paint Low Temp	Pavement Marking Paint High Build	Pavement Marking Paint High Build (Temporary)
Alignment (Lateral Deviation)	Inches	< 2.0	< 2.0	< 2.0
Application Rate	Sq Ft/Gallon	89-94	67-70	100-105
Thickness	Mil	17.5 ± 0.5	23.5 ± 0.5	15.5 ± 0.5
Width	Inches	Per Plans ± 0.25	Per Plans ± 0.25	Per Plans ± 0.25
No Tack Dry Time @ 77° F	Minutes	5-10	7-12	5-10
Glass Bead Application Rate	Lbs, Gallon	7+	9+	5+

- (6) High Build (Temporary) shall only be used for temporary pavement marking applications. Equipment shall have a bead dispenser directly behind, synchronized with the paint applicator and shall be capable of painting a clean-edged pavement marking of the designated width plus or minus 1/4 inch with no overspray on the road surface. For centerlines and lane lines, an automatic skip control shall be used. Machines having multiple applicators shall be used for centerlines with "no passing zones." In areas where machines are not practical, suitable hand-operated equipment shall be used as directed by the Project Engineer. Pavement markings shall be protected until dry.

627.01 Modified Epoxy Pavement Marking. The modified epoxy pavement-marking compound

shall be applied with equipment that will precisely meter the two components in the ratio given in subsection 713.17(a). The equipment shall automatically shut off or warn the operator if one component is not being mixed. The equipment shall produce the required amount of heat at the mixing head and gun tip to provide and maintain the temperatures specified.

Before mixing, the individual components A and B shall each be heated to a temperature of 80 to 140 °F. After mixing, the application temperature for the combined material at the gun tip shall be 80 to 140 °F. The 140 °F upper limit is the maximum temperature under any circumstances.

Both pavement and air temperatures shall be at least 35 °F at the time of modified epoxy pavement marking application.

The surface areas of new portland cement concrete pavement and decks that are to receive markings shall be waterblasted before placement of the modified epoxy pavement marking. The amount of waterblasting shall be sufficient to remove all dirt, laitance, and curing compound residue.

The surface areas of new asphalt pavement, existing asphalt pavement, and existing concrete pavement that are to receive markings shall be cleaned with a high-pressure air blast to remove loose material before placement of the modified epoxy pavement marking. Should any pavement become dirty, from tracked mud etc. as determined by the Project Engineer, it shall be cleaned before the placement of the modified epoxy pavement marking.

When recommended by the modified epoxy manufacturer, a high-pressure water blast integrated into the gun carriage shall be used to clean the pavement surface before modified epoxy pavement marking application. The water blast shall be followed by a high- pressure air blast to remove all residual water, leaving only a damp surface.

Modified epoxy pavement marking shall be applied to the road surface according to the modified epoxy manufacturer's recommended methods at the application rate or coverage shown below. Glass beads shall be applied into the modified epoxy pavement marking by means of a low pressure, gravity drop bead applicator.

Modified epoxy pavement markings and beads shall be applied within the following limits:

Table 627-2
Application Rates and Tolerances for Modified Epoxy Pavement Marking

Description	Units	Modified Epoxy Pavement Marking
Alignment (Lateral Deviation)	Inches	< 2.0
Application Rate	Sq Ft/Gallon	85 - 90
Thickness	Mil	18.5 ± 0.5
Width	Inches	Per Plans ± 0.25
No Tack Dry Time @ 77° F	Minutes	5 - 7
Glass Bead Application Rate	Lbs per Gallon	23+

627.06 Thermoplastic Pavement Marking.

- (a) *Equipment-General.* The material shall be applied to the pavement by an extrusion method where one side of the shaping die is the pavement and the other three sides are contained by or are part of suitable equipment for heating, mixing, and controlling the flow of the material.

The equipment shall be constructed to provide continuous mixing and agitation of the material. Conveying parts of the equipment between the main material reservoir and the shaping die shall be so constructed as to prevent accumulation and clogging. All parts of the equipment that come in contact with the material shall be easily accessible and exposable for cleaning and maintenance.

All mixing and conveying parts up to and including the shaping die, shall maintain the material at the plastic temperature.

The equipment shall be so constructed as to assure continuous uniformity in the dimensions of the pavement marking. The applicator shall provide a means for cleanly cutting off square pavement marking ends and shall provide a method of applying "skip" lines. The use of pans, aprons or similar appliances that the die overruns will not be permitted under this specification.

Glass beads for the surface of the completed pavement marking shall be applied by an automatic bead dispenser attached to the applicator in such manner that the beads are dispensed almost instantly upon the completed line. The bead dispenser shall be equipped with an automatic cutoff control synchronized with the cutoff of the thermoplastic material.

The equipment shall be so constructed as to provide for varying die widths to produce varying widths of traffic markings.

The equipment shall be designed to permit agitation of the material to prevent scorching, discoloration or excessive high temperatures of any part of the material.

A special kettle shall be provided for melting and heating the composition. The kettle shall be equipped with an automatic thermostatic control device so that heating can be done by controlled heat transfer liquid rather than direct flame.

The applicator and kettle shall be so equipped and arranged as to satisfy the requirements of the National Fire Underwriters.

The equipment shall be so equipped as to permit preheating of the pavement immediately before application of the material.

The applicator shall be mobile and maneuverable to the extent that straight lines can be followed, and normal curves can be made in a true arc.

(b) Types of Equipment.

1. Portable Applicator. The portable applicator shall be a device typically used for painting crosswalk lines, stop bars, short lane lines and short centerlines. The applicator shall be easily maneuverable and capable of being propelled by the operator.
2. Mobile Applicator. The mobile applicator shall contain equipment to provide for automatic installation of skip lines in any combination of line and skip up to 40 feet. The mobile applicator shall be moved in conjunction with the melting and heating kettles in such a manner as to provide continuous highway operation of the kettles and the mobile applicator as an integral unit.
3. Epoxy Primer Equipment. The epoxy primer application shall be accomplished using equipment having the following features:

- A. The main storage tank shall be equipped with a visible gauge that will allow the Project Engineer to readily ascertain the rate of application.
- B. The main storage tank shall be equipped with a heating device that will maintain the epoxy at a constant efficient temperature.
- C. The spray nozzle and epoxy spray shall be protected from the action of wind to ensure placement where needed.
- 4. Cleaning Equipment. Equipment must be provided to ensure removal of laitance, dust, debris, paint and other foreign matter from the road surface immediately before the installation of the composition, or immediately before the application of primer.
- (c) *Application.* The pavement marking shall be applied to the pavement to either the right or left of the application unit, dependent upon roadway lane being used. The unit shall not occupy more than one lane of roadway while operating.

The finished lines shall have well defined edges and be free of waviness. All of the equipment necessary to the preheating and application of the material shall be so designed that the temperature of the material can be controlled within the limits necessary to its pourability for good application.

At the time of installation of thermoplastic materials, the pavement shall be clean, dry, and free of laitance, oil, dirt, grease, paint or other foreign contaminants. Pavement and ambient temperatures shall be at least 50 °F.

An epoxy resin primer conforming to subsection 708.07 shall be applied to all pavement surfaces before the application of the thermoplastic pavement marking.

The marking material shall not be applied until the epoxy resin primer reaches the tacky stage, approximately 15 minutes under normal conditions. An infrared heating device may be employed to shorten the curing time of the epoxy.

To ensure the best possible adhesion, the marking material as specified, shall be installed at the manufacturer's recommended temperature.

The minimum thickness of thermoplastic lines as viewed from a lateral cross section shall not be less than 3/32 inch at the edges, or less than 1/8 inch at the center.

Measurements shall be taken as an average throughout any 36-inch section of the line. The material, when formed into traffic pavement markings, must be readily renewable by placing an overlay of new material directly over an old line of compatible material. Such new material shall bond itself to the old line in such a manner that no splitting or separation takes place.

Glass beads shall be applied to the thermoplastic pavement marking by means of a low pressure, gravity drop bead applicator at a rate of 10 pounds per 100 square feet, minimum.

627.07 Methyl Methacrylate Pavement Marking. Methyl methacrylate pavement marking shall be installed per manufacturer's recommendations. The Contractor shall use installation equipment, materials, equipment technicians and operators recommended by the manufacturer.

Methyl methacrylate pavement markings shall be applied to the road surface according to the manufacturer's recommended methods at 60-mil minimum thickness. Glass beads shall be

applied using a double drop bead application system. The first bead applicator shall apply glass beads at the rate of 3.2 pounds per square yard (10 pounds per gallon) minimum, and 1.9 pounds per square yard (6 pounds per gallon) minimum for the second bead applicator.

Methyl methacrylate pavement marking, and beads shall be applied within the following limits:

Table 627-3
Application Rates and Tolerances for
Methyl Methacrylate Pavement Marking

Description	Units	Methyl Methacrylate Pavement Marking
Alignment (Lateral Deviation)	Inches	< 2.0
Application Rate	Sq Ft per Gallon	26 - 28
Thickness	Mil	60 ± 2.0
Width	Inches	Per Plans ± 0.25
No Tack Dry Time @ 77 °F	Minutes	< 15
Glass Bead Application Rate	Lbs per Gallon	1 st Application = 10+ 2 nd Application = 6+

627.08 Preformed Plastic Pavement Marking. This retroreflective preformed plastic strip shall be suitable for application on asphaltic or portland cement concrete pavement. The strip shall be applied at the locations called for on the plans or as directed.

If recommended by the manufacturer, an epoxy resin primer conforming to subsection 708.07 shall be applied to all pavement surfaces before the application of the preformed plastic pavement marking.

The surface of the pavement shall be clean, free of loose foreign material, dry and have no moisture for a minimum of 48 hours before application of the markings.

The air and surface temperature shall be a minimum 40 °F or as recommended by the manufacturer.

The marking strip as applied shall be in good appearance, free of cracks and the edges shall be true and straight.

The preformed plastic pavement marking shall be Type I, Type II, or Type III as shown on the plans.

Before beginning installation operations, the Contractor shall submit to the Project Engineer instructions from the performed plastic pavement manufacturer detailing surface preparation, grooving requirements and material application. The instructions shall include the following:

- (1) Equipment Requirements.
- (2) Approved Work Methods and Procedures.
- (3) Material Application Temperature Requirements.
- (4) Ambient Air and Surface temperature Requirements.

(5) Weather Limitations.

(6) Special Precautions.

(7) Any other requirements necessary for successful installation and satisfactory performance of the material.

The Contractor shall secure from the manufacturer all warranties and guarantees with respect to materials, workmanship, performance, or combination thereof, and shall include these warranties and guarantees with the Certification of Compliance.

Materials supplied without installation instructions or with incomplete instructions will not be accepted for use.

Unless otherwise shown on the plans, typical pavement markings shall conform to the shapes and sizes as shown on Standard Plan S-627-1.

The Contractor shall make all arrangements to have a manufacturer-trained installer of the manufacturer's products on-site during the placement of preformed plastic pavement marking to ensure proper installation. A minimum of two weeks before the placement of the preformed plastic pavement marking, the Contractor shall submit written documentation of the installer's qualifications and training in the installation of preformed plastic pavement marking. Upon completion of the work, the Contractor shall obtain and submit to the Project Engineer written documentation from the manufacturer-trained installer certifying that the product was installed in full compliance with this specification and manufacturer's recommendations.

The preformed plastic pavement marking shall be inlaid on new and existing pavements as shown in the Contract. The material shall be usable for patching worn areas of the same type according to the manufacturer's recommendations.

The Contractor shall not perform wet cutting of pavement unless otherwise directed. Application and removal of temporary pavement marking associated with wet cutting of pavement shall be at the Contractor's expense.

The preformed plastic pavement marking shall conform to pavement contours by the action of traffic, and shall be applicable on new, dense, and open graded asphalt wearing courses during the paving operations according to the manufacturer's recommendations. After application, the markings shall be immediately ready for traffic.

(a) Inlaid Preformed Plastic Pavement Marking. The grooved width for inlaid preformed plastic pavement marking is called for in the Contract. The grooved width shall be the pavement marking width plus 1 inch, with a tolerance of plus or minus 1/4 inch. The depth of the grooves shall be 130 mils plus or minus 5 mils. Groove position shall be a minimum of 2 inches from the edge of the pavement marking to the longitudinal pavement joint.

Grooving shall not be performed on bridge decks with Polyester Polymer Concrete Overlays.

The bottom of the groove shall have a smooth, flat finished surface. The spacers between blade cuts shall be such that there will be less than a 10-mil rise in the finished groove between the blades.

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 re-clean grooves, as necessary, before application of the preformed plastic pavement markings.

(b) Reserved.

627.09 Preformed Thermoplastic Pavement Marking. The markings shall consist of a resilient white or yellow thermoplastic product with glass beads uniformly distributed throughout the entire cross-sectional area. Legends and symbols shall be capable of being affixed to bituminous pavements by heating.

The markings shall conform to pavement contours, breaks and faults through the action of traffic at normal pavement temperatures. The material shall have resealing characteristics with the capability of fusing with itself and previously applied thermoplastic markings under normal use.

The preformed thermoplastic markings shall be packaged in a protective plastic film with cardboard stiffeners where necessary to prevent damage in transit. The carton in that the material is packed shall be clearly labeled for ease of identification.

(a) Application. Application temperature shall be as recommended by the manufacturer. The pavement and air temperature shall be as recommended by the manufacturer at the time of application. The materials shall be applied using a heating method recommended by the manufacturer. The Contractor shall provide the Project Engineer a copy of the manufacturer's installation recommendations before beginning the work. The pavement shall be clean, dry and free from debris. The preformed thermoplastic markings may be installed on top of existing thermoplastic markings after all loose material has been removed. The preformed thermoplastic markings shall not be installed on top of existing preformed plastic pavement markings without first removing the existing markings to a depth that ensures removal of the adhesive backing of the preformed plastic. It shall not be installed on top of pavement marking paint without first removing the paint.

(b) Equipment. The Contractor shall use a heating method specifically recommended by the manufacturer for the installation of preformed thermoplastic markings.

627.10 Pavement Marking Tape. Retroreflective tape shall be suitable for temporary use on asphaltic or portland cement concrete pavements. The tape shall be applied at the locations shown on the plans or as directed. The tape shall conform to subsection 713.15.

The surface that the tape is applied shall be clean, dry and free of dirt, oils and grease. The tape shall be pressed down immediately after application, until it adheres properly and conforms to the surface. Temporary marking tape sections longer than 1 foot shall be removed before placement of the final pavement course. All tape shall be removed on sections where tape conflicts with revised traffic lanes before opening of new lanes to traffic.

Pavement marking tape (removable) shall be installed per the manufacturer's recommendations and maintained throughout the required construction phase at no additional cost to the Department.

627.11 Raised Pavement Markers. Raised pavement markers (temporary) shall be installed on centerlines, edge lines, and lane lines where specified in the Contract. Single

markers shall be installed at 5-foot intervals for solid lines. A group of four markers at 3-foot spacings and at 40- foot intervals shall be installed for skip lines.

Markers supplementing lines shall be installed at the spacing shown on the plans. Raised pavement markers (temporary) shall be installed per the manufacturer's recommendations and shall be maintained throughout the required construction phase at the Contractor's expense.

METHOD OF MEASUREMENT

627.12 The types of pavement marking described will be measured by the following units, complete-in-place and accepted.

Pavement marking paint will be measured by the number of gallons used. Procedures Method #1 or Method #2 will be used to determine the quantities for pavement markings paid by the gallon. The material used in excess of the application rate specified, will not be paid.

Modified epoxy pavement marking, polyurea, and methyl methacrylate pavement marking will be measured by the total number of gallons of components A (pigment/resin) and B (hardener/catalyst) combined to achieve the application requirements as specified. Procedures Method #1 or Method #2 will be used to determine the quantities for pavement markings paid by the gallon. The material used in excess of the application rate specified, will not be paid.

Thermoplastic pavement marking, preformed thermoplastic pavement marking, and preformed plastic pavement marking will be measured by the square foot. The unmarked spaces between markings will not be included in the overall measurement.

The amount of pavement marking tape to be measured will be the linear feet of the specified width tape applied. Gaps in marking will not be measured for payment.

Raised pavement marker (temporary) will be measured as a unit in place and shall include all adhesive necessary for installation. Removal of the raised pavement marker shall be included in the work.

Pavement word and symbol markings, transverse and longitudinal crosswalk lines, and stop lines will not be measured, but shall be the quantities, in square feet, designated in the Contract; except measurements will be made for revisions requested by the Project Engineer. The unmarked spaces within these markings will not be included in the measurement.

BASIS OF PAYMENT

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

Payment will be made under:

Pay Item	Pay Unit
Pavement Marking Paint	Gallon
Pavement Marking Paint (High Build)	Gallon
Pavement Marking Paint (High Build)(Temporary)	Gallon
Pavement Marking Paint (Low Temperature)	Gallon
Modified Epoxy Pavement Marking	Gallon

Methyl Methacrylate Pavement Marking	Gallon
Thermoplastic Pavement Marking	Square Foot
Preformed Plastic Pavement Marking (Type _) (Inlaid)	Square Foot
Preformed Plastic Pavement Marking (Word-Symbol) (Type I) (Inlaid)	Square Foot
Preformed Plastic Pavement Marking (Xwalk-Stop Line) (Type I) (Inlaid)	Square Foot
___Inch Pavement Marking Tape	Linear Foot
Pavement Marking Tape (Removable) Linear	Foot
Raised Pavement Marker (Temporary)	Each
Pavement Marking Paint (Word-Symbol)	Square Foot
Pavement Marking Paint (Xwalk-Stop Line)	Square Foot
Thermoplastic Pavement Marking (Word-Symbol)	Square Foot
Thermoplastic Pavement Marking (Xwalk-Stop Line)	Square Foot
Preformed Thermoplastic Pavement Marking	Square Foot
Preformed Thermoplastic Pavement Marking (Word-Symbol)	Square Foot
Preformed Thermoplastic Pavement Marking (Xwalk-Stop Line)	Square Foot

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

Glass beads and cleaning with high-pressure water blast or air blast shall be included in the cost of the work.

Calibration and the verification of DLS equipment will not be measured and paid for separately but shall be included in the work.

Each authorized application of temporary pavement marking will be measured and paid for at the contract unit price for the type of material used.

Control points and Contractor pavement marking plans will not be measured and paid for separately but shall be included in the work.

All costs associated with having the Preformed Plastic Pavement Marking manufacturer- trained installer on-site and providing the documentation will not be measured and paid for separately but shall be included in the work.

APPENDIX A

MUNICIPAL GOVERNMENT PAVEMENT ENGINEERS COUNCIL (MGPEC) FORM 20 - ASPHALT PAVEMENT MATERIALS 2024



Form 20

Mix Design Requirements V. 2024

Agency: City and County of Denver - DOTI **Date:** 7/20/2026

Project: University Blvd over Cherry Creek Bridge Rehabilitation

Details: Length Varies due to skew - Approx 115 feet **APM (tons):** 71
(To / From, Length)

Classification ☒ Arterial ☐ Collector ☐ Local ☐ Other _____

APM Placement ☒ Wearing course ☐ Intermediate lift ☐ Bottom lift ☐ Patching

ASPHALT MIX DESIGN

Design / Traffic ☐ N_{design} = 50 gyrations <100,000 ESALs
☒ N_{design} = 75 gyrations ≥100,000 to <3 million ESALs

Binder ☐ PG 58-28 ☒ PG 64-22 ☐ PG 76-28 (Top lift only)

Grading		Minimum Lift (3x)	Maximum Lift (5x)
☐ ST (3/8")		1 1/8"	2 1/4"
☒ SX (1/2")		1 1/2"	3"
☐ S (3/4")		2"	5"
☐ SG (1")		3"	6"
☐ SMA (1 1/2")		1 1/2"	3"
☐ SMA (3/4")		3"	4 1/2"

Anti – Strip ☐ Liquid ☐ Lime

Allowable %RAP ☒ 30% (Maximum) ☐ 35% Maximum SG, (lower lifts only)

WMA ☒ Additive ☐ Foaming

Other Additives ☐ Product (Description) _____