

STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION:

The *City of Grand Junction Standard Specifications for Road and Bridge Construction* are hereby modified or supplemented for this Project by the following modifications to *The Standard Specifications for Road and Bridge Construction*, State Department of Highways, Division of Highways, State of Colorado:

SP-1 SECTION 108.3 – REMOVAL OF STRUCTURES AND OBSTRUCTIONS

SP-1 SECTION 202 – REMOVAL OF STRUCTURES AND OBSTRUCTIONS

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

Section 202.07, shall include the following:

All concrete removal required for installation of new will be considered incidental and will not be measured or paid for separately.

Section 210.10, Adjust Structure, shall include the following:

- (1) The following shall apply to adjusting manhole rings in traveled through lanes:
 - (a) Manholes shall be paved over during the overlay. Sand or paper will be used to prevent the asphalt from adhering to the manhole cover. After paving, the manhole ring shall be adjusted to grade by the use of concrete grade rings. The cut area around the manhole shall then be patched with Grading-SX, Hot Mix Asphalt to the same thickness as the adjacent pavement. When adjusting the manhole ring to match the cross slope of the street, the Contractor shall fill the space between the concrete grade ring and the cast iron ring with Rapid Road Repair or Engineer approve equal. In the event that grade rings are removed and or replaced as part of the adjustment the contractor shall fill the annular area below the uppermost grade ring with a self-consolidating media such as 3/4" washed rock or completely fill the area with Rapid Road Repair or Engineer approved equal.
 - (b) Manhole adjustment tolerance: all manholes adjusted as part of this project shall meet the following criteria: level with the adjacent asphalt or (-)1/8". Manholes set outside of this tolerance will be rejected.
- (2) Valve boxes can be adjusted by the use of cast iron valve box extensions or by digging the valve box out after paving and raising the existing box. After adjusting the height of the valve box, the area around the valve box shall be filled with Grading-SX, Hot Mix Asphalt to the same thickness as the adjacent pavement. Water valve tolerance will be the same as section 1 b with the exception of (-) 1/4"

Subsection 202.12, shall include the following:

Locations of saw cuts shall be determined and directed by the Construction Inspector or the Engineer. Saw cuts shall be incidental to work.

SP-2 SECTION 304 – AGGREGATE BASE COURSE

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

Subsection 304.01 shall include the following:

In areas of asphalt overlay where there is no curb and gutter and/or a drainage pan, the Contractor shall backfill the shoulder with Class-6 Aggregate Base Course immediately following the overlay. The shoulder shall have a slope of 1:12 or flatter and shall extend a maximum 4' from the edge of asphalt. The aggregate base course shall be brought level to the new pavement surface and compacted. An exception to this will be made in areas where shoulder material would extend into existing yards or landscaping adjacent to the roadway. In these locations, it will be necessary to provide materials that match the existing landscape.

SP-3 SECTION 401 – PLANT MIX PAVEMENTS - GENERAL

REVISION OF SECTION 401 PLANT MIX PAVEMENTS

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

401.01

Description.

Add the following:

This work shall consist of providing a Hot Mix Asphalt (HMA) to be placed as shown on the plans, or as directed by the Owner. The Contractor shall be responsible for Process Control (PC) of the HMA; including the design, and control of the quality of the material incorporated into the project.

401.02 Composition of Mixtures.

Delete subparagraph (a) *Mix Design* and replace with the following:

A Job Mix Formula (JMF) design shall be submitted for each mixture required, at least 10 calendar days prior to placing any mix on the project, for acceptance by the Owner. JMF's previously approved by CDOT within the past six months may be utilized. The JMF design shall be determined using AASHTO T-312 or CP-L 5115 for the Method of Mixture Design. Grading

ST, SX, and S shall be designed using 100mm molds. The job mix gradation shall be wholly within the Master Range Table in subsection 703.04 before the tolerances shown in Section 401 are applied.

Designs shall be developed and performed in a materials laboratory that meets the requirements set forth by AASHTO Materials Reference Laboratory (AMRL) for all testing procedures. The design shall be stamped and signed by a Professional Engineer licensed in the State of Colorado. In addition, the Contractor shall submit, as part of the mixture design, laboratory data documents to verify the following:

- Gradation, specific gravity, source and description of individual aggregate and properties, and the final blend.
- Aggregate physical properties.
- Source and Grade of the Performance Graded Binder.
- Proposed Design Job Mix: aggregate and additive blending, final gradation, optimum binder content.
- Mixing and compaction temperatures used.
- Mixture properties shall be determined with a minimum of four binder contents.

The JMF for each mixture shall establish a single percentage of aggregate passing each required sieve size, a single percentage of asphalt cement to be added to the aggregate, and a single temperature for the mixture at the discharge point of the plant.

The Owner reserves the right to verify the asphalt supplier's mix design for each JMF design utilizing materials produced and stockpiled. The asphalt supplier shall provide, at no cost, a sufficient quantity of each aggregate, mineral filler, Recycled Asphalt Pavement (RAP), and additive for the required laboratory tests, as well as all Certificates of Conformance/ Compliance at any time on any material used. The Asphalt Supplier shall provide copies of quality control testing results during the production of HMA used within one business day from the sampling date.

Mixture design of HMA shall meet the requirements of Table 403-1 and Table 403-2 in the Revision to Section 403. For mixes requiring a design gyration of 100 (ESALs greater than 3 million) the Project Special Conditions should be used. This gyration is not recommended for the majority of roads within Mesa County.

Delete subparagraph (b) *Mixtures Furnished to the Project* and replace with the following:

Production verification shall occur prior to, or during, the start of the project. Volumetric properties of the mix shall be verified by LabCAT Level C Certified Technicians. If the mix was produced for another project within the last 90 days, data from that project can be submitted for verification. All mixtures furnished for the project shall conform within the ranges of tolerance listed in Table 401.02A. The mix verification test reports shall be submitted to the Owner prior to mix placement.

TABLE
401.02A
Production Mix
Tolerances

<u>Property</u>	<u>Tolerance</u>
<u>Asphalt Cement Content</u>	<u>± 0.3%</u>
<u>VMA</u>	<u>± 1.2%</u>
<u>Air Voids</u>	<u>± 1.2%</u>

Verification testing for binder content, gradation and physical properties shall be performed at the frequencies listed in Table 401.23-1.

There shall be no substitutions of materials allowed during production, unless approved in advance by the Owner. All substitutions will require checkpoint verification. If the checkpoint differs from the Job Mix Formula (JMF), a new mix design will be required. Upon request of the Owner, the binder grade may be changed by one available binder grade level without requiring a new mix design.

Should a change in the source of any material used in the production of HMA (aggregate, mineral filler, lime, or performance graded asphalt binder) occur, a one point verification test (at optimum binder content) of the mix must be performed to verify that the applicable criteria shown on Table 403-1 (HMA) and Table 403-2 (VMA) of Revision to Section 403 are still met. If this testing shows noncompliance, the Contractor shall establish a new job mix design and obtain approval by the Owner before the new HMA is used.

Add the following new subparagraphs:

(c) *Reclaimed Asphalt Pavement (RAP)*. RAP shall be allowed in HMA up to a maximum binder replacement of 23 percent, unless otherwise specified in the contract, and provided that all the specifications for the HMA are met. Fine Aggregate Angularity requirements shall apply only to the virgin fraction of the fine aggregate. RAP shall be of uniform quality and gradation with a maximum size no greater than the nominal aggregate size of the mix. RAP shall not contain clay balls, vegetable matter, or other deleterious substances.

The Contractor shall have an approved mix design for the amount of RAP to be used. The AC content of the RAP utilized in the Contractor RAP mix design shall be the average AC content determined in accordance with 1B or 1C, below, or alternatively, a minimum of five samples of the Contractors RAP stockpile may be sampled and the average AC content of the RAP be determined using AASHTO T-164, Method A or B, or in accordance with 1C below. The Contractor shall determine the total binder replaced by the binder in the RAP pursuant to the following equation:

$$\text{Total Binder Replaced} = (A \times B) \times 100/E$$

Where:

A = RAP % Binder Content *

B = RAP % in Mix *

E = Total Effective Binder Content *

* in decimal format (i.e. 2% is 0.02)

The Total Binder Replaced by the binder in the RAP shall not exceed 23 percent of the effective binder content of either the mix design or the produced mix.

The Contractor shall have an approved Quality Control (QC) Plan that details how the RAP will be processed and controlled. The QC plan shall address the following:

1. RAP Processing Techniques. This requires a schematic diagram and narrative that explains the processing (crushing, screening, and rejecting) and stockpile operation for this specific project.
2. Control of RAP Asphalt Binder Content (AASHTO T-164, Method A or B). RAP Asphalt Binder Content may also be determined in accordance with CP-L 5120, provided an RAP AC content correction factor is determined through correlation testing with AASHTO T-164, Method A or B. The correction factor shall be determined by performing correlation testing on the first five samples of the RAP AC content, then at a frequency of one for every five AC content tests thereafter. The correction factor shall be determined by calculating the average difference in AC content between CP-L 5120 and AASHTO T-164, Method A or B, and applying the correction to the AC content determined in accordance with CP-L 5120 :
Frequency: 1 per 1000 tons of processed RAP material (minimum five tests)
3. (Alternate) The Contractor may propose a RAP asphalt content correction factor to be used in conjunction with CP-L 5120. The proposed CP-L 5120 RAP asphalt content correction factor shall be used with all RAP asphalt contents tested for the mixture design and quality control sampling and testing. The methodology of the proposed CP-L 5120 RAP asphalt content correction factor shall be outlined in detail in the approved RAP QC Plan. At a minimum, the proposed CP-L 5120 correction factor shall identify the principal source locations of the RAP aggregate, gradation of the material tested, and specific ignition oven serial number used in all the RAP asphalt content testing. The RAP source locations, material gradation, and specific equipment used shall substantiate the CP-L 5120 asphalt content correction factor used for the testing. The substantiation must be from data gathered from historical information or specific asphalt content correction data obtained from tests performed on similar virgin aggregate sources, virgin material gradations, and the specific equipment used.
4. Control of RAP Gradation (CP31 or AASHTO T-30):
Frequency: 1 per 1000 tons of processed RAP material (minimum three tests, sampling from belt feed and not stockpile)
5. Process Control Charts shall be maintained for binder content and each screen listed in Table 401.2C, during addition of any RAP material to the stockpile. The Contractor shall maintain separate control charts for each RAP stockpile. The control charts shall be displayed and shall be made available, along with RAP AC extraction testing laboratory reports to the Engineer upon request

The processed RAP must be 100 percent passing the 31.5 mm (1¼ inch) sieve. The aggregate obtained from the processed RAP shall be 100 percent passing the 25.0 mm (1 inch) sieve. The aggregate and binder obtained from the processed RAP shall be uniform in all the measured parameters in accordance with the following:

**Table 401.2C
RAP Binder & Aggregate Uniformity Tolerances**

Element	StandardDeviation
Binder Content	0.5
% Passing ¾”	4.0
% Passing ½”	4.0
% Passing 3/8”	4.0
% Passing #4	4.0
% Passing #8	4.0
% Passing #30	3.0
% Passing #200	1.5

(d) *Warm Mix Asphalt (WMA) Technology.* The Contractor may choose to use a WMA Technology that is included on the CDOT approved products list (<https://www.codot.gov/business/apl/asphalt-warm-mix.html>).

WMA technologies (additive or foaming) used shall be identified on the mix design, indicating usage as a workability additive and/or anti-strip additive. WMA shall be submitted and approved by the Owner for use on a project.

The addition of WMA additives during production, including foaming, shall be controlled by a calibrated metering system interlocked with the plant’s controls per the manufacturers’ recommendation. Additives may be added at the asphalt terminal at the dosage rate recommended by the WMA technology provider. The foaming process mixes water and binder to create microscopic steam bubbles. Typical water injection rate is $\leq 2\%$ of binder flow rate or per manufacturers’ recommendation.

(e) *Anti-Strip Additives.* Anti-Strip shall be added into the HMA. Anti-Strip agents may be liquids (added to the binder), lime (added to the aggregates) or other products, and shall be submitted for approval by the Owner.

The minimum value for Tensile Strength Ratio (TSR) tested in accordance with Table 401.21-1 shall be 80% for the mix design and 70% during production.

There are various types of liquid Anti-Strips. Amine and Organo-silane type liquid Anti-Strip additives are physically mixed with the asphalt binder. Liquid Anti-Strip agents shall be added per the manufactures recommendations. Typical product dosages are provided in Table 401.2E-1.

**TABLE 401.2E-
1
Liquid Anti-Strip Dosage Rates**

Type	Typical Dosage Rate
Amine	0.4% to 0.8%
Organo-silane	0.05% to 0.15%

WMA chemical products which display Anti-Stripping characteristics will be classified, and identified on the mix design, as a liquid Anti-Strip additive.

When a liquid Anti-Strip additive is used, the Contractor shall include the following information with the mix design submission:

- Information on the type of liquid Anti-Strip additive to be supplied, including product name, product manufacturer/supplier
- Additive rate
- TSR values for the treated mixes
- The proposed method for incorporating the additive into the plant produced mix

401.03 Aggregates.

Add the following:

The percentage of fractured faces shall be as shown in Table 403.1 of the Revision to Section 403.

Grading ST (3/8" nominal) mixes may be used for leveling, maintenance, bike paths, sidewalks and thin lift overlays. Grading SX (1/2" nominal) mixes shall be used on top and bottom lifts and for patching. Grading S (3/4" nominal) mixes may be used for bottom lifts.

401.05 Hydrated Lime.

Add the following:

When used in the HMA, hydrated lime shall be added at the rate of 1% by dry weight of the aggregate and shall be included in the amount of material passing the No. 200 sieve.

401.06 Asphalt Cement.

Revise the second paragraph to read as follows:

The asphalt cement shall meet the applicable requirements of subsection 702.01.

Add the following:

The Contractor shall provide to the Owner acceptable 'Certifications of Compliance' of each applicable asphalt binder grade from the supplier. Should testing or certificate show nonconformance with the specifications, the asphalt binder may be rejected. When production begins, the Contractor shall, upon request, provide to the Owner a one quart can of each specified asphalt binder for analysis. Additionally, the Contractor shall provide the refinery test results that pertain to the asphalt binders used during production.

Based on climatic conditions and reliability, binder grades approved for use in Mesa County are as follows in Table 401.06A-1:

**TABLE
401.06A-1
Recommended Performance Graded
Binders**

Condition	Non-modified Binder	Modified Binder
Free flowing traffic loads and 300,000 to 1 million 18K ESAL	PG 64-22	
Free flowing traffic loads and 300,000 to 1 million 18K ESAL, plus above 6000 elevation	PG 58-28	
Slow moving or standing trucks, major street intersections and/or 10,000,000 18K ESAL		PG 76-28 (top lift only)

Binder grades other than those shown above shall not be used unless the proposed binder and the mix design are approved in writing by the OWNER. The asphalt cement shall meet the requirements of subsection 702.01

401.07 Weather Limitations and Placement Temperatures.

Revise as follows:

Surface temperatures shall be used to determine placement of APM. APM produced with documented WMA will be allowed a reduction in minimum surface temperatures for placement as provided in Table 401.07A-1. Ambient temperatures and other weather conditions shall be considered prior to placement.

**TABLE 401.07A-
1
Minimum Surface Temperatures for placement of APM**

Compacted Layer Thickness (in.)	Minimum Surface Temperature (°F)			
	Top Layer		Layers Below the Top Layer	
Product	APM	with WMA	APM	with WMA
<1½	60	50	50	40
1½ - <3	50	45	40	35
3 or more	45	40	35	35

If the Contractor modifies the placement and compaction processes when ambient temperatures are below minimum surface temperatures in Table 401.07A-1, they shall demonstrate to the Owner the required in-place density has been achieved. APM cooling software such as PaveCool, or MultiCool can be used to determine placement and compaction times available.

401.08 Asphalt Mixing Plant.

Delete the last paragraph of the subsection.

401.09 Hauling Equipment.

Add the following:

The Owner may reject any HMA which demonstrates it has been contaminated from a petroleum distillate release agent. The Owner may reject any uncovered HMA which demonstrates it has been impacted by contamination and/or weather.

401.10 Asphalt Pavers.

Delete the twelve paragraph and replace with the following:

Contractor shall submit for and receive approval of the screed control devices to be utilized on the paver prior to use for placing HMA on the project.

Add the following:

A Material Transfer Vehicle (MTV) or Material Transfer Device (MTD) may be required for placement of the HMA when specified in the contract documents. The MTV shall be a self-propelled unit with on board storage of material. An MTD is a non-self-propelled unit. Both MTV and MTD are capable of receiving material from trucks or from the ground, transferring the material from the unit to a paver hopper insert via a conveyor system.

401.11 Tack Coat.

Delete and replace with the following:

A tack coat shall be applied between pavement course and to all existing concrete and asphalt surfaces per Section 407. Tack coat is considered incidental to the cost of the HMA.

401.15 Mixing.

Add the following:

If a WMA technology (additive or foaming) is used, the discharge temperatures may be lowered during production at the discretion of the Contractor provided all specifications are achieved. Mix design is to indicate revised allowable discharge temperatures with WMA usage.

401.16 Spreading and Finishing.

Revise as follows:

Joints in the top layer of new pavement shall be located on lane lines unless otherwise shown on the plans. Longitudinal joints shall be minimized with wide paving pulls. Transverse joints shall be formed by cutting back on the previous run to expose the full depth of the course. Tack coat material shall be applied to contact surfaces of all joints before additional mixture is placed against the previously compacted material.

401.17 Compaction.

Revise as follows:

Equipment used for compaction of the HMA will be at the discretion of the Contractor. The number, weight, and type of rollers furnished shall be sufficient to obtain the required density and surface texture.

All joints shall be compacted to 92% of maximum theoretical specific gravity (Rice), taken six inches offset from the joint. The allowable variance shall be $\pm 2\%$. Joint density will be determined using nuclear density equipment.

Delete paragraphs six through eight, and paragraphs eleven to the end of the subsection and replace with the following:

Cores may be used to verify compaction results. The Contractor shall core the pavement, as required by the Owner; in accordance with AASHTO T 230, Method B, or for field calibration of nuclear density equipment in accordance with the ASTM D 2950. At a minimum, cores for nuclear density equipment correlation shall be taken at the beginning of placement of each project or change of mixture materials or gradation, unless otherwise approved by the Engineer. If the correlation cores were produced for another project within the last 90 days, data from that project can be submitted for verification, if no change in materials or gradation has occurred. When cores are used, the Contractor shall provide all labor and equipment for the coring and repair of the holes.

Along forms, curbs, headers, walls, and all other places not accessible to the rollers, the mixture shall meet all project compaction specifications. Any mixture that is defective, shall be corrected to meet the project specifications at the expense of the Contractor.

401.20 Surface Smoothness.

Delete and replace with the following:

The finish transverse and longitudinal surface elevation of the pavement shall be measured using a 10-foot straightedge. Surface smoothness shall be verified following the finish roller pass. Surface variation shall not exceed 3/16 inch in 10 feet for full lane width paving. For patching, the variation shall not exceed 3/8 inch in 10 feet. The final pavement surface shall not vary from the specified cross section by more than one inch at any point. Transverse measurements for variations shall exclude breaks in the crown sections. If the surface tolerance exceeds 3/16" across transverse joints, measured in at least three locations, the Contractor shall make corrections to the joint before proceeding. All corrections shall be made at the Contractor's expense.

The final surface pavement adjacent to curb and gutter shall be finished from 1/8-inch to 3/8-inches above the lip for catch curb and shall not extend above the lip for spill curb.

The Contractor shall adjust all manholes, valve boxes, and survey range boxes 1/8 to 1/4-inch below final grade and adjusted to match the slope of the roadway. Valve boxes and manholes are to be maintained fully accessible at all times for emergency and maintenance operations. The cost of adjusting valve boxes, manholes, and survey range boxes shall be included in the work, unless otherwise specified. The Contractor shall be responsible for any cost incurred by the Owner to provide access to the covered manholes or valve boxes. Final adjustment of all utility access points shall be completed within seven days of from the time the HMA was placed.

Add the following new subsections:

401.23 Testing and Inspection

The Contractor shall assume full responsibility for controlling all operations and processes to meet the Specifications. The Contractor shall perform all tests necessary for process control purposes on all elements at the frequency listed in Table 401.23-1. The Contractor shall maintain a log of all process control testing. Test results that have sampling or testing errors shall not be used. Process control testing shall be performed at the expense of the Contractor.

Laboratories shall be accredited by AASHTO Materials Reference Laboratory (AMRL) for the tests being performed. Technicians obtaining samples and conducting compaction tests must have a LabCAT Level A certification. Technicians conducting tests of asphalt content and gradation must have a LabCAT Level B certification. Technicians performing volumetric testing must have a LabCAT Level C certification. Equivalent NICET certification for all technicians is acceptable.

When requested by the Owner, the Contractor shall submit a quality control plan that addresses production, sampling, testing, and qualifications of testing personnel, timing, and methods for making adjustments to meet the specifications. The Contractor will provide a process or schedule for making corrections for material that was placed but does not meet specifications as well as obtain a follow up sample immediately after corrective actions are taken to assess the adequacy of the corrections. In the event the follow-up process control sample also fails to meet Specification requirements; the Contractor shall cease production of the asphalt mixture until the problem is adequately resolved to the satisfaction of the Owner.

**TABLE
401.23-1
Minimum Materials Sampling and
Testing for Process Control and
Owners Acceptance**

Test	Standard	Minimum Frequency
Sampling	AASHTO T168, ASTM D 979 and ASTM D3665, CP 41	1/1000 tons or fraction thereof (not less than one test per day)
In-Place Density	AASHTO T 166, T 238, T 230, CP 81 (nuclear), CP 44 (coring)	One test for each 250 lineal feet per lane and one test per 1,000 lineal feet of joint per lift
Thickness (Core) (when called for in Project specs.)	ASTM D3549	One test for each 1000 lineal feet per lane
Air Voids & VMA	CP-L 5115 A.I. SP-2	1/1000 tons or fraction thereof (not less than one test per day)
Gradation	AASHTO T 27/T 11, CP 31	1/1000 tons or fraction thereof (not less than one test per day)
Hveem/Marshall Stability As Applicable	CP-L 5016	One per project per mix used
Binder Content	CP-L 5120, AASHTO T 164 or other methods agreed upon between Owner and Contractor	1/1000 tons or fraction thereof (not less than one test per day)
Maximum Theoretical Specific Gravity (Rice)	AASHTO T 209 (Rice), CP-L 51	1/1000 tons or fraction thereof (not less than one test per day)
Lottman Stripping, TSR & Dry Density	CP-L 5109	One per project per mix used.

Field control testing of dense graded asphalt mixes for the above tests shall meet the requirements of Table 403-1 and Table 403-2 in the Revision to Section 403.

401.24 Acceptance

If any materials furnished, or work performed, fails to meet the specification requirements, such deficiencies shall be documented and reported to the Owner. Copies of all process control tests shall be delivered to the Owner within one business day. Test results that cannot be completed within one day shall be provided to the Owner no later than three days after the sample was obtained.

Owners Acceptance (OA) test results, if any, and/or Process Control (PC) test results will be evaluated to determine acceptability. If the Contractor does not meet the project specifications, but acceptable work has been produced, the Owner shall determine the extent of the work to be accepted. If the Owner determines the work is not acceptable, the Contractor shall correct the work, as approved by the Owner, at the expense of the Contractor.

SP-4 SECTION 403 – HOT MIX ASPHALT

REVISION OF SECTION 403 HOT MIX ASPHALT

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

403.02 Materials

Delete and replace with the following:

The materials shall conform to the requirements of subsections 401.2 of the Revised Section 401 above.

The design mix for hot mix asphalt (HMA) shall conform to the following Table 403-1 and Table 403-2:

**Table 403-1
Mixture Properties for Hot Mix Asphalt**

Property	Test Method	Value
Air Voids, percent at: N (design)	AASHTO T-132, CPL 5115	3.0 – 4.0
Lab Compaction (Revolutions): N (design)	CPL 5115	75
Hveem Stability, (Grading ST, SX & S only)	CPL 5106	28 min.
Aggregate Retained on the 4.75 mm (No. 4) Sieve for S, SX and SG, and on the 2.36mm (No. 8) Sieve for ST and SF with at least 2 Mechanically Induced fractured faces	CP 45	60% min.
Accelerated Moisture Susceptibility Tensile Strength Ratio (Lottman)(for S & SX mixes)	AASHTO T-283 Method B, CPL 5109 Method B	80 min.
Minimum Dry Split Tensile Strength, kPa (psi)	CPL 5109 Method B	205 (30) min.
Voids in the Mineral Aggregate (VMA) % minimum	CP 48, AI-SP2	See Table 403-2
Voids Filled with Asphalt (VFA)	AI MS-2	65-80%
Dust to Asphalt Ratio: Fine Gradation Coarse Gradation	CP 50	0.6 – 1.2 0.8 – 1.6
<p>Note: AI MS-2 = Asphalt Institute Manual Series 2</p> <p>Note: Mixes with gradations having less than 40% passing the 4.75 mm (No. 4) sieve shall be approached with caution because of constructability problems.</p> <p>Note: Gradations for mixes with a nominal maximum aggregate size of one-inch or larger are considered a coarse gradation if they pass below the maximum density line at the #4 screen.</p> <p>Gradations for mixes with a nominal maximum aggregate size of 3/4" to 3/8" are considered a coarse gradation if they pass below the maximum density line at the #8 screen.</p> <p>Gradations for mixes with a nominal maximum aggregate size of #4 or smaller are considered a coarse gradation if they pass below the maximum density line at the #16 screen.</p>		

**Table 403-2
Minimum Voids in Mineral Aggregate (VMA)**

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

403.03 Construction Requirements

Delete the first paragraph and replace with the following:

The construction requirements shall be as prescribed in subsections 401.3 through 401.14 of the Revised Section 401 above.

403.04 Method of Measurement

Delete and replace with the following:

Hot Mix Asphalt will be measured by the ton or the square yard. Batch weights will not be permitted as a method of measurement when measured by the ton. The tonnage shall be the weight used in the accepted pavement.

403.05 Basis of Payment

Delete and replace with the following:

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

Payment will be made under:

Pay Item	Pay Unit
Hot Mix Asphalt (Grading __)(PG__)	Ton
Hot Mix Asphalt (Grading __)(PG __)	Square Yard
Hot Mix Asphalt (Patching)	Square Yard

Aggregate, asphalt cement, asphalt recycling agent, additives, hydrated lime, tack coat, and all other work necessary to complete each hot mix asphalt items will not be paid for separately but shall be included in the unit price bid.

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

SP-5 SECTION 407 – PRIME COAT, TACK COAT, AND REJUVINATING AGENT

**REVISIONS OF SECTION 407
PRIME COAT, TACK COAT, AND REJUVENATING AGENT**

Section 407 of the Standard Specifications is hereby revised for this project as follows:

407.01 Description

Add the following:

Prior to placement of APM, a tack coat shall be applied to all existing concrete and asphalt surfaces.

407.02 Asphalt Material.

Add the following:

The tack coat shall meet the specification for emulsified asphalt, consisting of CSS-1h or SS-1h, and conform to AASHTO M208 or M140.

407.07 Application of Asphalt Material.

Add the following:

The tack coat shall be applied at the rates specified in Table 407-1. The surface receiving the tack coat shall be dry and clean, and dust, debris, and foreign matter shall be removed. Tack coat shall be applied uniformly. The Contractor shall allow the tack coat to cure (dehydrate) prior to the placement of APM. If the tack becomes contaminated during construction, it shall be cleaned, and if necessary, additional tack coat shall be reapplied and allowed to cure before paving resumes.

**TABLE 407-1
Tack Coat Application
Rates**

Pavement Condition	Application Rate (gal/yd ²)		
	Residual	Undiluted	Diluted (1:1)
New asphalt	0.03 - 0.04	0.05 – 0.07	0.10 – 0.13
Oxidized asphalt	0.04 – 0.06	0.07 – 0.10	0.13 – 0.20
Milled Surface (asphalt)	0.06 – 0.08	0.10 – 0.13	0.20 – 0.30

Milled Surface (PCC)	0.06 – 0.08	0.10 – 0.13	0.20 – 0.30
Portland Cement Concrete	0.04 – 0.06	0.07 – 0.10	0.13 – 0.20

407.09 Method of Measurement and Basis of Payment.

Delete and replace the following:

Tack Coat will not be measured and paid separately but shall be considered included in the work for Section 401 – Asphalt Pavement Materials.

SP-6 SECTION 601 – STRUCTURAL CONCRETE

Section 601 of the Standard Specifications is hereby revised for this project as follows:

Subsection 601.02, Classification:

CONCRETE SHALL MEET THE FOLLOWING REQUIREMENTS:

- 4,500 PSI Compressive at 28 Days
- 6% air \pm 1.5%
- Slump 4", Loads exceeding 4 ½" shall be rejected
- Maximum Water Cement Ratio no greater than 0.45.

Subsection 601.06, Batching:

This CDOT Specification has been added to this Project:

The Contractor shall furnish a batch ticket (delivery ticket) with each load for all concrete. Concrete delivered without a batch ticket containing complete information as specified shall be rejected. The Contractor shall collect and complete the batch ticket at the placement site and deliver all batch tickets to the Engineer or his representative at the end of each day. The Engineer or his representative shall have access to the batch tickets at any time during the placement. The following information shall be provided on each ticket:

1. Suppliers name and date
2. Truck number
3. Project name and location
4. Concrete class and designation number
5. Cubic yards batched
6. Type brand and amount of each admixture
7. Type, brand, and amount of cement and fly ash
8. Weights of fine and course aggregates
9. Moisture of fine and course aggregates
10. Gallons of batch water

The contractor shall add the following information to the batch ticket at time of placement:

1. Gallons of water added by the truck operator.
2. Number of revolutions of the drum for mixing
3. Discharge time

SP-7 SECTION 608 – CURBS, GUTTERS, SIDEWALKS, AND TRAILS

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

Subsections 608.06, Basis of Payment shall include the following:

The Contract Unit Price for the various concrete items shall be full compensation for all equipment, labor, materials, and incidentals required for the complete installation. Incidental items include subgrade compaction, cutting and removal of asphalt in areas where concrete will be installed; removal of existing concrete, removal of existing base course, disposal of excavated and removed materials; furnishing, placement and compaction of Class 6 Aggregate Base Course; forming, furnishing and placement, finishing, curing and protection of the concrete; reinforcing steel and joint filler.

SP-9 SECTION 630 - CONSTRUCTION ZONE TRAFFIC CONTROL

Section 630 of the Standard Specifications are hereby revised for this project as follows:

Subsection 630.09, Traffic Control Plan, shall include the following:

The following guidelines and limitations shall apply to the traffic control:

1. Two way traffic shall be maintained on all streets (unless otherwise approved).
2. Concrete activities shall be coordinated so that concrete trucks and other vehicles do not block the traffic lanes.
3. All incidental costs shall be included in the original contract price for the project.
4. Sidewalks that are obstructed or under construction shall be barricaded, as required for pedestrian safety.

Subsection 630.14, Method of Measurement, shall include the following:

Distribution of door-hanger notices to all businesses and / or residents located adjacent to the overlay work will not be paid for separately but shall be included in the pay item for Traffic Control (Complete in Place). The City will provide the door hangers for distribution.

STANDARD SPECIFICATIONS FOR CONSTRUCTION OF WATER LINES, SANITARY SEWERS, STORM DRAINS, UNDERDRAINS AND IRRIGATION SYSTEMS

The City of Grand Junction *Standard Specifications for Construction of Water Lines, Sanitary Sewers, Storm Drains, Underdrains and Irrigation Systems* are hereby modified for this Project as follows:

SECTION 108 – MEASUREMENT AND PAYMET

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

Subsection 108.2, Conduit, shall include the following:

The Contract unit price for each new sewer conduit installed shall include excavation, bedding, pipe installation, backfill, compaction, and cleaning of the sewer conduit with a jetting truck.

SECTION 104 – INSTALLATION OF PIPE AND APPURTENANCES

Section 104 of the Standard Specifications is hereby revised for this project as follows:

Subsection 104.2.a, Laying Gravity Flow Pipe, shall include the following:

SECTION 02750 – PIPE BURSTING

PART 1 - GENERAL

1.01 WORK INCLUDED:

This specification covers the rehabilitation of sewers lines using pipe bursting. This process will split or fracture the existing pipe while simultaneously installing a new pipe.

The CONTRACTOR shall be responsible for all associated work, including maintaining existing water or sewer service, dealing with existing utilities, reconnecting existing services and protecting existing structures and foundations against damage due to pipe bursting. Any repairs of any damaged utilities or structures during pipe bursting operations must be acceptable to the ENGINEER and OWNER. The completed work must provide a complete and satisfactory installation covering all incidental work necessary for the methods used.

For pipe bursting, the replacement line will follow the existing mainline shown on the project drawings. Pipe bursting must be static; the pneumatic method is NOT allowed. The Contractor will furnish all labor, equipment, materials, tools and appurtenances necessary or proper for the performance and completion of the pipe bursting.

1.02 CONTRACTOR QUALIFICATIONS:

The CONTRACTOR, or the subcontractor performing the work, shall be certified by the pipe bursting equipment manufacturer as a fully trained user of the pipe bursting equipment. Operation of the pipe bursting equipment shall be performed by trained personnel. The CONTRACTOR shall present evidence to prove to the satisfaction of the ENGINEER that he, or the subcontractor performing the work, has had previous experience in sewer pipe installation of this nature.

The pipe bursting CONTRACTOR shall have actively engaged in the installation of pipe using pipe bursting on at least two (2) pipe bursting projects in similar size and scope. The CONTRACTOR'S pipe bursting subcontractor shall keep the same supervisor on this Project until the pipe bursting installation on the project is satisfactorily completed.

Statement of Qualifications from two (2) past projects documenting pipe bursting experience shall include:

1. Project name and location, pipe sizes and lengths, Owner's name, address, telephone number, contact person, date and duration of work, additional information on the project, and contents handled by pipeline.
2. Supervisory field personnel and historical information of sewer pipe bursting experience. At least one of the field supervisors listed must be at the site when pipe bursting operations are in progress.

1.03 RESPONSIBILITY:

The pipe bursting CONTRACTOR shall have complete responsibility for installation of the new joint restrained PVC pipe within the existing sewer main, locate and reconnect all services, protect and repair any damage to other existing utilities in the vicinity of the work or any other features or structures that may be damaged during construction, and to supervise all aspects of the work as required by these Contract Documents. If upsizing the existing main to sizes shown on the plans results in the need to bore out a portion of the existing main prior to installing the new pipe, that work shall be included.

The CONTRACTOR shall be responsible for making any investigations into site or soil conditions or any other existing conditions that he deems necessary in order to prepare his bid and execute the work. All work shall be completed within the rights-of-way or easements available, or the CONTRACTOR shall obtain written permission to occupy any additional properties.

The CONTRACTOR shall abide by the conditions of any obtained construction, access or regulatory permits. And shall provide construction traffic control in compliance with City requirements.

1.04 SUBMITTALS:

Submittals will be required for all qualifications, processes, and materials in accordance with this section. Submittals shall include all equipment proposed for pipe bursting. A detailed description of the complete process proposed for the replacement of the sewer main by pipe bursting shall also be submitted. This includes excavations, service

locations and reconnections, maintaining the design sewer slope, and the process to upsize the space for the new pipe.

Specifically, submittals to be provided must include, but are not necessarily limited to the following:

- A. Statement of Qualifications from two (2) past pipe bursting project similar in size and scope.
- B. Detailed construction procedures and layout plans, including sequence of construction and how the CONTRACTOR will maintain the pipe slope between manhole locations.
- C. Method of installing pipe to the pipe slope shown in the construction plans.
- D. Method of locating and reconnecting service lines.
- E. Method of establishing and utilizing the launching and receiving pits.
- F. Method of bypass pumping around any sewer bursting operation as necessary.
- G. Information on all equipment proposed for pipe bursting operations.
- H. Any other information required to provide a complete understanding of the proposed construction methods.

PART 2 - EXECUTION

The pipe bursting processes shall comply with manufacturer's requirements and the Specifications. All materials shall be transported, handled and stored as recommended by the manufacturer and so as not to damage them.

CONTRACTOR shall employ a static pipe bursting method to satisfactorily install the new pipe. CONTRACTOR shall be responsible for and promptly repair any damage to any existing facilities or structures during the pipe installation.

The pipe bursting tool shall be designed to force its way through the existing pipe materials by fragmenting the pipe and compressing the old pipe sections into the surrounding soil as it progresses. A properly sized bursting unit shall be used to create sufficient room for the new pipe.

CONTRACTOR shall locate all existing services, laterals, and any features that may impact the pipe bursting operation before pipe bursting. It includes a set-up for bypass pumping for sewers, if necessary. Once the bursting is completed all services must be reconnected to the new pipe within the time requirements.

LOCATION AND PROTECTION OF UNDERGROUND UTILITIES

- i. Correct location and verification of all underground utilities that may impact the pipe bursting installation is the responsibility of the Contractor, regardless of any locations shown on the drawings or previous surveys completed.
- ii. Utility location and notification services shall be contacted by the Contractor prior to the start of construction.

- iii. All existing lines and underground utilities shall be positively identified, including exposing those facilities that are located within an envelope of possible impact by the pipe bursting installation as determined for the specific site conditions. It is the Contractor and pipe bursting system operator's responsibility to determine this envelope of safe offset from existing utilities. This will include, but is not limited to, soil conditions, utility proximity and material, and pipe bursting system and equipment.

The pipe bursting unit (head) shall be remotely controlled and locatable, so that its location can be accurately determined at any time. The pipe bursting unit shall be able to data log the pull force. CONTRACTOR shall provide data logs of the pull force required for each bursting segment. The pull force shall not exceed the limits of the restrained joint PVC pipe set by the pipe manufacturer.

Insertion pits shall be of sufficient length to allow the bursting head and new restrained joint PVC pipe to enter the host pipe at an angle that will maintain the grade of the existing sanitary sewer pipe.

If any newly installed pipe does not satisfactorily comply with these requirements, it shall be removed and replaced by the CONTRACTOR. This includes replacing any defective joints, and any section of pipe with a gash, abrasion or other flaw with a depth equal to 10% of the wall thickness.

Lubrication shall be used if in the opinion of the CONTRACTOR such lubrication is necessary to ensure the successful completion of the job. Any lubricants used shall not negatively impact the environment.

An appropriate relaxation period shall be allowed prior to making service connections and connecting to manholes. The relaxation period shall be appropriate with and dependent upon site conditions, as determined by the CONTRACTOR.

Any material that enters the pipe during the pipe bursting operation shall be removed by the CONTRACTOR. The CITY will video the completed section to verify the construction.

CONTRACTOR shall make excavations as needed to connect to existing pipes, locate, expose and protect utility crossings, or to install appurtenances to the main or other connections, services, laterals, or fittings. This work shall comply with other specification sections as appropriate.

Following completion of the work, the CONTRACTOR shall provide a complete set of as-built drawings to the ENGINEER. These drawings shall accurately show all connections, appurtenances, pipe slope, fittings, services, etc; the depth and location of the pipe, and other details from construction.

PART 3 – TESTING AND ACCEPTANCE

After the new joint restrained PVC pipe is installed and all services are reconnected, the line shall be inspected per specification Section 105 – Pipeline Testing. The City will provide the CCTV inspection.

END OF SECTION 02750

SECTION 105 – PIPELINE TESTING

Delete **Section 105.2.** The City of Grand Junction will not require the new sanitary sewer main to be pressure or leakage tested.

All sanitary sewer mains shall be deflection tested using a Mandrel and will be closed captioned (CCTV) inspected prior to final acceptance.