

DIVISION 3 – CONCRETE AND PAVEMENT**SECTION 03250 - STREETS****1. GENERAL**

The purpose of these Standards is to provide minimum standards to safeguard life and limb, health, property and public welfare by regulating the design of, construction of, choice of materials used for, location of, maintenance and use of all public improvements and common facilities including, but not limited to, public and private streets, traffic signals and devices, public and private parking lots and appurtenances thereto. All equipment and material shall be new unless approved by the Town of Ridgway (Town).

These Standards represent minimum requirements and design values. Additional requirements of higher design values, commensurate with conditions, may be required by the Town if, in the Town's judgment, they are in the best interest of the Town. These design guidelines have been prepared to assist engineers preparing plans for roads and other street related public improvement projects in the Town of Ridgway. Variations may be considered based solely on sound engineering practice and will be reviewed and approved by the Town on an individual basis. Such variations must be requested in writing along with sufficient documentation supporting the request.

2. CDOT SPECIFICATIONS

Section 101 and Sections 200 through 717 of the current Standard Specifications for Road and Bridge Construction of the Colorado Department of Transportation, State of Colorado, (CDOT Specifications) as re-emphasized, supplemented or amended by the State and by these specifications shall govern all road and bridge construction work within the public right-of-way and in other areas of Town jurisdiction or ownership. Where a conflict between these Standards exists, the more stringent shall apply unless otherwise approved by the Town.

3. STREET SYSTEM DESIGN CRITERIA**3.01. Layout**

Layout of all street systems shall conform to the Town subdivision requirements as defined in the Subdivision Regulations and with the Town Standards including but not limited to the Minimum Design Standards for Curb, Gutter, Sidewalk, and Streets. Generally, local residential cross sections shall be used in areas where average daily traffic (ADT) is not likely to exceed 400 vehicles per day. Collector and arterial streets shall be constructed whenever engineered traffic analysis of the future traffic volumes indicates the need of a cross section greater than that of a local service street as outlined in the Town's typical drawings.

Additional ROW and/or easements may be required to satisfy other criteria contained in these Standards, or as deemed necessary by the Town. Areas outside the ROW shall be contour graded, compacted, and sloped, as required for proper drainage, soil stability, and maintenance accessibility. Outside the clear zone, cuts and fills proposed on slopes greater than three (3) horizontal to one (1) vertical shall require supporting calculations provided by a qualified geotechnical engineer based on a soils analysis. Within the clear zone and immediately behind the curb, slopes shall not exceed 6:1.

Design standards for streets and intersections shall follow the guidance determinations as set forth in the AASHTO “A Policy On Geometric Design Of Highways And Streets” and as supplemented by AASHTO “Local And Low Volume Streets” as well as these Standards and applicable Town regulations. Basis for design shall be documented and referenced.

4. STAKING REQUIREMENTS

The professionally licensed surveyor shall set stakes at the bottoms of the approaches, the vertical point of change (VPC), the design elevation at the vertical point of intercept (VPI) station, the high point or low point, and the vertical point of tangent (VPT), as well as 25’ stationing for the vertical alignment. For the horizontal alignment, provide stakes at 25 ft stations for flow line and top back of walk if not attached to curb, for ADA ramps include the beginning of the drop and end of the drop, sidewalk, begin curb return (BCR), ½ delta, and end curb return (ECR), and the details for the valley pans and fillets.

Survey stakes shall be set so that they are not in the way of construction and a set precisely.

Provide the Town cut/fill sheets that have the name of the point being staked, the station, the offset, the elevation of the top of stake, the design grade at that location, and the cut or fill.

5. DESIGN ELEMENT COORDINATION

Horizontal and vertical alignment continuity shall be provided between new and existing streets to achieve safe and aesthetically pleasing transitions. Sufficient data on existing infrastructure shall be depicted on plans, and limits of construction shall be designated to ensure that the desired continuity is achieved. Drainage and utility facilities are to comply with all applicable sections of Town Standards and are to be fully coordinated with the street design and proposed construction. Where new construction adjoins existing development, the design of the new construction shall incorporate the same standards to the adjoining existing development unless more stringent requirements are deemed necessary and demonstrate in the plans no adverse impacts on existing facilities, public and private.

6. ADA COMPLIANCE

All designs shall meet standards of the Americans with Disabilities Act, 42 U.S.C. § 12101, et seq., as amended. Design guidance is available in the Public Right-of Way Accessibility Guidelines (PROWAG).

7. TRAFFIC IMPACT STUDY

All requests for subdivision, zoning and other site developments shall provide a Traffic Impact Study using the Institute of Traffic Engineers (I.T.E.) informational manual, when requested by the Town, in a form specified by the Town. Impact Studies will typically be required for developments adding more than 12 additional lots.

8. DRIVEWAY CONSTRUCTION REGULATION

Every driveway hereafter constructed, reconstructed or altered, in the Town right-of-way, shall conform with RMC 14-5-15 and to the following regulations.

- 8.01.** No driveway shall be so located as to create a hazard to pedestrians, motorists, or to invite or compel illegal or unsafe traffic movements.
- 8.02.** Unless otherwise approved by the Town, all driveways shall be constructed within lines at right angles to the curb or street line.
- 8.03.** No driveway shall be constructed in such a manner as to create a hazard to any existing street lighting standard, utility pole, traffic regulating device or fire hydrant. The cost of relocating any such street structure when necessary to do so shall be borne by the responsible party. Relocation of any street structure shall be performed only by or through the person holding authority for the particular structure involved.
- 8.04.** No construction, alteration or repair shall be permitted for any driveway which can be used only as a parking space or which provides access only to the area between the street roadway and private property.
- 8.05.** All driveways shall be so constructed that they shall not interfere with the drainage system of the street.
- 8.06.** Where curbs exist, or are required, driveways shall be paved for their full width from the back of curb to the property line.
- 8.07.** A driveway or curb cut on a corner lot shall be set back a minimum of ten (10) feet from the property line at the corner or shall be a minimum of twenty (20) feet from the cross street curb line whichever is greater.
- 8.08.** No property shall be allowed more than one driveway (no looped driveways).
- 8.09.** Allowable widths for driveways are listed on the driveway typical drawings.
- 8.10.** Water meter pits shall not be located in any driving or parking surface unless otherwise approved by the Town.
- 8.11.** No curb cuts shall be allowed on a State Highway except with written permission of the Colorado Department of Transportation. The responsible party shall obtain all required permits.
- 8.12.** Where curbs do not exist and a driveway crosses a drainage ditch, if practical driveway shall have a pan at the barrow ditch. If approved by the Town, a culvert may be installed by the property owner at a diameter sized according to the ditch capacity, but in no case less than twelve (12) inches. The minimum length of any culvert shall be five (5) feet greater than the driveway width or twenty (20) feet whichever is greater. Culvert installation shall include flared end sections with geotextile beneath riprap to prevent erosion.
- 8.13.** Any deviation from these standards shall be allowed only by special written permission from the Town.

9. ANGLED PARKING IN TOWN-OWNED RIGHTS-OF-WAY

- 9.01.** Proposed angled parking in rights-of-way shall not be allowed on Federal or State Highways, Town major arterial streets, or Town minor arterial streets,
- 9.02.** New angled parking in the right-of-way where there is adequate width, shall be constructed in sections not less than half (½) of a town block in length.

9.03. Angled parking in the right-of-way shall meet the following design standards:

- A. A six (6) foot wide sidewalk with a minimum six (6) foot landscaped area between the sidewalk and the vertical curb section, or a fourteen (14) foot sidewalk with a two (2) foot strip of a different pattern or texture before the beginning of the curb/gutter section shall be included, with street trees placed at required intervals in appropriately designed tree grates.
- B. Trees shall be planted between the sidewalk and the parking area at approximately twenty-five (25) foot intervals.
- C. Angled parking in the right-of-way shall be delineated by vertical curbs. However, parking blocks are prohibited.
- D. Landscaped islands defined by vertical curb and gutter extending as far into the street as is necessary to define the required depth of the parking spaces, and a twelve (12) foot to fourteen (14) foot travel lane shall be built at all corners, and at mid-block. The islands at the corners shall be of sufficient size to accommodate adequate snow storage during the winter. The specific size(s) for said islands shall be determined during the review of the construction plans.
- E. Sidewalks and a striped crosswalk at the mid-block crossing may be required. The decision as to the necessity of a sidewalk and crosswalk shall be made during the review of construction plans, and shall be based upon the location and projected level of use.
- F. Angled parking in the right-of-way shall be at either a sixty degree (60°) or forty-five degree (45°) angle. The size of parking spaces shall be in conformance with the parking typical drawing in the Town Standards.
- G. Angled parking in the right-of-way shall not be allowed within forty (40) feet of corners (as measured from the existing curb line) where parked cars back into the travel lane toward an intersection; said parking shall comply with the distance requirements set forth in the edition of the 2010 edition of Model Traffic Code for Colorado Local Governments currently adopted by the Town of Ridgway:
 - i. No parking within five (5) feet of a driveway
 - ii. No parking within fifteen (15) feet of a hydrant
 - iii. No parking within twenty (20) feet of a crosswalk
 - iv. No parking within thirty (30) feet of a traffic control signal

10. DRAINAGE

It shall be the applicant's responsibility to provide engineering drawings stamped by a registered engineer that show adequate drainage capacity including for all run-on water and integrate well with the drainage pattern throughout the rest of the block and downstream. Covered drains may only be allowed in the discretion of the Town in areas where no other reasonable options exist.

11. LANDSCAPING

Landscaping plans for the islands and the entire parking arrangement shall be submitted and approved by the Town prior to construction. Landscaping shall be consistent with the Town Landscape regulations and be consistent with Low Impact Development criteria. Drip irrigation shall be provided where needed to establish

the landscaping. Nonfunctional turf is discouraged. No vegetation or other objects shall intrude into clear vision areas.

12. DEVIATIONS

Deviations from these design standards require written request for the deviation with sufficient support documentation for the Town to assess the request.

13. MAINTENANCE RESPONSIBILITY

Adjacent property owners shall be responsible for maintaining the street trees, vegetated islands, and any planting strips located in the Town's right-of-way in accordance with RMC 14. Adjacent landowners shall also be responsible for snow removal, striping, and pavement repair and/or replacement within any right-of-way.

14. USE OF PARKING

Parking in the right-of-way shall be for use by the general public, and not solely for the private use of the person requesting it, or the adjacent landowner, or business entity owned by said requesting person. Signage is prohibited which purports to limit the public's use of parking spaces that have been installed in the right-of-way.

15. SUBGRADE INVESTIGATION AND PAVEMENT DESIGN REPORT

This report shall be prepared by or under the supervision of and signed by a Professional Engineer currently registered in the State of Colorado and shall include the following information.

- 15.01.** Vicinity map to locate the investigated area.
- 15.02.** Scaled drawings showing the location of soil borings.
- 15.03.** Scaled drawings showing the estimated extent of subgrade soil types.
- 15.04.** ESAL for each street with supporting data and assumptions.
- 15.05.** Pavement design alternatives for each street on a scaled drawing.
- 15.06.** Tabular listing of sample designation, sample depth, Group Number, Liquid Limit, Plasticity Index, percent passing the No.200 sieve, Group Index, Unified and AASHTO Classification, and soil description.
- 15.07.** Proctor Compaction Curves.
- 15.08.** R-value test results of each soil type used in the design. Minimum R values shall meet the Town Standards
- 15.09.** Pavement design methodology following AASHTO Guide for Design of Pavement Structures– with all assumptions and variables clearly defined.
- 15.10.** Design calculations.

15.11. A narrative describing potential subgrade soil problems including, but not limited to, heave or settlement prone soils, frost susceptible soils, ground water, drainage considerations (surface and subsurface), cold weather construction (if appropriate), and other factors, properties, or fill areas which could affect the design or performance of the pavement system.

15.12. Recommendations to alleviate or mitigate the impact of problems discussed above.

16. QUALITY CONTROL

The Responsible Party is responsible for quality control of all work performed and shall implement whatever procedures, methods, testing, surveying, and supervision that is required in order to insure that the work conforms to the approved plans and Street System Standards.

The Responsible Party is responsible for submission of HMA quality control testing documentation to verify that the mix design for the work performed conforms to the Standards for Hot Mix Asphalt (HMA) as shown in Table 1.

HMA *			
Asphalt Content (QC)	CP41 method A or E, or CPL 5120	1 per 1000 Ton 1 per day min.	1 per 1000 Ton 1 per Day min.
Gradation of aggregate (QC)	CP31 CDOT Table 703-3	1 per 1000 Ton	1 per 1000 Ton
Air Voids (Pa) (QC)	AASHTO T 269 2.8% to 5.2%	1 per 1000 Ton	1 per 1000 Ton
Voids in Mineral Aggregate (VMA) (QC)	CP48 See Table 5	1 per 30,000 Ton	1 per 30,000 Ton
Percent Relative Compaction (QC)	CP81 92% to 96%	1 per 500 SY	1 per 800 SY

17. QUALITY ASSURANCE

The developer, owner or Responsible Party for administering the construction of public facilities shall provide a quality assurance program. This program shall include systematic inspection and testing of the work and materials during construction to assure the owner and the Town that the Contractor is providing work that is in conformance with the Town-approved plans and specifications.

Initial testing shall be performed at the beginning of each construction phase in order to identify and correct any non-compliant work.

A minimum of one test will be required for any portion of material less than that shown in the "Frequency" column on Table 1 above.

All failing tests shall be re-tested after the material has been reworked, modified or adjusted by the Contractor. The Contractor will be required to remove and replace any work or materials that do not meet test requirements or specifications to the satisfaction of the Town.

18. GRADE CONTROL

Establish and maintain the required lines and grades, including crown and cross-slope, for each course during construction operations. Provide stakes (red top, orange top, blue top) at 25' station at the crown and edges of the road. Preserve staking and provide at least 2 business days' notice to the Town before string lining the top of each lift so that the Town can observe the grade measurements.

19. REMOVALS, EXCAVATION, BACKFILLING, AND RESTORATION SPECIFICATIONS**19.01. General**

This section covers surface removals, excavation, backfilling, compaction, disposal of surplus material, restoration of disturbed surfaces, and all other work required for the safe and proper road construction.

19.02. Concrete Removal

Concrete pavement shall be cut vertically along pre-marked lines, unless otherwise specified. The depth of the saw cut shall be to the full depth of the concrete section. Cut shall begin at construction joint and extend to the next construction joint unless the plate remaining will be more than 4 ft long.

19.03. HMA Pavement Removal

HMA pavement designated to be cut for removal, where new HMA pavement will be placed against the cut face, shall be wheel cut or saw cut, along a neat line. HMA pavement designated for removal, where concrete pavement will be placed against the cut face, shall be saw cut along a straight line with a vertical face. Cut faces of concrete and HMA pavement shall be protected from damage until the new pavement is placed against them.

19.04. Excavation and Backfill of Structures and Pipes

Pipe bedding and trench backfill material and compaction requirements are specified in Section 02200 of these Standards.

Flow-fill, where approved by the Town for use, shall meet the requirements of CDOT Standards. The Town may require that a sample of the proposed flow-fill mix be prepared, tested and/or placed in the backfill to demonstrate its performance prior to approval of the mix. Flow-fill shall be placed to the depth indicated on the plans or as directed by the Town. Bleed water shall be drained off or otherwise removed from the surface of the flow-fill after it has been placed.

Excavation and backfill for the installation of all pipe, manholes, valves, vaults and other structures and appurtenances shall be in accordance with Sections 02200, 02713, and 02723.

19.05. Sub Base Preparation

When material needs to be excavated to reach the elevation at the bottom of the aggregate it shall be cut to elevation. Then it shall be scarified a minimum of 8", moisture conditioned to +/-2% of optimum moisture, and compacted to 95% standard proctor.

Where fill is needed to reach sub base elevation, prior to fill, the area shall be scarified a minimum of 8", moisture conditioned to +/-2% of optimum moisture, and compacted to 95% standard proctor. The fill shall then be placed in maximum 8" lifts with materials specified on the Town approved plans, and each 8" shall be compacted to 95% modified proctor at +/- 2% optimum moisture, tested, and proof rolled.

19.06. Topsoil Placement

Topsoil shall be furnished in and installed in accordance with the requirements in Section 02200 of these standards.

19.07. Dust Control

The Responsible Party shall furnish and apply a dust palliative on portions of the roadway, haul roads and other locations as necessary or as directed to prevent air borne dust. This shall include prevention of dust generated from the Contractor's operations and from windy weather conditions. Dust abatement shall be provided, as needed, throughout the construction period, including nights, weekends and holidays.

19.08. Subgrade Stabilization

Subgrade stabilization shall be provided in accordance with Section 02200 of these Standards.

20. BASE COURSE CONSTRUCTION**20.01. General**

- A. Materials shall be placed on an approved subgrade that has been proof rolled within the previous twenty-four hours and found to be stable and non-yielding. Should weather conditions change, such as freezing, precipitation, etc., aggregate base materials shall not be placed until the subgrade has been retested and proof rolled and is re-approved by the Town. Each subsequent lift shall be density tested and proof rolled before placing the following lift.
- B. The required thickness of the base course may be reduced, subject to the approval of the Town, by increasing the depth of HMA at the rate of two (2) inches of aggregate base course to one (1) inch of HMA, or appropriate depths based on strength coefficients.

- C. If the required compacted thickness exceeds six (6) inches, the base course shall be constructed in two or more lifts of equal thickness. The maximum thickness of any lift to be compacted shall not exceed six (6) inches.
- D. The minimum depth of base course on streets and alleys shall be six (6) inches. Class 5 and 6 material shall be classified as base course. Class 5 and Class 6 material shall have a minimum "R" value of 78. Class 6 shall meet the requirements of Sub section 2.04 of Section 02200.
- E. Class 2 material shall be classified as subbase course and shall be used only when the base requirement is greater than six (6) inches. Class 2 material shall have a minimum "R" value of 70. Class 2 shall meet the requirements of Sub section 2.04 of Section 02200.

20.02. Base Course Placement

- A. The base course material shall be placed on the previously prepared subgrade at the locations and in the proper quantities to conform to the typical cross sections as shown on the plans. Placing and spreading shall be done by means of a spreader machine, moving vehicle, motor grader, or by other approved equipment methods. The material shall be placed without segregation. Any segregated areas shall be removed and replaced with uniformly graded material at the Responsible Party's expense.
- B. The base material may be placed in lifts of up to six (6) inches, providing that after compaction, uniform density is obtained throughout the entire depth of the lift. If the required depth exceeds six (6) inches, it shall be placed in two (2) or more lifts of approximate equal thickness. If uniform density cannot be obtained by six (6) inch lifts, the maximum lift shall not exceed four (4) inches in final thickness.
- C. Base material shall not be placed on a foundation that is soft or spongy or one that is covered by ice or snow. A geotechnical engineer shall provide base material recommendations where foundations are not stable.
- D. Base material shall not be placed on a dry or dusty foundation where the existing condition would cause rapid dissipation of moisture from the base material and hinder or preclude its proper compaction. Such dry foundations shall have water applied to them and shall be reworked or re-compacted.
- E. Care shall be exercised in the hauling and placing of base course so as to avoid segregation of the coarse and fine materials. The base course material shall be placed on the previously prepared and approved subgrade in sufficient quantity to conform to the thickness specified on the approved cross section. The material shall be mixed and watered to obtain a uniform mixture at optimum moisture.

20.03. Compaction

- A. Rolling shall be continuous until the base material has been compacted thoroughly in accordance with Section 304 of the current CDOT Standard Specifications.
- B. Water shall be uniformly applied as needed during compaction of each lift to obtain optimum moisture content and to aid in consolidation. The surface of each lift shall be maintained during the compaction operations such that a uniform texture is produced and the aggregates are firmly placed.

- C. The compaction shall be continued until the base course has a density of not less than ninety-five percent (95%) of its modified proctor value at +/- 2% optimum moisture.

20.04. Testing

The Responsible Party shall provide and pay for laboratory and field testing at the rate of 1 test for every 500 square feet of surface on every finished subgrade, sub base and base surface to demonstrate quality assurance.

- A. At least twenty percent (20%) of the tests shall be taken within one (1) foot of a manhole or valve box.
- B. Nuclear testing equipment and methods are acceptable when performed by an approved certified testing laboratory and when performed in accordance with the requirements of ASTM D-2922 and ASTM D-3017.
- C. Proof rolling
 - i. After each lift of base course has been compacted, tested and found to meet specifications, the entire lift shall be proof-rolled with a heavily loaded vehicle with the Town or approved representative onsite for observation. The vehicle must have a certified loaded GVW of fifty thousand (50,000) pounds with a loaded single axle weight of at least eighteen thousand (18,000) pounds and a tire pressure of ninety (90) psi. Subbase that is pumping, deforming, or failing in any way shall be reworked, replaced or otherwise modified to form a smooth, stable, non-yielding base for subsequent paving lifts. The Town shall be notified at least twenty-four (24) hours before final proof rolling.
 - ii. Each lift shall be proof rolled prior to the placement of the next lift.

20.05. Finished Surface

The finished base course surface shall be smooth and free of ruts and irregularities, and shall be true to grade and crown as shown on the plans. The base course shall be maintained in this condition by watering, drying, rolling, or blading until the final surface is placed.

20.06. Base Course Approval

The results of field density tests and proof rolling shall be submitted and reviewed by the Town. Provided all tests are acceptable, compaction shall be approved for the placement of the HMA. Should testing indicate unsatisfactory work, the necessary reworking, compaction or replacement shall be required prior to continuation of the paving process. The approval is valid for twenty-four (24) hours. Changes in weather, such as freezing or precipitation, shall require re-approval of the base course.

20.07. Shape Control

Responsible Party shall demonstrate by string lining that the base course is shaped to the design shape in the presence of the Town.

21. HMA PAVEMENT MATERIALS AND CONSTRUCTION**21.01. General**

This work consists of one or more lifts of a bituminous mixture constructed on a prepared foundation in accordance with these Street Standards. The placement of HMA shall conform to the lines, grades, thickness and typical cross sections shown on the plans or established. Each lift shall be compacted to the required density and approved before placement of the next lift.

HMA for patching consists of those quantities required for the replacement of unstable corrugated areas in the existing pavement, pipe trenches, areas removed for curb and gutter forms, areas between the curb and gutter or sidewalk and the existing paved parking lots, and areas designated on the plans.

21.02. Storm Drain Protection

Provide appropriate means to protect all storm drain inlets and road side ditches from contamination during paving activities. Following completion of paving remove any temporary controls and clean drainage structures as necessary.

21.03. Weather Limitations

Apply prime and tack only when the ambient temperature in the shade is 50°F and when the temperature has not been below 35°F in the previous 12 hours.

Do not pave when base surface is wet or contains an excess of moisture.

Place asphalt only when the air temperature is 40°F or above, when the underlying base dry and the weather is expected to not precipitate.

21.04. Traffic Control

Control vehicular and pedestrian traffic as needed to protect the public and the paving operations in accordance with the MUTCD.

Provide flagman, barricades, warning signs, and warning lights for movement of traffic and safety to cause the least disruption to the work and inconvenience to the public.

Street closures require approval of the Town and notice to all impacted users of the roadway.

21.05. Aggregates

Aggregates shall be of uniform quality, clean, hard, durable particles of crushed stone, crushed gravel, natural gravel, or crushed slag free from clay balls, organic matter, or other deleterious materials. Aggregates meeting the requirements of Table 2 shall be used to develop the Job Mix Formula and the HMA mixture. The aggregate should be composed of angular, coarse textured, cube shaped particles. Excess of fine material shall be wasted before crushing. Sand may be used to obtain gradation of the blended aggregate mixture but should not exceed more than fifteen percent (15%). If the percent aggregate passing the #4 sieve is greater than ten percent (10%) by weight of the individual aggregate sample, plasticity will be determined in accordance with AASHTO T 90. Aggregate moisture content shall be no more than two percent (2%).

TABLE 2: AGGREGATE PROPERTIES

Property	Test Procedure	Coarse Retained on #4 Sieve	Fine Passing the #4 Sieve
Fine Aggregate Angularity Traffic Level Low, Moderate Trails and Pathways	CP-L5113 Method A		40% Minimum
Traffic Level 3 to 5 Moderate, High, Parking Lots			45% Minimum
Fractures Faces (minimum 2)	CP-45	80% Minimum	
LA Abrasion	AASHTO T 96	45% Minimum	
Flat and Elongated Places	AASHTO M 283	10% Maximum	
Sodium Sulfate Soundness	AASHTO T 104	12 % Maximum Combined Coarse and Fine	
Adherent Coating (Dry Sieve)	ASTM D 5711	0.5 %	45% Minimum
Sand Equivalent	AASHTO T 176		45% Minimum

A. Sources of Aggregates

Sources of aggregates shall be designated by the Responsible Party with the submittal of the job mix formula.

B. Gradation

The gradation of aggregates used in the mixture shall meet the criteria shown in Table 3, the Aggregate Master Range Table, and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, or vice versa, but shall be well graded from coarse to fine. The nominal size aggregate used in the HMA mixture shall not be more than one-third (1/3) the thickness of the HMA lift being constructed.

TABLE 3: AGGREGATE MASTER RANGE TABLE

Sieve Size	Percent by Weight Passing Square Mesh Sieves		
	Grading S	Grading SG	Grading SX
1 ½"		100	
1"	100	90 - 100	
¾"	90 - 100		100
½"			90 - 100
3/8"			
#4			
#8	23 - 49	19 - 45	28 - 58
#30			
#200 ¹	2 - 8	1 - 7	2 - 10

21.06. HMA Material

Binder (asphaltic cement) shall be from an approved source and shall meet the requirements listed in Table 702.2 of the current CDOT Standard Specifications for Road and Bridge Construction. Based on climatic conditions and reliability, the binder grade approved for use in the Ridgway area is PG 64-22 or PG 58-28 Non-Modified Binder and PG 64-28 Modified Binder.

A. Composition of Mixture

The HMA plant mix shall be composed of a mixture of well-graded aggregate, filler (if required), bituminous material and anti-stripping additive. The aggregate fractions shall be sized, handled in separate size groups and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula.

B. Asphalt content control shall be part of the Contractor's Quality Control. If the materials are within the specification limits, the lot shall be acceptable. Volumetrics falling outside the limits of the job mix formula will warrant corrective action, which may include removal and replacement of the represented day's production.**C. Job Mix formula**

No HMA mixture shall be produced until the Town has approved a job mix formula.

- i. The job mix formula shall be submitted by the Responsible Party to the Town at least ten (10) days prior to the start of paving operations.
- ii. Design Criteria

TABLE 4 DESIGN CRITERIA	
Test Property	Requirements
Stability	28 min
Compaction Gyrations (N design)	75*
Air Voids (percent by volume of mix)	3.0 to 5.0
Voids Filled (percent by volume of mix)	65 TO 78
Voids in Mineral Aggregate	See Table 5

* On roadways with high traffic loading, N design values greater than seventy-five (75) gyrations may be specified by the Engineer of record (See Table 2-1 in the CAPA Guideline for the Design and Use of Asphalt Pavements for Colorado Roadways)

TABLE 5				
Voids in Mineral Aggregate (VMA)				
Nominal Maximum Particle Size *		Minimum VMA (percent)		
		Percent Design Air Voids		
mm	In.	3.0	4.0	5.0
9.5	3/8	14	15	16
12.5	1/2	13	14	15
19	3/4	12	13	14
25	1	11	12	13
37.5	1-1/2	10	11	12
* The nominal maximum particle size is one sieve size larger than the first sieve to retain more than ten percent (10%).				

- iii. The maximum size aggregate used shall not be more than one-third ($\frac{1}{3}$) of the thickness of the lift being constructed. (3:1 ratio)
- iv. Job mix control testing shall be performed by the contractor at the start of plant production and in conjunction with calibration of the plant for the job mix formula.
- v. It should be recognized that the aggregates produced by the plant may not satisfy the gradation requirements or produce a mix that exactly meets the job mix formula. In those instances, it will be necessary to reevaluate and redesign the mix using plant-produced aggregates.
- vi. Contractor may propose a design using rubber additives, recycled asphalt, warm mix asphalt, or other new technologies. The design shall be submitted to the Town for approval.

21.07. Transportation

- A. Transport asphalt concrete mixtures from mixing site in trucks having tight, clean, smooth, metal beds. Coat hauling compartments with lime-water mixture to prevent asphalt concrete mixture from sticking. Use of diesel is prohibited. Elevate and drain compartment of excess solution before loading mix.
- B. Observe State Highway overweight regulations. When requested by the Town, provide weigh tickets whereby the items required on the tickets shall conform to CDOT Specifications section 109.01 demonstrating conformance with the regulations. Should an overweight limit be exceeded, the Responsible Party shall pay the Town in accordance with CDOT Specifications section 105.18 shown below:

Overweight (Pounds)	Price Reduction (Dollars)
0 - 3000	20
3001 - 4000	40
4001 - 5,000	82
5,001 - 6,000	130
6,001 - 7,000	226
7,001 - 8,000	376
8,001 - 9,000	582
9,001 - 10,000	842
Over 10,000	\$870 plus \$164 for each 1,000 lbs over 10,000 lbs

- C. When necessary, so that the mixture will be delivered on the project at the specified temperature and be protected from weather, provide covers of such size as to protect the mixture. During periods of cold weather or for long-distance deliveries, provide insulation around entire truck bed surfaces and provide covers securely fastened.

21.08. Job Mix Testing Requirements

All commercial testing and laboratory work necessary to establish the job mix formula and all testing necessary to assure conformance of materials and workmanship to the requirements of the specifications shall be arranged for and paid for by the Contractor. Copies of all test reports shall be promptly submitted directly to the Town.

21.09. Volumetric Tolerances

HMA mix design volumetric tolerances for the approved HMA mixture shall be within the limits shown in Table 7. Mixture being produced by the plant shall be verified prior to the start of the placement of the mixture. Verification shall be performed by a LabCAT Level C certified technician to verify the volumetric properties of the mixture. If the mixture has been produced for another project within the last ninety (90) days, verification results from that project may be submitted for this verification.

TABLE 7: HMA MIXTURE DESIGN VERIFICATION TOLERANCES

Property	Tolerances
Air Voids	± 1.2%
VMA	± 1.2%
Binder Content	± 0.3%
Stability	applicable minimum

21.10. Lift Thickness

Each lift of compacted HMA shall be of uniform thickness. The minimum compacted lift thickness shall be three (3) times the maximum nominal aggregate size. The maximum thickness shall be three (3) inches unless the contractor can demonstrate the ability to achieve compaction of thicker lifts.

21.11. Prime Coat

Prime coat materials and application shall be in accordance with the requirements of the current CDOT Standard Specifications, Section 407. Prime coat shall be applied to compacted base course except when the base has been processed and compacted in the last twenty-four (24) hours. Prime coat material shall be allowed to cure a minimum of twenty-four (24) hours prior to asphalt paving unless otherwise authorized by the Town.

A. Surface Preparation

Before applying the prime coat, all loose material shall be removed from the surface. That portion of the surface prepared for treatment shall be dry and in satisfactory condition. Dust or contamination of prime coats shall require brooming and reapplication.

B. Emulsified Application

Asphalt Emulsified Prime (AEP) shall be applied in accordance with the manufacturer's recommendations. The prime coat shall be carefully applied. If excessive amounts of curb, sidewalks, or other structures are sprayed with liquid asphalt, they shall be cleaned at the Responsible Party's expense. The prime coat shall not be applied when the surface is excessively wet, when the atmospheric temperature is less than forty degrees (40°) Fahrenheit, when precipitation is imminent, or as recommended by the manufacturer.

C. Curing

Curing shall be required for all prime coats. The prime coat shall be sticky, or tacky, when cured. The length of time required for curing shall depend on the air temperature, humidity and wind conditions, and the prime coat shall be black when cured. The prime coat shall be allowed to cure for a minimum of twenty-four (24) hours prior to the paving operation unless otherwise authorized by the Town. If after the curing period the prime coat has not penetrated the base material, and the surface must be used by traffic, a suitable blotter material shall be applied in amounts necessary to absorb excess liquid asphalt. The blotter material shall be a dry, gritty sand.

D. Coverage

Prime coat AEP shall be uniformly applied at a rate of three-tenth (0.3) gallons per square yard to the surface of the aggregate base course. Application rates for other approved prime coat materials shall be as specified in the Contract Documents or as directed by the Town.

21.12. Tack Coat

All tack coat materials and construction shall be in accordance with the requirements of the current CDOT Standard Specifications, Section 407. Tack coat shall be applied where additional HMA is to be placed over existing asphalt or concrete surfaces and any other locations noted on the Town approved construction plans. Tack coats may not be required where prepared surface has not been opened to traffic and is less than twenty-four (24) hours old and remains free of dust, dirt or debris.

A. Surface Preparation

Before applying the tack coat, all loose material shall be removed from the surface. That portion of the surface prepared for treatment shall be dry and in satisfactory condition. Dust or contamination of tack coats shall require brooming and reapplication.

B. Liquid Asphalt

The liquid asphalt used for tack coat shall be an emulsified asphalt grade CSS-1h or SS-1h and shall satisfy the requirements of ASTM D977. Other emulsified asphalts may be used upon written permission of the Town.

C. Application

The surface shall be allowed to cure to permit drying and setting of the tack coat prior to the paving operation. A 1:1 dilution should be applied at the rate of 0.05 to 0.15 gallons per square yard. A wand, spray bar, or hand spray nozzle attached to the spray bar can be used for applying tack to gutter faces, valve boxes, manholes and rings.

22. ASPHALT DELIVERY AND PLACEMENT**22.01. Equipment**

Provide the size and quantity of equipment to ensure a uniform continuity of operation and to complete the work specified within the project time schedule.

A. Asphalt Distributor

The distributor shall be in good mechanical condition and shall be capable of uniformly distributing the prime coat throughout a reasonable range of widths, pressures, temperatures, and application rates.

Distributor equipment shall include a tachometer, pressure gauges, accurate volume measuring devices or a calibrated tank, and thermometer for measuring temperatures of tank contents. They shall be equipped with a power unit for the pump, and full circulation spray bars adjustable laterally and vertically.

B. Bituminous Pavers

Pavers shall be self-contained, power-propelled units, provided with an activated screed or strike-off assembly, heated, if necessary, that shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture and control pavement edges to true lines and grades without the use of stationary forms.

The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation and shall be equipped with a distributor system to place the mixture uniformly in front of the screed without segregation. Asphalt mix shall be placed and compacted in succeeding layers not to exceed 3" in depth.

C. Rolling Equipment

Rollers shall be self-propelled steel-wheeled rollers, pneumatic-tired rollers, or vibrating rollers, capable of reversing without backlash.

The number and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition.

D. Hand Tools

Provide rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heaters, and other miscellaneous small tools to complete the work specified.

22.02. Placing the Mix

The asphalt concrete mixture will be placed by a paving machine as specified, capable of spreading the mixture true to line, grade, and crown. The mixture shall be spread at a temperature of not less than 250°F. The desired temperature shall be set by the Engineer and shall be maintained within plus or minus 30°F. Hand placing and spreading will be permitted in inaccessible and small areas. Place each course in one or more lifts to provide a nominal compacted thickness conforming to the indicated grade, cross-section, finish thickness, and density, as specified and shown on the drawings.

A. Continuity of Operations: It is essential to place the mixture in as continuous an operation as practicable to ensure good plant mix asphalt paving with good riding qualities and uniform density.

- i. The paver speed will be maintained in balance with the plant production, and a sufficient number of trucks should be available to assure uniform capacity operation of the asphalt plant and pavers.
- ii. Defects caused by unnecessary stopping due to lack of coordination between mixing, hauling, and lay down shall be removed and replaced.

B. Pavement Placing: Paving operations shall begin along the concrete gutter or low side of street and in direction of traffic flow and work toward crown from both sides of the street.

- i. After the first truckload of the day has been spread, the loose and compacted depths shall be checked so that a ratio can be established for the correction of loose depth.
- ii. If segregation of materials should occur, the spreading operation will be stopped immediately and not resumed until the cause is determined and corrected.
- iii. Any asphalt mix which clings to the sides of the hopper shall be continually loosened and pushed into the active mix. No mix shall be retained in the hopper when there is a delay in the asphalt concrete supply.
- iv. Immediately after any course is screed, and before roller compaction is started, the surface shall be checked. Any area showing an excess or deficiency of bituminous material shall be removed and replaced and all irregularities in alignment and grade shall be corrected by the addition or removal of mixture.

C. Hand Placing: Place mixture at a rate that will ensure handling and compaction before mixture becomes cooler than acceptable working temperatures. The mixture will be spread, tamped, and

finished to a uniform density and to the correct depth. The surface will be checked as required under paver placing.

D. Joints

- i. Carefully make joints between old and new pavements, or between successive days work, to ensure a continuous bond between adjoining work. Saw cut existing old pavement so that an even vertical surface is exposed. Apply tack coat and butt new pavement up to saw cut edge of existing pavement. Construct joints to have the same texture, density, and smoothness as the adjacent section of asphalt concrete course.
- ii. Clean contact surfaces free of sand, dirt or other objectionable material and apply tack coat. Also apply tack coat to contact surfaces of old pavement joints before placing mixture against them.
- iii. Offset transverse joints in succeeding courses not less than 24 inches.
- iv. Cut back edge of previously placed course to expose an even, vertical surface of full course thickness. Offset longitudinal joints in succeeding courses not less than 6 inches.
- v. When the edges of longitudinal joints are irregular, honeycombed, or inadequately compacted, cut back unsatisfactory sections to expose an even, vertical surface of full course thickness.

22.03. Compacting the Mix

- A. A minimum of two rollers will be required and as many additional rollers as necessary shall be used to compact the asphalt mixture at the proper temperature to obtain the specified pavement density.
- B. Begin rolling operations as soon after placing when the mixture will bear weight of roller without excessive displacement. Delays in rolling of fresh mixture shall not be tolerated.
- C. The roller wheels shall be kept moist with only enough water to avoid picking up the material. A detergent may be added to the water, but no oil will be permitted for this purpose.
- D. Do not permit heavy equipment, including rollers, to stand on finished surface before it has thoroughly cooled or set.
- E. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- F. The line of rolling should not be suddenly changed or the direction of rolling suddenly reversed, thereby displacing the mix.
- G. If rolling causes displacement of materials, the affected areas shall be loosened at once with lutes or rakes and restored to the original grade with loose material before being re-rolled.
- H. Rolling Transverse Joints:
 - i. The first pass shall be made with the steel-wheeled roller moving along the longitudinal joint for a few feet.
 - ii. The surface shall then be straight-edged and corrections made, if necessary.
 - iii. The joint will then be rolled transversely with the roller on the previously laid material, except for a six (6) inch projection of the wheels. Continue with successive passes each covering six

(6) to eight (8) inches of fresh material until the entire width of the drive roll is on the new mix.

- iv. Unless boards of proper thickness are placed at the edge of the pavement to permit off the pavement movement, the transverse rolling shall stop six (6) to eight (8) inches short of the outside edge with this edge being rolled out later when rolling longitudinally.
- I. Rolling of longitudinal joints shall follow directly behind the paving operation.
 - i. The roller shall ride on the previously placed lane, except for a six (6) inch projection of the roller wheel onto the new mix. The roller shall continue to roll along this line, shifting its position gradually across the joint, until a thoroughly compacted, neat joint is obtained.
 - ii. The edges of the pavement shall be rolled concurrently with the longitudinal joint. The roller wheels shall extend two (2) to four (4) inches beyond the pavement edge.
 - iii. After longitudinal joints and edges have been compacted, breakdown rolling shall follow immediately.
- J. Breakdown Rolling: Accomplish breakdown rolling immediately following rolling of transverse and longitudinal joints and outside edge.
 - i. Operate rollers as close as possible to paver without causing pavement displacement.
 - ii. The roller operation shall progress with the drive wheel forward in the direction of paving.
 - iii. Check crown, grade, and smoothness after breakdown rolling and repair displaced areas by loosening at once with lutes or rakes and filling, if required, with hot loose material before continuing rolling.
- K. Intermediate Rolling: Follow the breakdown rolling as closely as possible while the asphalt mix is still plastic and at a temperature that will result in maximum density.
 - i. Pneumatic-tired rollers shall be used for the intermediate rolling unless otherwise acceptable to the Engineer.
 - ii. Rolling shall be continuous, at least three complete coverages, after the breakdown rolling until all of the mix placed has been thoroughly compacted.
 - iii. The turning of pneumatic-tired rollers on the paving mix, which causes undue displacement, will not be permitted.
- L. Finish Rolling: Perform finish rolling while the mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and the course has attained specified density.

23. APPURTENANCES

Valves and manholes and other surface appurtenances shall be protected by plastic and paved over and then adjusted to ¼" below the finished elevations and set to match the road slope.

24. PATCHING

Unless otherwise approved by the Town, all trenches and excavations in collector or arterial streets shall be patched before the street is reopened to traffic. All longitudinal trenches shall be repaved with an asphalt

paving machine. The Responsible Party shall maintain all temporary patches until a permanent patch is installed. Between November 15th and March 1st, a four (4) inch thick concrete cap will be required on all excavations in asphalt section of right-of-way unless otherwise approved by the Town that is to be replaced with asphalt when the hot mix asphalt is available. Patching construction shall be consistent with the Town's typical trench detail.

25. SURFACE SMOOTHNESS

The finished surface of all pavements may be subject to testing by the 10-foot straightedge method. At the request of the Town, the Responsible Party shall furnish an approved ten (10) foot straightedge and depth gauge and provide an operator to assist the Town in testing the finished pavement surface. Areas to be tested shall be determined by the Town or the Construction Inspector. The variation between any two contacts with the surface shall not exceed three-sixteenth (3/16) inch in ten (10) feet. Areas showing deviation of more than three-sixteenth (3/16) inch shall be marked and corrected at the Responsible Party's expense. This test may be waived by the Town.

26. FIELD QUALITY CONTROL

Density Control - Conduct tests for density control during compaction operations in accordance with the requirements of ASTM 02950 - Tests for Density of Bituminous Concrete In-Place by Nuclear Method. The Responsible Party shall provide and pay for all laboratory and field testing at the rate of 1 test per 500 square foot of asphalt area on the top of each lift for quality assurance.

Depth of Asphalt Control - Conduct tests of in-place compacted thickness to ensure the required thicknesses are achieved as specified on the drawings and herein. A minimum of one core sample for every 1200 square yards is required to measure thickness and Marshall stability and flow.

27. PAVEMENT MARKINGS

27.01. Striping: Material for striping shall be a modified epoxy meeting the requirement of CDOT 713.17 on the CDOT approved product list. Striping shall be completed in accordance with the approved design drawings, CDOT section 627.05 and other applicable CDOT standards and manufacturer's recommendations. When the quantify of striping for parking lines is minimal as determined by the Town, parking lines can be marked with two layers of acrylic, each layer meeting the requirements of CDOT 627-04.

27.02. Words and Symbols: Material for markings other than striping shall be from Preform Plastic Type I (permanent) meeting the requirements of CDOT 713.13 and listed on the CDOT approved product list. Work shall be completed in accordance with the approved design drawings, applicable CDOT standards including but not limited to sections 627.08, and manufacturer's recommendations.

27.03. Retroreflectivity of pavement markings shall be tested in accordance with CDOT 105.03 (a). If retroreflectivity reading in less than 175, the epoxy shall be removed and replaced. Retroreflectivity of all materials shall meet the requirements of CDOT 713 and other relevant CDOT standards and applied consistent with CDOT standards and manufacturer's recommendations.

28. CLEANING AND PROTECTION

28.01. Cleaning: When paving is complete, clean surface of all spilled asphalt materials.

28.02. Protection: After final rolling, do not permit vehicular traffic on asphalt concrete pavement until it has cooled and hardened and in no case sooner than 6 hours, unless the Town Manager allows.

28.03. Provide barricades and warning devices as required to protect pavement and the general public. Cover openings of structures in the area of paving until permanent coverings are placed.

29. FINAL INSPECTION AND ACCEPTANCE

The acceptance of all road and bridge improvements by the Town will be based on the following.

29.01. Submittal of satisfactory results of all required quality assurance (QA) tests certified by the Responsible Party's Engineer or a qualified independent laboratory.

29.02. Submittal of a copy of the daily inspection reports prepared by the Responsible Party's Engineer or his representative.

29.03. Passing a final inspection of the work by the Town.

29.04. Submittal of two sets of Record (As-Built) Drawings in accordance with the Town of Ridgway submittal standards in Sub Section 19 of the General Requirements for the Town Standards.

29.05. The Responsible Party shall guarantee all portions of the street for a period of two (2) years after completion against defective workmanship and materials and shall keep the street in good repair during that period. The Town shall possess sole authority to require the Responsible Party to repair or replace dedicated public improvements throughout the warranty period. This decision shall be final and obligatory upon the Responsible Party.

30. SIGNS

30.01. General

Regulatory and street name signs shall be on breakaway posts and generally conform to the Manual of Uniform Traffic Control Devices section 2D.38. Colors used shall be those specified in the MUTCD.

30.02. Design

Town street names signs shall be as directed by the Town to match other signs in the Town. The font shall be Standard Alphabets for Traffic Control Devices Series B. The Town logo shall be affixed to the left of the street name. Punctuation shall not be used.