

Section 501. PLANT PRODUCED HOT MIX ASPHALT

501.01. Description. This work consists of providing and placing Hot Mix Asphalt (HMA) mix using Superpave Mixture Design Methods.

A. Terminology.

Broken Aggregate. Cracked aggregate caused by construction operations.

Crack. A visible fissure of varying length and orientation in the HMA, partially or completely through at least one course.

Flushing. A shiny or reflective condition, tacky to the touch, appearing on the HMA surface when asphalt binder collects in the voids at high pavement temperatures.

HMA Mix Design. The selection and proportioning of aggregates, mineral filler, Reclaimed Asphalt Pavement (RAP), and asphalt binder to meet the mix design criteria required by the contract.

HMA Segregation. Areas of HMA pavement exhibiting non-uniform distribution of coarse and fine aggregate particles, visually or otherwise identifiable.

Job Mix Formula (JMF). An HMA mix for a specific project, including adjustments to optimize the field application.

Lot. A discrete tonnage of one mix, typically made up of five sublots.

Pavement. The completed HMA placement, including layers on driving lanes and shoulders.

Pavement Edge. The extremity boundaries of the pavement.

Roller Cracking. High density surface map-cracking that appears immediately after rolling.

Rutting. A depression or displacement of the HMA surface that occurs in a longitudinal direction or a localized area.

Sublot. A portion of a lot represented by a complete set of quality assurance tests.

Target Value. A JMF parameter value that may be adjusted, if approved by the Engineer, to account for changes in the physical properties of the mixture.

501.02. Materials. Provide materials in accordance with the following:

Superpave HMA Mixtures.....902

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Superpave Aggregates.....	902
Mineral Filler, 3MF.....	902
Anti-Foaming Agent.....	904
Asphalt Binders.....	904
Bond Coat, SS-1h, CSS-1h.....	904

Plant produced HMA consists of asphalt binder, aggregates, mineral filler, and other additives.

Provide release agents that do not harm the HMA mixture. Do not use fuel oil or other distillate derivatives.

Provide the HMA mix type and the performance grade of asphalt binder as required by the contract.

Provide blended aggregates for HMA top course mixtures, except top courses for shoulders, bike paths, temporary roads, and parking areas, meeting the required Aggregate Wear Index (AWI).

A. Composition of HMA Mixtures.

1. **Mix Design.** Develop an HMA mix design in accordance with the *HMA Production Manual* and submit to the Department. The Department will evaluate the design in accordance with Section 1 of the *HMA Production Manual*, "Procedures for HMA Mix Design Processing."

Provide written certification that the materials in the mix design are from the same source and meet the material properties in the mix design or the Department-approved JMF. Ensure that all JMF adjustments are in accordance with the *HMA Production Manual*.

The Contractor may use mix designs approved by the Department on other projects, if approved by the Engineer. Provide combined aggregate blends meeting the properties specified in section 902. Provide a mix design that meets the requirements of Table 501-1, Table 501-2, and Table 501-3 as applied to combined aggregate blends.

For mix design purposes, top and leveling courses are the mix layers within 4 inches of the surface. The base course consists of the layers below 4 inches from the surface. For mix layers within the 4-inch threshold, if less than 25 percent of the mix layer is within 4 inches of the surface, the mix layer is a base course.

For projects that specify a mix type E03, the Contractor may use a mix type LVSP.

If High Stress HMA is shown on the plans, provide the same mix design as required for the mainline top and leveling courses, except change the performance graded binder as shown on the HMA application table.

Table 501-1 Superpave Mix Design Criteria					
Design Parameter	Mix Number				
	5	4	3	2	LVSP
Percent of Maximum Specific Gravity (%G _{mm}) at the design number of gyrations, (N _d) (c)	96.0% (a)				
%G _{mm} at the initial number of gyrations, (N _i)	See Table 501-3				
%G _{mm} at the maximum number of gyrations, (N _m)	98.0%				
VMA min % at N _d (based on aggregate bulk specific gravity, (G _{sb})) (c)	15.00	14.00	13.00	12.00	14.00
VFA at N _d	See Table 501-2 (b)				
Fines to effective asphalt binder ratio (P _{No200} /P _{be})	0.6–1.2				
Tensile strength ratio (TSR)	80% min				
a. For mixtures meeting the definition for base course, design mixtures to 96.0% of Maximum Specific Gravity %G _{mm} at the design number of gyrations, (N _d). During field production, increase %G _{mm} at the design number of gyrations, (N _d) to 97.0%. b. For base course or regressed shoulder mixtures, the maximum criteria limits do not apply. c. Lower Target Air Voids by 1.0% if used in a separate shoulder paving operation, unless otherwise shown on the plans.					

Table 501-2 VFA Minimum and Maximum Criteria			
Estimated Traffic (million ESAL)	Mix Type	Top & Leveling Courses	Base Course
≤0.3	LVSP	70–80	70–80
≤0.3	E03	70–80	70–80
>0.3 – ≤1.0	E1	65–78	65–78
>1.0 – ≤3.0	E3	65–78	65–78
>3.0 – ≤10	E10	65–78 (a)	65–75
>10 – ≤30	E30	65–78 (a)	65–75
>30 – ≤100	E50	65–78 (a)	65–75
a. The specified VFA range for mix Number 5 is 73%–76%.			

Estimated Traffic (million ESAL)	Mix Type	%G _{mm} at (N _i)	Number of Gyration (a)		
			N _i	N _d	N _m
≤0.3	LVSP	91.5%	6	45	70
≤0.3	E03	91.5%	7	50	75
>0.3 – ≤1.0	E1	90.5%	7	76	117
>1.0 – ≤3.0	E3	90.5%	7	86	134
>3.0 – ≤10	E10	89.0%	8	96	152
>10 – ≤30	E30	89.0%	8	109	174
>30 – ≤100	E50	89.0%	9	126	204

a. Compact mix specimens fabricated in the SGC to N_d. Use height data provided by the SGC to calculate volumetric properties at N_i. Compact mix specimens at optimum P_b to verify N_m for mix design specimens only.

2. **Recycled Mixtures.** The Contractor may substitute Recycled Asphalt Pavement (RAP) for a portion of the new material required to produce HMA mixture. Design and produce the mix to meet the criteria in this subsection and the contract.

- a. **Stockpile Requirements.** Process RAP to the size required for the specified HMA mix. Ensure the stockpile contains enough material to produce the recycled mixtures the Engineer approves for the project. If the RAP stockpile is not sufficient to produce recycled mix quantities required for the project, provide an Engineer-approved mix design without RAP at the same unit price.

Provide documentation of testing and accumulated tonnage in the stockpile to the MDOT laboratory. The Contractor may estimate the tonnage. The Department will begin evaluating the mix design after receipt of the documentation.

- b. **Mix Design.** Submit required documentation for recycled mix designs in accordance with Section 1 of the *HMA Production Manual*, "Procedures for HMA Mix Design Processing."

B. **HMA Plant Certification.** Ensure hot mix asphalt plants are certified by the Department at least 3 work days before mix production begins. The Engineer will certify hot mix asphalt facilities in accordance with Section 2 of the *HMA Production Manual*, "Certification Procedure of HMA Plants." Post a seal of certification in the plant control office.

C. **HMA Production.** Submit an approved mix design for the mix required to the Engineer at least 2 work days before production begins.

Ensure even heating of the mass of asphalt binders and maintain heat control. Heat asphalt binders to the temperature required for the type of binder, except ensure that neither the asphalt binder nor the HMA

exceed the maximum temperature specified in Table 904-7. The Department will reject asphalt binder and mix if the temperature exceeds the maximum specified in Table 904-7. The Department will reject contaminated asphalt binder.

Stockpile aggregates at the facility, in a manner that prevents segregation. Dry aggregates to a moisture content that will ensure an appropriately coated HMA mix. For batch and continuous plants, the Department will reject aggregates in the hot bins that contain sufficient moisture to cause foaming or a water-saturated mixture. Remove rejected materials from the bins.

Place uniform gradations of aggregates in the cold feed system. If providing a blend of aggregates for the mix by combining aggregates from at least two cold feed bins, ensure the blend meets the combined gradation (from JMF) quality control tolerances.

The Engineer will allow the use of at least one hot aggregate bin to proportion aggregates to meet the JMF tolerances, if the cold feed requirements are met.

501.03. Construction.

A. **Equipment.** Provide equipment in accordance with section 107, capable of producing pavement that meets the requirements of this section.

1. **Cold-Milling Machines.** Provide equipment that consistently removes the HMA surface, in one or more passes, to the required grade and cross section, and produces a uniformly textured surface. Provide machines equipped with the following:
 - a. Automatically controlled and activated cutting drums, and
 - b. Grade reference and transverse slope control capabilities.
2. **Hauling Equipment.** Ensure transport trucks are equipped to protect the mix from the weather and retard the loss of heat.
3. **Pressure Distributor.** Provide a pressure distributor in accordance with subsection 505.03.A.1.
4. **Pavers.** Equip each paver with a full-width vibratory or tamper bar screed capable of spreading and finishing HMA to the required cross section and grade. Use a paver that produces a uniformly finished surface, free of tears, other blemishes, and measurable segregation.

Equip the paver to provide a uniform head of material ahead of the screed. Install reverse pitch augers or paddles inside the ends of the auger shafts to force the mix to the center of the main screed.

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Ensure extensions, added to the main screed, provide the same vibrating or tamping action and heating capabilities as the main screed. Adjust extensions to the main screed so, after breakdown rolling, no longitudinal marks remain on the surface. Equip in-line screed extensions with a continuation of the automatically controlled spreading augers to within 12 inches of the outside edge. Follow the manufacturer's recommendations for other screed extensions.

Except for the paving operations listed in subsection 501.03.F.1.a through subsection 501.03.F.1.d, equip pavers with an automatically controlled and activated screed with grade reference and transverse slope control. Use an Engineer-approved grade referencing attachment, at least 30 feet long, for lower courses and the first pass of the top course. Ensure the Engineer approves alternate grade referencing attachments before use.

After placing the first pass of the top course, the Contractor may, with prior approval from the Engineer, substitute a joint matcher, a grade referencing attachment at least 10 feet long, or other grade referencing equipment for constructing adjacent passes of the top course.

5. **Rollers.**

- a. **Steel-Wheeled Rollers.** Provide self-propelled vibratory steel-wheeled rollers, static tandem rollers, or self-propelled static three-wheeled rollers. Provide a steering device that allows the roller to follow the established alignment. Equip rollers with wheel sprinklers and scrapers. Provide smooth roller wheels, free of openings or projections that will mar the pavement surface.

Provide vibratory rollers with an automatic shutoff to deactivate the vibrators if the roller speed decreases below ½ mph. Provide rollers that operate in accordance with the manufacturer's recommended speed, impacts per foot, and vibration amplitude for the thickness of HMA mix.

- b. **Pneumatic-Tired Rollers.** Provide self-propelled pneumatic-tired rollers. Equip rollers with at least seven wheels spaced on two axles so the rear group of tires does not follow in the tracks of the forward group, providing at least ½-inch tire path overlap. Provide smooth tires capable of being inflated to the pressure recommended by the roller or tire manufacturer. Equip the rollers with a mechanism that can smoothly reverse the motion of the roller.

Equip the rollers with wheel scrapers and skirting to enclose the wheels to within 3 inches of the pavement surface. Use a release agent to prevent material from sticking to the tires and being deposited on the top course pavement during rolling.

- c. **Combination Rollers.** The Contractor may use combination pneumatic-tired and steel-wheeled rollers manufactured specifically for HMA compaction, if equipped with the required sprinklers and scrapers.
 6. **Spreaders.** Use self-propelled spreaders capable of pushing the hauling units. Ensure spreaders can maintain the required width, depth, and slope, without causing segregation.
 7. **Material Transfer Device.** When a Material Transfer Device (MTD) is required, it must be capable of delivering HMA mix from the truck transport to the paver hopper to ensure constant paver speed, remixing HMA material using manufacturer's developed technology, and depositing material in the paver hopper. Provide a paver hopper insert with at least a 10 ton capacity in the paver and keep at least one-third full of mix during paving.
 8. **Compressed Air System.** If a compressed air system is required for cleaning pavement, equip the air compressor with a moisture separator to remove oil and water from the air supply. Provide a compressor capable of producing at least 100 psi and continuous 150 cfm airflow.
 9. **Miscellaneous Equipment.** Provide a straightedge at least 10 feet long and other tools to finish the work.
 10. **Lights on Equipment.** If maintaining traffic on HMA construction, equip equipment within the project, including cold-milling machines, distributors, and rollers, with at least one Department-approved flashing, rotating, or oscillating amber light. Equip pavers with at least one light on each side. Mount the lights so the warning signal is visible to traffic in every direction. Operate the lights while work is in progress. Ensure hauling units activate four-way flashers on the project.
- B. **Preparation of Base.** Provide subgrade, subbase, aggregate base course, crushed and shaped base, or rubblized base in accordance with the relevant sections of Division 2 and Division 3, before HMA placement.
- C. **Preparation of Existing Pavement.** Prepare the existing surface as required to construct HMA pavements, shoulders, and approaches.

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1. **Drainage Structures, Monument Boxes, and Water Shutoffs.** Adjust, temporarily lower, or both, catch basins, manhole covers, monument boxes, and water shutoffs in accordance with subsection 403.03.A.

2. **Cleaning Pavement.** Using methods approved by the Engineer, clean dirt and debris from the pavement surface and paved shoulders before placing HMA. Remove loose material from joints and cracks using compressed air.

If the Engineer determines the compressed air system will not remove deleterious material, remove loose material by a hand or mechanical method, as approved by the Engineer. The Department will pay for removal of material by hand or mechanical methods in accordance with subsection 501.04.E.

Do not place HMA until the Engineer inspects and approves the condition of the existing pavement.

3. **Removing Existing Pavement for Butt Joints.** If a butt joint is required, remove the existing surface to the thickness of the proposed overlay, for the full width of the joint. Uniformly taper the removal to the original surface over at least 35 feet.
4. **Edge Trimming.** For required removal of HMA shoulder material or no greater than 1 foot width of HMA pavement, cut the HMA material full depth along the pavement edge or removal line to prevent tearing the pavement surface. Cut joints, where the completed surface will be exposed, with a saw, cold-milling machine, or other methods approved by the Engineer. Cut joints, where the completed surface will be covered by HMA mix, with a coulter wheel, saw, cold-milling machine, or other method approved by the Engineer.
5. **Cold-Milling HMA Surfaces.** Before milling existing pavement, obtain a Department-approved mix design in accordance with subsection 501.02.A, and ensure the availability of HMA mix quantities to cover milled surfaces.

Remove the HMA surface to the depth, width, grade, and cross section shown on the plans. Backfill and compact depressions resulting from removal of material below the specified grade, in accordance with subsection 501.03.C.9.

If the milling machine discovers buried structures within the specified grade, such as valve boxes, manholes, or railroad tracks that are not identified on the plans, the Department will pay for all associated costs, as extra work, in accordance with subsection 103.02.

Immediately after cold-milling, clean the surface. Dispose of removed material in accordance with subsection 104.07.D and subsection 204.03.

6. **Removing HMA Surface.** Except as specified in subsection 501.03.C.4, removing HMA surface applies to removing HMA overlying a base course that is to remain in place.

Cut joints, exposed in the completed surface, with a saw or cold-milling machine. Cut joints, covered by HMA mix, with a coultter wheel, saw, or cold-milling machine. Obtain the Engineer's approval of alternate methods for cutting joints.

When removing HMA overlying a base course that is to remain in place, cut the edges of the surface requiring removal along straight lines for the full depth of the HMA surface.

When removing HMA by cold-milling, the Engineer may direct the Contractor to remove less than the full depth of HMA surface.

7. **Removing HMA Patches.** Remove patches that may compromise the performance of the overlay.
8. **Joint and Crack Clean Out.** If the plans show joint and crack clean out, use mechanical or hand methods to remove joint sealants to at least 1 inch deep. Remove vegetation, dirt, and debris that cannot be removed using the methods specified in subsection 501.03.C.2, from transverse and longitudinal joints and cracks. Use hand patching to fill cleaned joints and cracks at least 1 inch wide.
9. **Hand Patching.** If the contract requires hand patching, fill holes, depressions, joints, and cracks in the existing pavement and replace existing patches. Compact the hand patching material in no greater than 3 inch layers to the adjacent pavement surface grade using a machine vibrator or Department-approved roller. Use top course or other Engineer-approved mix for hand patching material.
10. **Repairing Pavement Joints and Cracks.** Repair joints and cracks as required.

D. **Bond Coat.** Uniformly apply the bond coat to a clean, dry, surface with a pressure distributor. Obtain the approval of the Engineer for the application rate after work begins. Apply the bond coat ahead of the paving operation to allow the bond coat to cure before placing HMA.

Do not leave pools of bond coat on the surface and do not spray the bond coat on adjacent pavement surfaces. Apply the bond coat to each

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HMA layer and to the vertical edge of the adjacent pavement before placing subsequent layers.

E. Transportation of Mixtures. Weigh each load of HMA, accepted by the Department, to the nearest 20 pounds on an approved scale with an automatic printout system. Provide a scale and printout system for platform and suspended scales in accordance with subsection 109.01.B.6.

Apply a release agent, in accordance with subsection 501.02, to hauling units. The Engineer will reject loads with excessive amounts of release agent. Do not place crusted HMA in the paver.

The Department will reject loads with a temperature either below 250 °F or greater than ±20 °F from the recommended maximum mixing temperature specified by the binder producer at the time of discharge from behind the screed.

F. Placing HMA.

1. **General.** Provide a pavement as shown on the plans.

Place HMA on a cured bond coat using pavers in accordance with subsection 501.03.A.4, unless placing mixtures for the following:

- a. Variable width sections;
- b. The first course of a base course mix on a subgrade or sand subbase;
- c. Base course mixtures for shoulders and widening less than 10½ feet wide; or
- d. Top and leveling course mixes for shoulders and widening less than 8 feet wide.

Place HMA mix in layers, and do not exceed the application rate. If the application rate for an HMA pavement exceeds the maximum rates specified in Table 501-4, and the edges are not confined, construct the pavement in at least two layers.

Table 501-4 HMA Application Rates		
Mix Number	Course Application	Application Rate, (lb/yd²) minimum–maximum (a)
2	Base	435–550
3	Base, Leveling	330–410
4	Leveling, Top	220–275
5	Top	165–220
LVSP	Leveling, Top	165–250
LVSP	Base	220–330
a. Minimum application rates do not apply to wedging courses.		

Wedge with HMA to remove irregularities in the existing road surface. Place and compact HMA wedging to correct the foundation. Allow the wedging to cool enough to support construction equipment without causing visible distortion of the mat before placing subsequent wedging, base, leveling, or top course mixtures.

Place HMA mix to the slope and width shown on the plans. Place subsequent HMA course to align the vertical edge with the previous courses, without constructing a ledge. Correct ledges that result from placing material in excess of the width shown on the plans at no additional cost to the Department.

Place shoulder aggregate and compact flush after placement of each layer of HMA at the end of the paving day or place traffic control devices in accordance with subsection 812.03, at no additional cost to the Department. Complete final shaping and compaction of the shoulders after placing the top course of HMA.

If delays slow paving operations and the temperature of the mat immediately behind the screed falls below 200 °F, stop paving and place a transverse construction joint. If the temperature of the mat falls below 190 °F before initial breakdown rolling, remove and replace the mat at no additional cost to the Department.

If placing the uppermost leveling and top course, place the longitudinal joint to coincide with the planned painted lane lines.

If the temperature of the mat falls below 170 °F before placing the adjacent mat, apply bond coat to the vertical edge of the mat.

If constructing the lanes with at least two pavers in echelon, match the depth of loose HMA from each paver at the longitudinal joints.

Transition the new mat to existing surfaces at the beginning and end of resurfacing sections and at intersections unless using butt joints. Transition the new mat to existing surfaces at a rate of 1 inch over 35 feet. Construct transitions on a cured bond coat applied at a rate of 0.10 gallons per square yard. After compaction, spray with bond coat, sand, and roll the first 3 feet of the joint and 1 foot of the existing surface.

2. Joints in HMA Pavement.

- a. **Transverse Construction Joint.** If constructing a transverse construction joint, stop the paver and lift the screed before material falls below the auger shaft. Remove the paver and roll through the planned joint location. Cut a transverse vertical joint and remove excess HMA.

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Place burlap, canvas, or paper as a bond breaker ahead of, and against the vertical face. Place HMA against the bond breaker and taper from the new mat to the existing surface. Extend the temporary taper 5 feet for each inch of mat thickness, or as directed by the Engineer. Compact and cool the temporary taper before allowing traffic on the new surface. Remove the temporary taper before resuming paving.

- b. **Vertical Longitudinal Joint.** When opening to traffic, plan the work to resurface adjacent lanes to within one load of the same ending point at the completion of paving operations each day. Construct a vertical joint to conform to the pavement cross section.

When compacting an unsupported (unconfined) edge of the mat, keep the roller from 3 inches to 6 inches inside the unsupported edge on the first pass; ensure the roller overhangs the unsupported edge by 3 inches to 6 inches on the second pass.

When placing HMA in a lane adjoining a previously placed lane, place the mixture so that the strike off shoe will produce an edge that is adjacent to or minimally overlaps the adjoining course. Compact the longitudinal joint by rolling from the hot side, keeping the edge of the roller approximately 6 inches to 8 inches inside the cold joint for the first pass. For the second pass of the roller, compact the joint from the hot side while overlapping the cold side by 6 inches to 8 inches.

- c. **Tapered Overlapping Longitudinal Joint.** The Engineer will allow a tapered overlapping longitudinal joint in lieu of a longitudinal vertical joint.

If using tapered overlapping longitudinal joints, the Engineer will not require resurfacing lanes within one load of the same point-of-ending at the completion of paving operations each day. Pave adjacent lanes within 24 hours, unless delayed by inclement weather or approved by the Engineer.

Construct the tapered overlapping longitudinal joint by tapering the HMA mat at a slope no greater than 1:12. Extend the tapered portion beyond the normal lane width.

Place a ½-inch to 1-inch notch at the top of the taper on paving courses.

Provide a uniform slope by constructing the tapered portion of the mat using a Department-approved strike-off device that will not restrict the main screed.

Apply bond coat to the surface of the taper before placing the adjacent lane.

3. **Placing HMA Shoulders.** Use a self-propelled mechanical paver or spreader to place HMA shoulders.

If placing the top course on new shoulders, or placing leveling, or top course on existing HMA shoulders at least 8 feet wide, place the mix using a paver with an automatically controlled and activated screed and strike-off assembly and corresponding grade referencing equipment. Use grade-referencing equipment, as directed by the Engineer.

Stop shoulder paving at crossroad approaches, auxiliary lanes, commercial driveways, and ramps. Do not pave through these areas.

4. **Placing HMA Approaches.** Place HMA on driveway or crossroad approach foundations, approved by the Engineer.

Place approaches in layers no greater than the application rate. Do not stop mainline paving of lanes adjacent to the approach to pave the HMA approach.

- G. **Rolling.** Compact each layer of HMA in accordance with the contract and free of roller marks.

Keep the surface of the steel roller wheels moist during rolling.

- H. **Smoothness Requirements.** After final rolling, the Engineer may test the surface longitudinally and transversely using a 10-foot straightedge at selected locations in accordance with MTM 722. Construct the surface and correct variations, at no additional cost to the Department, to the tolerances specified in this subsection.

1. **Base Course.** Construct lower layers of base courses to a tolerance of $\frac{3}{4}$ inch, and final layers of base courses to a tolerance of $\frac{3}{8}$ inch.
2. **Leveling and Top Course.** For multiple course construction, construct lower courses to a tolerance of $\frac{1}{4}$ inch, and top courses to a tolerance of $\frac{1}{8}$ inch.

Construct single courses to a tolerance of $\frac{1}{4}$ inch.

501.03

I. **Weather and Seasonal Limitations.**

1. **HMA Weather Limitations.** Except as limited by subsection 501.03.I.2, place HMA in accordance with the following restrictions:

- a. Do not place HMA or apply bond coat when moisture on the existing surface prevents curing;
- b. Do not place HMA unless the temperature of the surface being paved is at least 35 °F and there is no frost on or in the grade or on the surface being paved, unless otherwise approved by the Engineer in writing;
- c. Place only HMA courses that are greater than 200 pounds per square yard if the temperature of the surface being paved is greater than 35 °F;
- d. Place only HMA courses that are greater than 120 pounds per square yard if the temperature of the surface being paved is at least 40 °F; and
- e. Place any HMA course if the temperature of the surface being paved is at least 50 °F

2. **HMA Seasonal Limitations.** Unless otherwise approved by the Engineer in writing, place HMA in accordance with subsection 501.03.I.1 and the following seasonal limitations.

- a. From June 1 to October 15 for the Upper Peninsula;
- b. From May 15 to November 1 for the Lower Peninsula, north of M-46; and
- c. From May 5 to November 15 for the Lower Peninsula, south of M-46.

J. **Protection of Structures.** Protect bridges, curbs, gutters, driveways, sidewalks, barriers, and other appurtenances to prevent surfaces from becoming discolored during application of bond coat or HMA to the road surface. Remove material from appurtenances, as directed by the Engineer, at no additional cost to the Department.

K. **Aggregate Shoulders.** On resurfacing projects, scarify existing aggregate shoulder surfaces before placing new aggregate material.

Maintain the shoulder for vehicles to pass the construction equipment. If Contractor operations or traffic disturbs the area between the pavement and the right-of-way line, restore the area to a condition approved by the Engineer at no additional cost to the Department.

L. **Monument Boxes.** Place or adjust monument boxes in accordance with section 821.

M. **Quality Control (QC) Plan.** Prepare and implement a quality control (QC) plan for HMA, in accordance with the HMA Production Manual.

Make adjustments in process controls to prevent production of non-conforming material in lieu of accepting payment at a reduced price. The Department will not allow continual production of non-conforming material at a reduced price in lieu of making adjustments.

The Engineer will not perform sampling or testing for quality control or assist in controlling the HMA production and placement operations.

N. **HMA Mix Acceptance.** The Engineer will inspect field-placed material, perform QA sampling and testing, and monitor Contractor adherence to the HMA-QC Plan.

1. **HMA Field-Placed Inspection.** The Engineer will perform inspection acceptance of HMA. The Department will inspect the base and leveling courses within 18 hours and the top course within 36 hours of placement. The Engineer will accept the pavement within these timeframes unless corrective action is required. If the Engineer determines that corrective action is required, inspection acceptance and paving of overlying courses will not occur until after the Contractor completes corrective action and the Engineer has determined that the pavement is in conformance with the contract.

The Engineer will determine the need for corrective action based on the acceptance factors specified in Table 501-5. Corrective action may include remedial treatment, including crack or surface sealing, or replacement.

Submit an action plan to the Engineer that addresses all acceptance factors that resulted in the need for corrective action. Complete all corrective action required to repair or replace unacceptable work at no additional cost to the Department.

If the Engineer and the Contractor agree, the Department may make a contract adjustment of no greater than 100 percent of the bid price for corrective action.

The Department will not grant time extensions for repair work to meet the inspection acceptance requirements specified in subsection 501.04.N.1.

The Engineer will determine the area subject to corrective action, for removal and replacement of top courses, as the longitudinal extent of corrective action multiplied by the width of the paving course affected.

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The Department will accept HMA subject to corrective action as follows:

- a. HMA placed for corrective action involving full removal and replacement will be accepted in accordance with the contract.
 - b. The area requiring corrective action other than full removal and replacement will not be measured for incentive payment.
 - c. If more than 10 percent of the area of a subplot requires corrective action, the subplot will not be measured for incentive payment.
2. **HMA Testing Acceptance.** The Engineer will accept HMA based on visual inspection, small tonnage, or QA sampling and testing acceptance criteria. The Engineer will notify the Contractor before conducting QA sampling to allow the Contractor to witness the sampling, but not in a manner that will allow alteration of production in anticipation of sampling. The Engineer will conduct QA sampling in accordance with MTM 313.
- a. **Visual Inspection Acceptance Criteria.** The Engineer may accept quantities less than 500 tons, of any individual mixture, in accordance with the Materials Quality Assurance Manual.
 - b. **Small Tonnage Acceptance Criteria.** If the total tonnage of a specific mix does not exceed 5,000 tons, the Engineer will perform QA sampling and testing in accordance with the contract.
 - c. **QA Sampling and Testing Acceptance Criteria.** If the total tonnage of a specific mix is greater than 5,000 tons, the Engineer will perform QA sampling and testing in accordance with the contract.
- O. **Asphalt Binder Acceptance.** The Department will accept asphalt binder in accordance with Department procedures.

Table 501-5 HMA Acceptance Factors and Corrective Action				
Acceptance Factors (a)	Length	Extent (b)	Severity	Corrective Action (c)
Segregation	—	>215 ft ² / 328 ft LL	Heavy (d)	Replace
Rutting	—	>32 ft	>¼ in average depth over the length of occurrence	Replace
Flushing	—	>108 ft ² / 328 ft LL	High (e)	Replace
Edge of Paved Shoulder	>33 ft	visible ledges	>3 in	Trim
Crack (g)	any	any	all	Seal (f)

Note: LL = lane length.
a. Acceptance factors apply to all courses except flushing, which applies to the top course only.
b. Extent is calculated by summing locations within the length required.
c. The appropriate corrective action is dependent on the extent and severity of the factor, and on the intended service life of the pavement.
d. Segregation severity will be determined in accordance with MTM 326. If segregation thresholds are met twice on a paving course, the Contractor may be required to use a Material Transfer Device for the remaining paving for that course at no additional cost to the Department.
e. Flushing severe enough to significantly effect surface friction (Friction Number <35).
f. Other corrective action may be required as crack frequency increases.
g. A reflective crack determined by the Engineer to be caused by an underlying condition.

501.04. Measurement and Payment.

Pay Item	Pay Unit
HMA, 5 E _____	Ton
HMA, 4 E _____	Ton
HMA, 3 E _____	Ton
HMA, 2 E _____	Ton
HMA, LVSP	Ton
HMA, (type), High Stress.....	Ton
HMA Approach	Ton
HMA Approach, High Stress.....	Ton
Pavt for Butt Joints, Rem.....	Square Yard
Edge Trimming	Foot
Cold Milling HMA Surface.....	Square Yard, Ton
HMA Surface, Rem.....	Square Yard
HMA Patch, Rem.....	Square Yard
Joint and Crack, Cleanout	Foot
Hand Patching	Ton
Pavt, Cleaning	Lump Sum
Pavt Joint and Crack Repr, Det _____	Foot

501.04

A. **HMA, (type), High Stress.** The Department may pay for **HMA, (type), High Stress** for up to 150 feet outside the limits shown on the plans to ensure the Contractor has time to transition to the high stress HMA. The Department will pay for high stress HMA placed outside the 150-foot limit as other HMA mix pay items.

B. **Pavement for Butt Joints, Removal.** The unit price for **Pavt for Butt Joints, Rem** includes the cost of removing and disposing of concrete or HMA materials.

C. **Edge Trimming.** The Engineer will measure **Edge Trimming** along the cut edge. The unit price for **Edge Trimming** includes the cost of cutting, removing, and disposing of excess HMA material.

D. **Cold Milling HMA Surface.** The unit price for **Cold Milling HMA Surface** includes the cost of removing, loading, hauling, weighing and disposing of the cold milled material, and cleaning the cold milled pavement. If paid by the ton for cold-milled HMA, deposit the cold milled material directly from the cold milling machine into the hauling units and weigh on a scale meeting the requirements of subsection 109.01.G before placement in a stockpile or a disposal area.

The Engineer will not weigh or pay for material picked up by cleaning after cold milling.

E. **Pavement, Cleaning.** The Engineer will measure **Pavt, Cleaning** as a unit, including paved shoulders, approaches, and widened areas. The unit price for **Pavt, Cleaning** includes the cost of cleaning the foundation, joints, and cracks, and sweeping shoulders, base courses, and leveling courses.

If the Engineer directs additional hand or mechanical methods to clean the pavement, the Department will pay for this work as **Joint and Crack, Cleanout** if the contract documents include the pay item. If the contract documents do not include a pay item for joint and crack cleanout, the Department will pay for additional hand or mechanical work as extra work, in accordance with subsection 109.07.

F. **Joint and Crack, Cleanout.** The Engineer will measure **Joint and Crack, Cleanout** along the cleaned joint and crack. If using compressed air does not completely clean out the joint or crack, and the Engineer directs the use of hand or mechanical methods to remove loose material, then the Department will pay for this as extra work, in accordance with subsection 103.02.

G. **Hand Patching.** The unit price for **Hand Patching** includes the cost of placing HMA, by hand or other methods, and compacting the material.

H. **Removing HMA Surface.** The Engineer will measure, and the Department will pay for removing HMA surface, no greater than 12 inches thick, overlying material to remain in place, as **HMA Surface, Rem**. The unit price for **HMA Surface, Rem** includes the cost of edge cutting to establish a neat line, as required, and removal and disposal of the HMA material.

The Engineer will measure and the Department will pay for removing HMA surface, greater than 12 inches thick, overlying material to remain in place, as **Pavt, Rem** in accordance with subsection 204.04.

I. **Pavement Joint and Crack Repair.** The Engineer will measure **Pavt Joint and Crack Repr**, of the detail required, along the joint and crack. If the pavement joint and crack repair exceeds 30 inches in width, the Engineer will measure each 30-inch wide segment, or portion thereof, separately for payment. The Department will pay for the HMA material used to fill the joints, after removal of objectionable material, as **Hand Patching**.

J. **HMA.** The Engineer will measure, and the Department will pay for, **HMA** of the mix specified based on the weight placed, as supported by weigh tickets. The Engineer will adjust the unit price for HMA, of the mix specified, in accordance with the contract.