

Section 502. HOT MIX ASPHALT CONSTRUCTION PRACTICES

502.01 Description. This work consists of preparing the existing pavement and constructing HMA pavements, shoulders, and approaches. The pavement shall meet the plan requirements, and be uniform in texture, density and smoothness with no measurable segregation.

502.02 Materials. Materials shall meet the following requirements.

| | |
|------------------------------------|-----|
| Hot Mix Asphalt Mixtures | 501 |
| Bond Coat, SS-1h, CSS-1h | 904 |

Release agents. The Contractor shall use a release agent that does not harm the properties of the mixture, or the environment and is approved by the Engineer. Fuel oil or other distillate derivatives are not allowed.

502.03 Construction. Equipment shall be safe, environmentally acceptable, and capable of producing a specification pavement.

A. Equipment.

1. **Cold-Milling Machines.** Cold-Milling machines shall be equipped with automatically controlled and activated cutting drums. Cutting drums must be capable of grade reference and transverse slope control, and produce a uniformly textured surface. An approved grade referencing attachment, not less than 30 feet in length, shall be used. The Contractor shall receive approval from the Engineer prior to use of any alternate grade referencing attachments.

Equipment for removing the hot mix asphalt (HMA) surface shall be capable of consistently removing the HMA surface, in one or more passes, to the required grade and cross section.

2. **Hauling Equipment.** Trucks shall be equipped to completely protect the mixture from the weather and to retard the loss of heat.
3. **Pressure Distributor.** The pressure distributor shall meet the requirements in subsection 508.03.A.1.
4. **Pavers.** The paver shall be a capable of spreading and finishing the HMA, with a full-width vibratory or tamper bar screed, to the required cross section and grade. The paver shall produce a uniformly finished surface free from tearing or other blemishes and free from measurable segregation.

The paver shall be equipped to provide a uniform head of material ahead of the screed. Reverse pitch augers or paddles shall be installed at the inside of both ends of the auger shafts to force the mix to the center of the main screed.

When extensions are added to the main screed, they shall provide the same vibrating or tamping action and have the same heating capabilities as the main screed. The

extensions shall be adjusted to the main screed so they leave no longitudinal marks on the surface after breakdown rolling. Inline screed extensions shall be equipped with a continuation of the automatically controlled spreading augers to within 18 inches of the outside edge. All other screed extensions shall follow the manufacturers recommendations.

Except for certain conditions outlined in subsection 502.03.F, pavers shall be equipped with an automatically controlled and activated screed capable of grade reference and transverse slope control. An approved grade referencing attachment, which is 30 feet or more in length, shall be used for all lower courses and the first pass of the top course. The Contractor shall receive approval from the Engineer prior to use of any proposed alternate grade referencing attachment. After the first pass of the top course has been placed, a joint matcher or a 10-foot or longer grade referencing attachment may be substituted for constructing subsequent adjacent passes of the top course with prior approval from the Engineer.

5. **Rollers.** Rollers shall meet the following requirements:

- a. **Steel-Wheeled Rollers.** Steel-wheeled rollers shall be self-propelled vibratory or static tandem rollers or self-propelled static three-wheeled rollers. The steering device shall respond readily and permit the roller to be directed on the alignment desired. Rollers shall be equipped with wheel sprinklers and scrapers. Roller wheels shall be smooth and free from openings or projections which will mar the surface of the pavement.

Vibratory rollers shall have an automatic shutoff to deactivate the vibrators when the roller speed is less than 0.5 mph. They shall operate according to the manufacturer's recommendations for speed, impacts per foot, and amplitude of vibration (dynamic force) for the thickness of HMA being compacted.

- b. **Pneumatic-Tired Rollers.** Pneumatic-tired rollers shall be self-propelled. They shall be equipped with a minimum of seven wheels situated on the axles such that the rear group of tires will not follow in the tracks of the forward group, but are spaced to provide a minimum tire path overlap of ½ inch. The tires shall be smooth and shall be capable of being inflated to the pressure recommended by the manufacturer of the roller. Pneumatic rollers shall leave the top course pavement free of excessive globules of mixture after rolling. The rollers shall be equipped with a mechanism capable of reversing the motion of the roller smoothly. The rollers shall be equipped with wheel scrapers, and have skirting to enclose the wheel area to within 3 inches of the pavement surface. A release agent shall be used to prevent material from sticking to the tires.
- c. **Combination Rollers.** Combination pneumatic-tired and steel-wheeled rollers that are manufactured specifically for HMA compaction shall be equipped with the necessary sprinklers and scrapers as described above.

6. **Spreaders.** Spreaders shall be self-propelled with sufficient power and weight to push the hauling units. They must be capable of maintaining the specified width, depth, and slope, without causing segregation of the material.
 7. **Compressed Air System.** When a compressed air system is used for cleaning pavement, the compressed air equipment shall produce a continuous, high-volume, high pressure stream of clean dry air. The air compressor shall be equipped with a moisture separator to remove all oil and water from the air supply. The compressor shall be capable of producing a minimum of 100 psi and continuous 150 cubic feet per minute of air flow.
 8. **Miscellaneous Equipment.** The Contractor shall provide a straightedge (10-foot minimum) and all tools necessary to satisfactorily finish the work.
 9. **Lights on Equipment.** On HMA construction where traffic is being maintained, all equipment working within the project limits, including cold-milling machines, distributors, and rollers shall be equipped with at least one approved flashing, rotating, or oscillating amber light. Pavers shall be equipped with at least one such light on each side of the paver. The lights shall be mounted so that the warning signal will be visible to traffic in all directions. Hauling units shall activate four way flashers within the project limits. The lights shall be in operation while the work is in progress.
- B. **Preparation of Base.** The subgrade, subbase, aggregate base course, crushed and shaped base, or rubblized base shall meet applicable requirements of division 2 and 3, at the time of placement of the HMA.
- C. **Preparation of Existing Pavement.**
1. **Catch Basin and Manhole Covers, Monument Boxes, and Water Shutoffs.** These shall be temporarily lowered and/or adjusted as specified in section 403.03.A.
 2. **Cleaning Pavement.** Before placing any HMA, the surface of the pavement and the paved shoulders, if applicable, shall be thoroughly cleaned of all dirt and debris using a method approved by the Engineer. All joints and cracks shall be blown out with a compressed air system to remove loose material. If the compressed air system does not remove detrimental material from the joints and cracks, as determined by the Engineer, then approved mechanical or hand methods shall be used. This additional effort will be paid for according to subsection 502.04.D.

The Contractor shall not place any HMA until the condition of the pavement to be resurfaced has been inspected and approved by the Engineer.

3. **Removing Existing Pavement for Butt Joints.** When a butt joint is specified, the existing surface shall be removed to a depth equal to the thickness of the proposed overlay, for the full width of the joint where the overlay is to end. The removal shall be uniformly tapered up to the original surface over a minimum of 35 feet.

4. **Edge Trimming.** Where the removal of HMA shoulder material or up to one foot width of HMA pavement is required, the HMA material shall first be cut full depth along the pavement edge or removal line to prevent the tearing of the pavement surface. Joints which will be exposed in the completed surface shall be cut with a saw, cold-milling machine or other method approved by the Engineer. Joints which will be covered by HMA shall be cut with a coultter wheel, saw, or cold-milling machine or other method approved by the Engineer.
5. **Cold-Milling HMA Surfaces.** The HMA surface shall be removed to the depth, width, grade, and cross section specified. If material is removed below the grade specified, the depressions shall be backfilled and compacted according to subsection 502.03.C.9 at the Contractor's expense.

Immediately after cold-milling, the surface shall be cleaned. The material which is picked up shall not be incorporated in any HMA. The Contractor shall dispose of the material removed from the surface according to subsections 103.07 and 204.03.B.

Prior to milling the existing pavement, the Contractor shall have an approved mix design and adequate supply of materials to ensure that the first lift of the specified HMA is placed on all milled surfaces.

6. **Removing HMA Surface.** Removing HMA surface applies to removing an HMA surface overlying a base course that is to remain in place, except as specified in subsection 502.03.C.4.

Joints which will be exposed in the completed surface shall be cut in a neat line with a saw or a cold-milling machine or other methods approved by the Engineer. Joints which will be covered by HMA shall be cut with a coultter wheel, saw, or cold-milling machine or other method approved by the Engineer. When removing an HMA surface overlying a base course that is to remain in place, the edges of HMA surface to be removed shall be cut along straight lines for the full depth of the HMA surface. When removing by cold-milling, the Engineer may direct that the depth of the HMA surface removed be less than full depth. The cutting of the edges, removal and disposal of the HMA material is included in this item of work.

7. **Removing HMA Patches.** Any patches which may cause an unsatisfactory performance of the overlay shall be removed.
8. **Joint and Crack Clean out.** When called for on the plans, this work shall consist of removing joint sealants to a depth of at least one inch. This work also includes removing vegetation or dirt and debris that cannot be removed from transverse and longitudinal joints and cracks by mechanical or hand methods described in subsection 502.03.C.2. Hand patching shall be used to fill cleaned joints and cracks that are equal to or greater than one inch wide.
9. **Hand Patching.** Where called for in the contract documents, this work consists of filling holes and depressions and pavement joints and cracks in the existing pavement and replacing existing patches. The hand patching material shall be compacted in

maximum 3-inch lifts to the adjacent pavement surface grade by use of a machine vibrator or approved roller. Hand patching material shall be top course mixture.

10. **Repairing Pavement Joints and Cracks.** This work shall consist of repairing joints and cracks according to the applicable details shown in the contract documents.

- D. **Bond Coat.** The bond coat shall be applied uniformly to the clean, dry, surface with a pressure distributor. Pools of bond coat shall not be allowed to remain on the surface. When constructing HMA shoulders or widenings, the bond coat shall not be sprayed on the adjacent pavement surface. The bond coat shall be applied to each layer of HMA and to the vertical edge of the adjacent pavement before placing subsequent layers. The uniform rate of application shall be approved by the Engineer.

The bond coat shall be applied far enough ahead of the paving operation to allow it to cure before placing the HMA.

- E. **Transportation of Mixtures.** An approved release agent shall be applied to the hauling units. Excessive use of release agent will be cause for rejection of the load. The HMA being placed in the paver shall not be crusted. The temperature of the mixture discharged from the hauling unit should be at the target placement temperature specified in Table 502-1 or as agreed upon with the Engineer. A tolerance of ± 20 °F from the specified target placement temperature is acceptable. Occasional loads outside ± 20 °F may be permitted, provided that adjustments are made to bring the temperature of the mixture back to the specified target placement temperature. Any load having a temperature below 250 °F or above 350 °F at time of discharge from the hauling unit will be rejected.

Table 502-1 Target Placement Temperatures.

| Temperature of the Surface Being Overlaid °F | Rate of Application of HMA Material, Pounds per Square Yard | | |
|---|---|----------|------|
| | <120 | 120 -200 | >200 |
| Target Placement Temperatures, °F | | | |
| 35-39 | | | 330 |
| 40-49 | | 330 | 315 |
| 50-59 | 330 | 315 | 300 |
| 60-69 | 315 | 300 | 285 |
| 70-79 | 300 | 285 | 270 |
| 80-89 | 285 | 270 | 270 |
| 90 and over | 270 | 270 | 270 |

- F. **Placing HMA.** Pavers will be required to meet subsection 502.03.A.4 except when placing mixtures for: (1) variable width sections, (2) the first course of a base course mixture on a subgrade or on a sand subbase, (3) base course mixtures for shoulders and widenings less than 10.5 feet in width, or (4) top and leveling course mixtures for shoulders and widenings less than 8 feet in width.

HMA mixtures shall be placed in lifts not to exceed the application rate. When the application rate for a HMA pavement exceeds the maximum rates shown in Table 502-2 and the edges are not confined, the pavement shall be constructed in two or more lifts.

Table 502-2 Maximum Application Rates

| Mixture Type | Course Application | Maximum Application Rate lbs/syd |
|--------------|---------------------|-------------------------------------|
| 2 | Base | 550 |
| 3 | Base | 410 |
| 3 | Leveling | 330 |
| 4 | Leveling, Top | 275 |
| 5 | Top | 220 |
| 13A | Base, Leveling, Top | 250 |
| 36A | Leveling, Top | 165 |
| 2C | Base | 500 |
| 3C | Base, Leveling | 330 |
| 4C | Leveling, Top | 260 |

When necessary to take out irregularities in the existing road surface, wedging with HMA shall be performed. Any corrections made to the foundation by wedging with HMA shall be placed, compacted, and allowed to cool enough to support construction equipment without causing visible distortion of the mat prior to placing subsequent wedging, base, leveling, or top course mixtures.

All HMA mixtures shall be placed to the plan slope and width. Any subsequent HMA course shall be placed such that the current vertical edge aligns with the previous course(s) without constructing a ledge(s). Any ledge which results from placing material in excess of the plan width shall be corrected at the Contractor's expense.

Shoulder aggregate shall be placed and compacted flush after each lift of HMA placed. Shoulders that are not flush with the pavement upon completion of the day's paving shall have traffic control devices placed per subsection 812.03 at the Contractor's expense. The shoulder aggregate shall be brought flush the next day. Final shaping and compaction of the shoulders shall follow the placement of the top course of HMA.

When delays result in slowing paving operations such that the temperature of the mat immediately behind the screed falls below 200 °F, paving shall be stopped and a transverse construction joint placed. If the temperature of the mat falls below 190 °F prior to any rolling, the mat shall be removed and replaced at the Contractor's expense.

When placing the uppermost leveling and top course, the longitudinal joint shall coincide with the proposed painted lane lines.

Whenever the temperature of the previously placed mat falls below 170 °F prior to placement of the adjacent mat, the vertical edges of the initial mat shall be coated with bond coat before the mixture is placed on the adjacent section.

Connections with existing surfaces at the beginning and ending of resurfacing sections and at intersections may be made by feathering out the mix at the rate of approximately 1 inch per 35 feet unless butt joints are used. Feathering shall be done only over areas where bond coat has been applied at 0.10 gallons per square yard and properly cured. After compaction has been completed, the first 3 feet of the joint and 1 foot of the area not surfaced shall be sprayed with bond coat, sanded, and rolled.

If the lanes are being constructed with two or more pavers in echelon, the depth of loose HMA from each paver shall match at the longitudinal joints.

1. **Transverse Construction Joint.** When constructing a transverse construction joint, stop the paver and lift the screed before the material falls below the auger shaft, remove the paver and roll through the proposed joint location. Cut a transverse vertical joint and remove the excess HMA. Place burlap, canvas, or paper as a bond breaker underneath and against the vertical face. HMA shall be placed against the bond breaker and tapered from the new mat down to the existing surface. The length of the temporary taper shall be 5 feet for each inch of mat thickness unless otherwise directed by the Engineer. The temporary taper shall be thoroughly compacted and cooled before traffic is allowed on the new surface. The temporary taper shall be removed prior to resumption of paving.
2. **Longitudinal Joints.** Longitudinal joints shall be either vertical or tapered.
 - a. **Vertical Longitudinal Joint.** The work shall be planned such that at the completion of each day's paving operations, all lanes will have been resurfaced to within one load of the same point-of-ending.

When placing the HMA in a lane adjoining a previously placed lane, the mixture shall be placed such that it uniformly overlaps the first lane by 1 to 2 inches and is placed at a height above the cold mat equal to the breakdown roller depression on the hot mat. When necessary, alternative traffic staging shall be used to allow for bumping the joint. When the contractor is unable to bump the joint, a tapered overlapping longitudinal joint shall be used. The overlapping material shall be bumped, using a lute or other device which will accomplish similar results, back onto the hot lane so that the roller will compress the small amount of excess material into the hot side of the joint. If the overlap is excessive, the excess material shall be trimmed so as to leave an edge having a uniform thickness; the excess material shall be discarded, it shall not be spread across the surface course.

- b. **Tapered Overlapping Longitudinal Joint.** A tapered overlapping longitudinal joint may be constructed in lieu of a longitudinal vertical joint. The use of a tapered overlapping longitudinal joint eliminates the requirement that all lanes be resurfaced to within one load of the same point-of-ending at the completion of each day's paving operations.

The tapered overlapping longitudinal joint shall be constructed by tapering the HMA mat. The taper shall have a 1:12 slope and the tapered portion shall extend beyond the normal lane width.

A notch of 0.5 to 1 inch shall be placed at the top of the taper on all courses of paving.

The tapered portion of the mat shall be constructed by the use of an approved strike-off device that will provide a uniform slope and will not restrict the main screed. The adjacent lane shall be paved within 24 hours, unless delayed by inclement weather.

Bond coat shall be applied to the in place taper before the adjacent lane is placed.

Final density requirements for the entire pavement, including the taper area, will remain unchanged. Compaction of the initial taper section will be required as near to final density as possible. A weighted roller equal to the width of the taper shall be applied to the taper section of the pavement

3. **Placing HMA Shoulders.** The HMA shall be placed by a self-propelled mechanical paver or spreader.

Shoulder aggregate shall be placed and compacted flush after each lift of HMA placed. Shoulders that are not flush with the pavement upon completion of the day's paving shall have traffic control devices placed per subsection 812.03 at the Contractor's expense. The shoulder aggregate shall be brought flush the next day. Final shaping and compaction of the shoulders shall follow the placement of the top course of HMA.

When placing the top course on new shoulders, or when placing the leveling or top course on existing HMA shoulders 8-foot in width or greater, the mixture shall be placed using a paver having an automatically controlled and activated screed and strike-off assembly and corresponding grade referencing equipment. The use of the grade referencing equipment shall be as directed by the Engineer.

Shoulder paving shall be discontinued at crossroad approaches, auxiliary lanes, commercial driveways and ramps. Paving through is prohibited.

4. **Placing HMA Approaches.** The HMA shall be placed on an approved foundation of a driveway or crossroad approach.

Approaches shall be placed in lifts not to exceed the application rate. Mainline paving of the lane next to the approach shall not be stopped to pave the HMA approach.

- G. **Rolling.** Each layer of HMA shall be compacted to the required density, and free of all roller marks.

The final rolling operation on each layer of HMA placed shall be accomplished by use of tandem steel-wheeled rollers. Vibratory rollers shall be operated in the static mode when used for finish rolling or pinching the joint.

A pneumatic-tired roller shall be used for initial compaction on the first course placed on a rubblized base or existing pavement. Pneumatic-tired rollers shall not mark or rut the surface or displace the pavement edges.

The surface of the steel roller wheels shall be kept completely moist with water when rolling.

Rolling shall start longitudinally at the extreme sides of the lanes and proceed toward the center of the pavement, overlapping on successive trips by at least half the width of the drive wheel of the roller. Alternate passes of the roller shall be of slightly different lengths.

When compacting an adjoining lane and not restricted by traffic, the vertical longitudinal bumped joint shall be rolled first with the roller supported mainly on the cold lane with only 2 to 6 inches of the roller extending onto the freshly placed HMA mixture.

- H. **Smoothness Requirements.** After final rolling, the surface may be tested longitudinally and transversely by the Engineer using a 10-foot straightedge at selected locations according to MTM 722. The variation of the surface shall not exceed the following limits:

For Base Course Mixtures:

| | |
|--------------|--------------------|
| Lower Course | $\frac{3}{4}$ inch |
| Top Course: | $\frac{3}{8}$ inch |

For Leveling and Top Course Mixtures:

| | |
|-------------------------------|---|
| Multiple Course Construction: | $\frac{1}{8}$ inch for top course, $\frac{1}{4}$ inch for lower courses, |
| Single Course Construction: | $\frac{1}{4}$ inch |

Variations in excess of the specified limits shall be corrected at the Contractor's expense.

- I. **Weighing Loads.** Each load of HMA accepted by the Department shall be weighed to the nearest 20 pounds on an approved scale having an automatic print-out system. The scale and print-out system for platform and suspended scales shall meet subsection 109.01.G.
- J. **Weather and Seasonal Limitations.** HMA shall not be placed or bond coat applied when precipitation is imminent or when there is moisture on the existing surface that will prevent satisfactory curing.

Unless otherwise approved by the Engineer in writing, temperature and seasonal requirements for placing HMA shall be according to Table 502-1 or as stated below. Paving

will not be allowed below these minimum temperatures, nor when there is frost on or in the grade or on the existing surface.

Seasonal Limitations for placing HMA are as follows.

1. June 1 - October 15 for the Upper Peninsula
2. May 15 - November 1 for the Lower Peninsula north of M-46 and
3. May 5 - November 15, for the Lower Peninsula South of M-46.

K. **Protection of Structures.** Bridges, curbs, gutters, driveways, sidewalks, barriers, and other appurtenances shall be protected to prevent their surfaces from being discolored during the application of bond coat or HMA material to the road surface. Any material applied to these appurtenances shall be removed, as directed by the Engineer, at the Contractor's expense.

L. **Aggregate Shoulders.** On resurfacing projects, the existing aggregate shoulder surfaces shall be scarified prior to placing new aggregate material.

The shoulder shall be maintained as a satisfactory surface for vehicles to travel on while passing the construction equipment. If the area between pavement edges and the right-of-way lines is disturbed by the Contractor's operations or by traffic, it shall be restored to a condition satisfactory to the Engineer. This restoration will be at the Contractor's expense.

M. **Monument Boxes.** Monument boxes shall be placed or adjusted according to subsection 821.

502.04 Measurement and Payment.

| Contract Item (Pay Item) | Pay Unit |
|---|------------------|
| 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, Detail — | Foot |
| HMA, —, | Ton |
| HMA, —, —, inch | Square Yard |
| HMA Approach | Ton |

- A. **Pavt for Butt Joints, Rem** includes removing and disposing of concrete or HMA materials.
- B. **Edge Trimming** will be measured along the cut edge and includes the cutting, removing, and disposing of the excess HMA material.
- C. **Cold Milling HMA Surface** includes removing, loading, hauling, weighing, and disposing of the cold milled material. When paid for by the ton, the cold milled material shall be deposited directly from the cold milling machine into the hauling units and shall be weighed on a scale meeting the requirements in subsection 109.01.G prior to placing in a stockpile or a disposal area. Material picked up by cleaning after cold milling will not be weighed or considered for payment.
- D. **Pavt, Cleaning** will be measured as a unit including paved shoulders and approaches and widened areas. The work includes cleaning the foundation, joints, and cracks. The work also includes sweeping shoulders, base courses, and leveling courses, if necessary. If additional hand or mechanical methods are required by the Engineer, this work shall be paid for as Joint and Crack, Cleanout if this pay item is included in the contract. Otherwise, this work will be paid for as extra work according to subsection 109.07.
- E. **Joint and Crack, Cleanout** will be measured along the joint and crack cleaned.
- F. **Hand Patching** includes the HMA placed by hand, or other methods, and compacted.
- G. **HMA** is to be measured and paid by weight when in tons, or by area when in square yards. Refer to contract documents for details.