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# 6 Preparation of Surface

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**Subgrade Treatment**

**Proofrolling**

**Milling**

**Patching**

**Wedge and Level**

**Base Widening**

**Cleaning**

**Tacking**

*Application*

*Curing*

# CHAPTER SIX:

## *PREPARATION OF SURFACE*

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HMA pavements may be placed:

- 1) Over existing pavements, either HMA or concrete
- 2) On newly constructed subgrade, aggregate base or HMA base courses
- 3) For widening contracts, on a combination of existing pavement and a base course

The existing surface is required to be compacted, stable, and free from mud or other foreign matter before placing the new HMA pavement. Preparation for a HMA course may include subgrade treatment, proofrolling, milling, patching, leveling, wedging, and cleaning. The surface is required to be inspected for cross slope, potholes, base failure, dips, and bumps to determine the need for corrections.

The requirements of the Contractor for surface preparation are designated in the Quality Control Plan (QCP) for the contract.

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### SUBGRADE TREATMENT

Subgrade treatments on which HMA Base may be placed are specified in Section 207. One of several Subgrade Treatment Types may be allowed and is specified in the Contract Plans and Section 207.04. One subgrade treatment procedure is chemically modifying the soil (Figure 6-1).



**Figure 6-1. Chemically Modifying Soil**

## PROOFROLLING

In some cases the subgrade may be accepted by proofrolling according to Section **203.26**. A fully legally loaded tri-axle dump truck may be substituted for the pneumatic tire roller. Proofrolling is a visual means of determining whether or not the subgrade is compacted or stable and suitable to receive HMA base. A HMA base is required to be placed on an unyielding surface to sustain the design traffic loads when completed.

## MILLING

Milling is part of a pavement rehabilitation process where a portion of the old HMA pavement or PCCP is removed or planed by a milling machine in preparation for an HMA overlay (Figure 6-1).



**Figure 6-1. Milling Machine**

Milling is done prior to repaving for many reasons including:

- 1) Removal of distressed pavement
- 2) Improve smoothness
- 3) Reshape cross slopes
- 4) Eliminate shoulder work after new layer(s) are placed (mill and fill)
- 5) Maintain curb exposure
- 6) Maintain clearances and other drainage features
- 7) Transitions to approaches or other pavement where new paving stops
- 8) Roughing the existing surface texture to remove asphalt joint material

There are several different pay items for milling depending on the application. The specific type of milling is specified in the contract. Milling is paid by the square yard (SYS) and is specified in Section **306**. The types of milling include:

- 1) Approach Milling
- 2) Asphalt Milling
- 3) Asphalt Removal
- 4) PCCP Milling
- 5) Scarification/Profile Milling
- 6) Transition Milling

The macrotexture after milling is required to be checked in accordance with **ITM 812** and Section **306.04**. Milling procedures and procedures to check macrotexture and cross slopes are required to be described in the QCP.

The millings produced become the property of the Contractor and may be transported to a HMA plant facility for use as recycled asphalt pavement (RAP). When specified, millings may be used to construct shoulders.

## **PATCHING**

Unsuitable areas are required to be identified and marked for removal by INDOT personnel. Areas to be removed include potholes, base failures, unstable mixes in place, and spots with excess asphalt. If the pavement to be patched is overlaid, the edge of the removal area is not required to be sawed. The removal area is required to conform to the marked lines to minimize over-breakage. If the patch is not overlaid, a neat edge for the patch is required to be attained by sawing. The size of the patches depends on the conditions found on the contract. The size and depth of the excavation are required to be measured and recorded for determination of the pay quantities. A typical full depth HMA patch section is illustrated in Figure 6-2.

Where unstable material is encountered below the existing pavement in the base, subbase, or subgrade, this material is removed. The sides of the excavation are required to be vertical. The HMA may not be properly compacted against sloping sides. The bottom of the removal area is compacted and the area backfilled with suitable material up to the bottom of the existing pavement. The backfill material is placed in 6 in. lifts and compacted thoroughly.

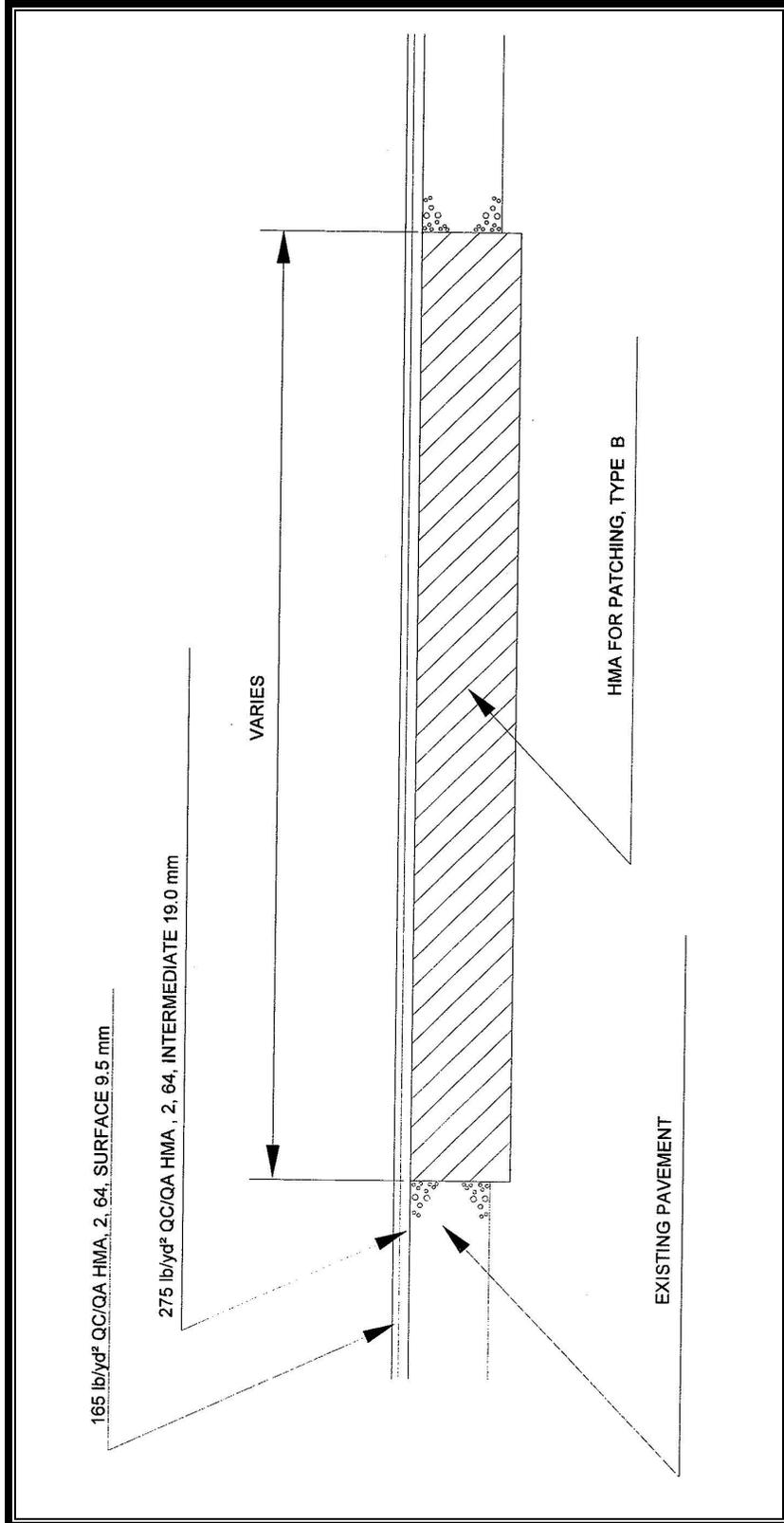


Figure 6-2. Typical Full Depth HMA Patch Section

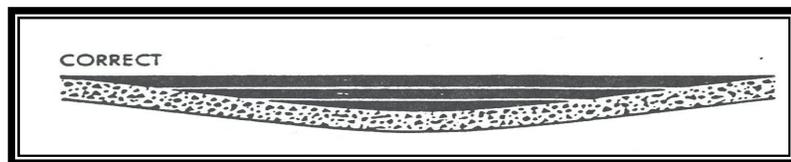
Before placing the HMA patching material, the edges of the existing mat are cleaned and tacked with asphalt to ensure a bond between the old surface and the new mix. In placing the patching mixture, the depth of each lift cannot exceed four times the maximum nominal particle size as indicated on the DMF. Each lift is required to be compacted before placing the next lift. The surface of the patch is required to be placed approximately 1/4 in. high, and be flush with the existing surface after the compaction is completed.

Patching operations are scheduled so that all removal areas opened during the day are completely patched at the close of the work day to allow opening the lane to traffic. When a patch cannot be completed, the HMA is backfilled, compacted, and a temporary surface placed to carry traffic during the night. All temporary work is at the expense of the Contractor and is avoided if at all possible.

### **WEDGE AND LEVEL**

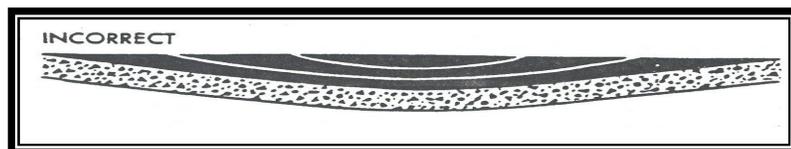
When the surface of a pavement is irregular, the surface is required to be brought to a uniform grade and cross section. Normally, milling is specified to correct this problem; however, sometimes a leveling course is used. Wedge and level may not be the best practice since proper compaction is difficult when non-uniform thicknesses are placed. The HMA materials used are specified in the contract and Section **402.07(d)**. Wedges of HMA are used to level sags and depressions in an old pavement prior to the paving operation.

Leveling and wedging material is required to be placed in lifts to ensure compaction. The top of each lift is required to be parallel to the desired profile or cross section as shown in Figure 6-3.



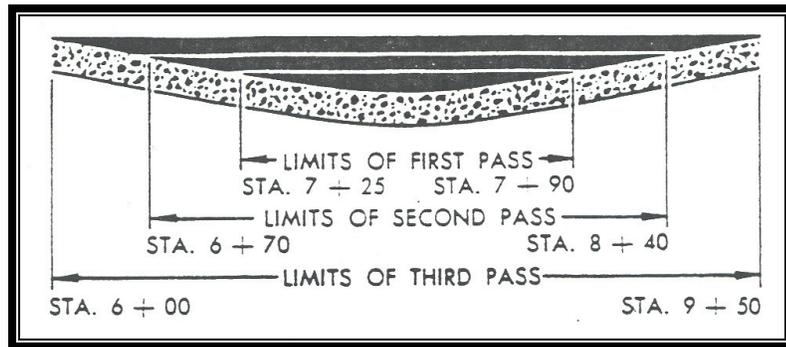
**Figure 6-3. Correct Wedge and Level**

Because of the difficulty of feathering the edges of HMA mixtures, placing the material in lifts parallel to the existing surface (Figure 6-4) usually results in rough patches that reflect to the finished surface.



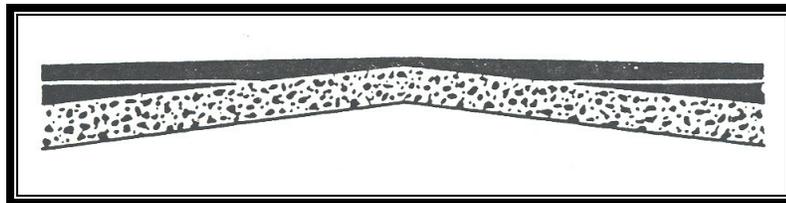
**Figure 6-4. Incorrect Wedge and Level**

The number and lengths of lifts are determined by the allowable lift thickness and the depth of the area to be leveled (Figure 6-5).



**Figure 6-5. Wedge and Level Lifts**

Wedges are also used to re-establish the crown on a tangent roadway or superelevation on a curve (Figure 6-6). The number of wedge courses necessary to rebuild the crown or superelevation depends on the total depth to be placed and the maximum aggregate size in the mix.



**Figure 6-6. Crown Wedge**

The finished depth of any course is required to be at least 1.5 times but not more than 6 times the maximum particle size as shown on the DMF or JMF. Feathering may be less than the minimum thickness requirements.

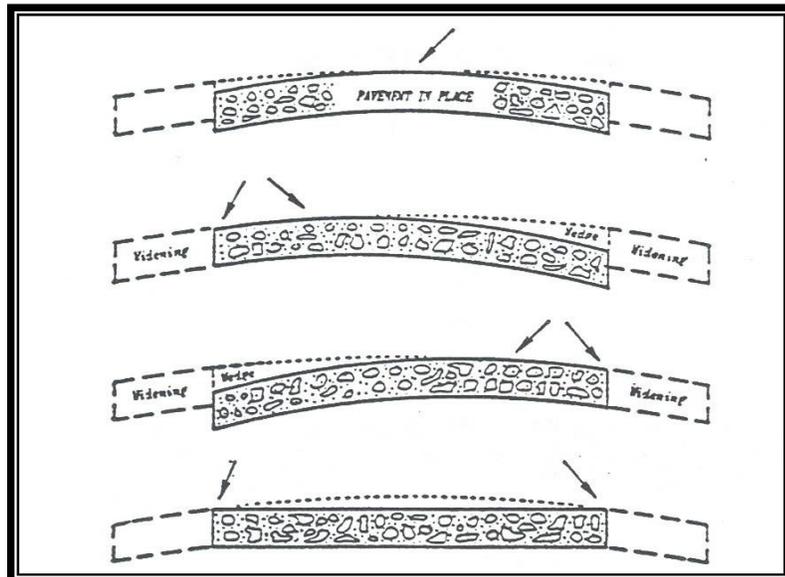
Acceptance of patching material and wedge and level is done on the basis of a Type D certification. This certification is required to be delivered to the job-site each morning before any mix may be accepted. Typically, the first truckload of material is delivered with the Type D certification. The Type D certification is required to report the air voids and binder contents of the mix. The allowable deviations from the DMF are 1.5 % for air voids and 0.7 % for the binder content. If the results do not comply with these requirements, the HMA is processed as a failed material.

## BASE WIDENING

With the increased emphasis on rehabilitation of existing roadways, more contracts require widening and resurfacing. The width of the widening, either on one or both sides of the pavement, and the type of base mixture are indicated on the plans or specified in the contract.

The area to be widened is usually excavated with a trenching machine, milling machine or motor grader, depending on the width. The subgrade is then compacted and the widened area backfilled to the planned line and grade. When the profile and alignment of the existing pavement edge is satisfactory, the edge may be used as a guide in excavating the widening trench. However, when either of these is irregular, field work and planning are required to establish line and grade before the Contractor begins work. Pavements to be surfaced are sometimes warped with variable or inverted crowns. On tangents, one edge may be higher than the surface at the centerline.

Typical examples of warped and non-uniform crowned pavements are shown in Figure 6-7. Sections needing correction may have excessive crown, one edge higher than the other, or no crown. In each instance, wedging is required. The controlling point for establishing the final profile is indicated by the arrows in Figure 6-7. The wedges are required to be placed before excavation of the widening sections is started so that a good reference for line and grade is established.



**Figure 6-7. Warped and Non-Uniform Crowned Pavements**

## CLEANING

The existing surface is required to be cleaned before applying the tack coat. Normally, cleaning may be done by sweeping, but sometimes mud or other foreign matter is required to be removed with shovels and hand brooms. Where dirt is embedded, a pressure washer or compressed air may be required for thorough cleaning. Typically power brooms are used for sweeping (Figure 6-8).

Excess asphalt material at cracks and joints is required to be removed to the elevation of the existing surface or below. Failure to remove the excess asphalt materials results in "bleeding" of the asphalt through the subsequent courses causing bumps or other irregularities in the surface.



**Figure 6-8. Power Broom**

## TACKING

A tack coat is the application of asphalt material to an existing paved surface (Figure 6-9). The primary purpose of the tack coat is to adhere the newly placed HMA to the old surface. Tack coats are covered by Section **406**. The material that is used for tacking is Asphalt Emulsion, AE-T, AE-PMT, SS-1h or AE-NT (Section **902.01(b)**).



**Figure 6-9. Tack Application**

***APPLICATION***

Tack coats are applied to have the least inconvenience to traffic and to permit one-way traffic without tracking or picking up of the material. Typically, nearly all of the tacked area is covered by mix each day. Tack coat may not be applied to a wet surface. The rate of application, temperature, and areas to be treated are required to be approved by the PE/PS before the application of tack material. In the event of rain or other circumstances where the tack coat remains uncovered, the material may be lightly sanded and provisions made for traffic safety.

The two essential requirements of a tack coat are:

- 1) The application of the asphalt material is required to be very thin
- 2) The material is required to uniformly cover the entire surface of the area to be paved without puddling or streaking

The asphalt material is required to be uniformly applied with a pressure distributor at a rate from 0.03 to 0.08 gallons per square yard unless otherwise specified or directed. The tack coat is not applied heavily. Too little tack is better than too much. The texture and absorption of the existing surface affects the desirable application rate.

The application rate depends on the speed of the truck, the length of the spray bar, the pump pressure, and the pump speed. Each distributor is equipped with charts or computerized systems for determining the correct setting for the pump and truck speed for any given spray bar length and application rate. When the Contractor cannot get uniform coverage and streaking or puddling continues despite adjustments to the distributor, the use of a burlap drag may be required. The tack coat may be mopped, broomed, or squeegeed to obtain a more even distribution or to facilitate curing.

Areas inaccessible to the spray bar are tacked with the hand spray. Extreme care is required to be taken with the hand spray to obtain uniform coverage without puddling.

### ***CURING***

Time is required to allow the asphalt emulsions to break and cure before the HMA is placed on the tack coat. The emulsion turns from brown to black and becomes sticky when the material "breaks" and the water evaporates.