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Instructions:

Page numbers and corresponding sheet-counts are given in the table below to indicate portions of the *Construction Manual* that are to be removed and inserted to accomplish this revision.

Chapter	Remove		Insert	
	Pages	Sheets	Pages	Sheets
Title Page	N/A	1	N/A	1
Chapter 5 Surface Treatments and Pavements	5-17 – 5-18	1	5-17 – 5-18	1

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**Washington State
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5. After each roller pass, a density reading is taken with the nuclear gauge at the test spot.
6. After finish rolling, densities are then to be determined at two additional locations, 15 to 25 feet each side of the test spot and in line longitudinal with the direction of paving. Evaluation of the compactibility of the mix shall be made on the average of the three densities.
7. If the average test spot density is greater than 92 percent, but less than 96 percent of Rice density for wearing courses or less than 98 percent of Rice density for base and leveling courses, a satisfactory test section has been completed. If the test section values are beyond these limits, the mix design should be changed. The State Materials Laboratory can provide assistance as needed.

The test section should be repeated when:

1. The results of previous tests are not considered by the Engineer to be reliable.
2. The Engineer directs a change in mix composition. Note that slight adjustments in bin masses are not considered a change in mix composition.
2. Routine control tests indicate changes from results found in previous qualifying test sections. (In this instance, the Inspector should check the contractor's rolling pattern for changes and check plant test results for mix changes. Any changes should be noted on the compaction report.)

Compaction Control

Compaction is controlled by testing with the nuclear density gauge for all classes of HMA where the paving is in the traffic lanes and compacted course thickness is greater than 0.10 foot. The nuclear gauge testing shall be conducted in accordance with current test methods. The specification requirements shall be a quality level of 1.00 or greater referenced to a minimum density of 91 percent of the maximum density (Rice density) as determined by WSDOT FOP for AASHTO T 209.

Cores of the finished pavement may be substituted for nuclear gauge readings to determine densities, provided they are requested by the Contractor by noon of the next day after paving. If this alternate is done at the request of the Contractor, and the cores show the materials to be outside specification limits, WSDOT shall be reimbursed for the coring expenses at the rate of \$125 per core. If the cores show the materials to be within specification limits, then there will be no charge for the cores.

Control lots not meeting the prescribed minimum density standard of 0.75 CPF need to be evaluated for removal and replacement with satisfactory material. At the Engineer's option, control lots with a CPF between 0.75 and 1.00 may be accepted at a reduced price in accordance with current policies.

For preleveling mix, the compaction control shall be to the satisfaction of the Engineer.

For all other conditions, the Contractor shall construct a test section in accordance with instructions from the Engineer. The number and timing of passes with an approved compaction train that will yield maximum density with the nuclear gauge in the test section shall be used on all succeeding paving. The Inspector should make sure the Contractor is making the required number of passes and reconstruct a test section if conditions change.

5-4.2B(4) Miscellaneous Duties of the Street Inspector

When constructing plant-mixed pavement adjoining gutters, curbs, cold pavement joints, manhole castings, etc., the Inspector shall see that all contact surfaces are painted with an approved asphalt material before placing the adjoining pavement.

A detailed Inspector's Daily Report (Forms 422-004, 422-004A, and 422-004B) shall be kept by the Inspector, noting all unusual occurrences, orders received from the Project Engineer, orders issued to the Contractor, and other pertinent information.

The Asphalt Concrete Pavement Compaction Report, Form 350-092, shall be prepared by the Density Inspector and distributed as shown on the form.

5-4.2B(5) Multiple Asphalt Plants

When two or more asphalt plants are used on one project, the mix from each plant must be placed with separate paving machines and compaction equipment. This is necessary because of the required adjustments on each paving operation to accommodate the different mixes and the various rolling patterns that may be necessary. Otherwise the test sections would not reflect true data for compaction controls due to different characteristics for the different aggregates or asphalt plants.

5-4.2B(6) Weed Control Under Asphalt Pavement

Weeds cause considerable damage to thin asphalt pavements such as sidewalks, shoulder overlays, and asphalt lined ditches. It is typically recommended that chemical weed control be used under all asphalt pavements less than 0.35 foot in depth unless a full depth base preparation was included in the construction. Check the contract requirements to see if soil residual herbicide is required.

5-4.2C How to ...

Calculate Approximate Paver Speed for Continuous Operation

To assist in working with the Contractor to determine paver speeds, the following formula can be used to calculate approximate speeds required to handle various production rates at varying depths. Section 5-04.3(3) of the *Standard Specifications* requires the paving machine to be operated at a uniform speed consistent with the plant production rate and compaction train capacity, which will allow a smooth, continuous paving operation.

$$S = [(T \div 0.076) \div (W * D)] \div 60$$

where: T = Tons per hour
 W = Width in feet
 D = Depth in feet
 S = Paver speed in feet per minute

Based on 2.052 tons per c.y. =
 0.076 tons per c.f.

Compute Yield

During the paving operation, a careful record shall be kept, showing truckloads, the weight of each truck and other pertinent data. Periodically, the Inspector shall compute the quantity of mix placed per square yard, and shall compare the yield against the proposed quantities. Overruns or underruns in quantities may be avoided by making a constant check of quantities placed.

HMA pavements are designed on a weight-volume relationship of 137 pounds for one square yard of pavement of a compacted depth of 0.10 foot. It is the intention in the construction of the pavement to spread the mixture according to an average yield in pounds per square yard.

Remember that the minimum compacted depth of pavement must also be met. If the aggregates are heavier than anticipated when the quantities were computed, or if the surface that the pavement is being constructed on is not true, the average yield can be attained without meeting the minimum thickness requirement.

Weigh tickets shall be collected and a daily total weight of mixture received shall be obtained and entered on the daily report for submission to the Project Engineer. To eliminate possible errors, totals as recorded by the Plant Inspector shall be compared against the total obtained by the Street Inspector. Careful attention given to those details may save argument with the Contractor concerning pay quantities.

Determining Minimum Lift Thickness

On occasion, the thickness of an individual lift of HMA is not specifically indicated on the roadway sections, or a contractor requests permission to place the HMA in more than one lift. Although maximum lift thickness is specified in the Standard Specifications, there is no guidance as to the minimum.

Lift thickness is governed by aggregate size. Adequate lift thickness ensures proper aggregate alignment during compaction, so that density and an impermeable mat can be achieved. Lifts placed too thin can lead to aggregate segregation, tearing, more rapid cooling and it is generally more difficult to achieve proper density and pavement smoothness. As a guide, the following table may be used to determine the minimum lift thickness for the various classes of mix.

HMA Class	Minimum Lift Thickness (feet)
Superpave 3/8"	0.08
Superpave 1/2"	0.12
Superpave 3/4"	0.20
Superpave 1"	0.25

5-4.3 Mix Design

Establishing Mix Proportions

The Contractor is required develop a mix design for each of the classes of HMA in the contract. When the contractor has completed a mix design it is submitted to the Project Engineer along with representative samples of the mineral materials that will be used for HMA production. The mix design and samples are shipped to the State Materials Laboratory in Tumwater for verification of the mix design.

During production it may be necessary to make adjustments in aggregate gradation and asphalt content on the job to fit field requirements such as workability, compactibility, and volumetric properties (Va, VMA and VFA). Section 9-03.8(6)A of the *Standard Specifications* provides the limits of change, both for the aggregate and the asphalt binder content, that can be approved by the Project Engineer. These changes can be made at the request of the contractor provided the change will produce material of equal or better quality. The Project Engineer may order a change in the asphalt binder content.

Adjustments for asphalt binder content greater than ± 0.3 percent may be approved by the State Materials Laboratory or the State Construction Office. Based on past experience in the Region, the Regional Administrator or the Regional Construction Engineer may wish to change the asphalt content beyond the $\pm 0.3\%$. To accomplish this, the Region may direct the Project Engineer to increase or decrease the asphalt content by notifying the Project Engineer in writing, or by e-mail, and sending a copy of this direction to the State Materials Laboratory. It is intended that this action include consultation with the State Materials Laboratory or the State Construction Office to provide the best asphalt paving material possible.

During construction, guidance for adjustments is provided through the use and interpretation of the compaction test sections and compaction control testing results.

The Contractor's plant operator shall be advised of all results of sampling and testing performed so that the proper gate settings may be established at the cold aggregate feeders.