



SECTION 402

PLANT MIX BITUMINOUS SURFACE LEVELING

402.1 Description. This work shall consist of placing, spreading and compacting a bituminous mixture as shown on the plans or as directed by the engineer. Spot wedging will not be required.

402.2 Material. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section
Coarse Aggregate	1004.2
Fine Aggregate	1002.3
Mineral Filler	1002.4
Asphalt Binder, Performance Graded (PG)	1015.3

402.2.1 Asphalt Binder. The grade of asphalt binder will be specified in the contract.

402.2.2 Wet Bottom Boiler Slag. The contractor may furnish wet bottom boiler slag of approved quality in lieu of coarse aggregate specified in [Sec 402.2](#). If wet bottom boiler slag is used, the slag shall meet the requirements for coarse aggregate, except that the percentage of wear specified in [Sec 1004.2.1](#) will not apply.

402.2.3 Reclaimed Asphalt. The asphalt binder content of recycled asphalt materials shall be determined in accordance with AASHTO T 164, ASTM D 2172 or other approved method of solvent extraction. A correction factor for use during production may be determined for binder ignition by burning a sample in accordance with AASHTO T 308 and subtracting from the binder content determined by extraction.

402.2.3.1 Reclaimed Asphalt Pavement. Reclaimed Asphalt Pavement (RAP) may be used in any mixture, except SMA mixtures. Mixtures may be used with more than 30 percent virgin effective binder replacement provided testing according to AASHTO M 323 is included with the job mix formula that ensures the combined binder meets the grade specified in the contract. All RAP material, except as noted below, shall be tested in accordance with AASHTO T 327, *Method of Resistance of Coarse Aggregate Degradation by Abrasion in the Micro-Deval Apparatus*. Aggregate shall have the asphalt coating removed either by extraction or binder ignition during production. The material shall be tested in the Micro-Deval apparatus at a frequency of once per 1500 tons. The percent loss shall not exceed the Micro-Deval loss of the combined virgin material by more than five percent. Micro-Deval testing will be waived for RAP material obtained from MoDOT roadways. All RAP material shall be in accordance with [Sec 1002](#) for deleterious and other foreign material. The aggregate specific gravity shall be determined by performing AASHTO T 209 in accordance with [Sec 403.19.3.1.2](#) and calculating the G_{se} to which a 0.98 correction factor will be applied in order to determine G_{sb} as follows:

$$G_{se} = \frac{100 - P_b}{\frac{100}{G_{mm}} - \frac{P_b}{G_b}}$$

$$RAP G_{sb} = RAP G_{se} \times 0.98$$

402.2.3.2 Reclaimed Asphalt Shingles. Reclaimed Asphalt Shingles (RAS) may be used in any mixture specified to use PG 64-22 in accordance with AASHTO PP 53 except as follows:

For mixtures containing RAS or a combination of RAS and RAP, the RAS contribution shall not exceed 20 percent effective virgin binder replacement. Mixtures containing a combination of RAS and RAP may have a maximum 30 percent effective virgin binder replacement with no virgin binder grade change. Mixtures containing a combination of RAS and RAP may have a 30 to 40 percent effective virgin binder replacement under the following conditions: (1) with a virgin binder grade change from a PG64-22 to a PG 58-28 or (2) with a combination of a PG64-22 binder and a rejuvenator provided testing demonstrates that a PG58-28, meeting the requirements of AASHTO M320, is achieved. Shingles shall be ground to 100 percent passing the 3/8-inch sieve. Waste, manufacturer or new, shingles shall be essential free of deleterious materials. Post-consumer RAS shall not contain more than 1.5 percent wood by weight or more than 3.0 percent total deleterious by weight. Post-consumer RAS shall be certified to contain less than the maximum allowable amount of asbestos as defined by national or local standards. The bulk specific gravity of RAS used in the job mix formula shall be 2.600.

$$RAS G_{sb} = 2.600$$

The gradation of the aggregate may be determined by solvent extraction of the binder or using the following as a standard gradation:

Shingle Aggregate Gradation	
Sieve Size	Percent Passing by Weight
3/8 inch	100
No. 4	95
No. 8	85
No. 16	70
No. 30	50
No. 50	45
No. 100	35
No. 200	25

402.3 Composition of Mixture. Aggregate sources shall be from the specific ledge combination of ledges within a quarry, or processed aggregate from a particular product, as submitted in the mix design. The total aggregate prior to mixing with asphalt binder shall be in accordance with the following gradation requirements:

Plant Mix Bituminous Surface Leveling	
Sieve Size	Percent Passing by Weight
3/4 inch	100
1/2 inch	99-100
3/8 inch	90-100
No. 4	60-90
No. 8	40-70
No. 30	15-35
No. 200	5-12

BP-3 in accordance with Sec 401.3 is an allowable substitution.

402.3.1 Mixture Characteristics. Bituminous surface leveling mixture shall have the following properties, when tested in accordance with AASHTO T 245 or AASHTO T 312. The number of blows with the compaction hammer shall be 35 or the number of gyrations shall be 35 with the gyratory compactor. The mixture shall have a minimum voids filled with asphalt (VFA) of 75 percent. The dust to effective binder ratio shall be 0.8 to 1.6.

Percent Air Voids	AASHTO T 245 Stability lb	Voids in Mineral Aggregate (VMA)
3.5	750	14.5

402.4 Job Mix Formula. The mixture shall be in accordance with [Sec 401.4](#).

402.5 Gradation and Deleterious Content Control. In producing mixture for the project, the plant shall be operated such that no deviations from the job mix formula are made. The contractor shall determine on a daily basis, at a minimum, the gradation on the aggregate reclaimed from the RAP by either extraction or binder ignition. The gradation results shall be used to determine the daily specification compliance for the combined gradation. Mixture as produced will be subject to the following tolerances and control:

- (a) The total aggregate gradations shall be within the master range specified in [Sec 402.3](#).
- (b) Material passing the No. 200 sieve shall not vary from the job mix formula by more than ± 2.0 percentage points.
- (c) The deleterious content of the material retained on the No. 4 sieve shall not exceed the limits specified in [Sec 1004.2](#).
- (d) If the plasticity index of any fraction exceeds that of the material approved for the mix design, additional testing may be required.
- (e) The quantity of asphalt binder introduced into the mixer shall be that quantity specified in the job mix formula. No changes may be made to the quantity of asphalt binder specified in the job mix formula without written approval from the engineer. The quantity of asphalt binder determined by calculation or tests on the final mixture shall not vary more than ± 0.3 percent from the job-mix formula.

402.6 Sample Location. The gradations of the total aggregate will be determined from samples taken from the hot bins on the batch-type plants, or from hot bins or combined hot aggregate flow on continuous mixing plants, or from the combined cold feed on dryer-drum plants. The deleterious content of the total aggregate will be determined from the samples taken from the combined cold feed belt. Samples for plasticity index will be taken from the stockpile. The RAP shall be sampled from the RAP feeding system on the asphalt plant.

402.7 Moisture Content. The bituminous mixture, when sampled and tested in accordance with AASHTO T 329, shall contain no more than 0.5 percent moisture by weight of the mixture.

402.8 Contamination. The bituminous mixture shall not be contaminated with deleterious agents such as unburned fuel, objectionable fuel residue or any other material not inherent in the job mix formula.

402.9 Field Laboratory. The contractor shall provide a Type 3 field laboratory in accordance with [Sec 601](#).

402.10 Construction Requirements.

402.10.1 Weather Limitations. Bituminous mixtures shall not be placed (1) when either the air temperature or the temperature of the surface on which the mixture is to be placed is below 50 F or (2) on any wet surface or frozen pavement. Temperatures shall be obtained in accordance with MoDOT Test Method TM 20.

402.10.2 Bituminous Mixing Plants. Bituminous mixing plants and preparation of material and mixtures shall be in accordance with [Sec 404](#).

402.10.3 Application of Prime or Tack. Application of prime or tack coat shall be in accordance with [Sec 403.12](#).

402.10.4 Hauling Equipment. Trucks used for hauling bituminous mixtures shall be in accordance with [Sec 404](#).

402.10.5 Spreading. The existing surface shall be cleaned of all dirt, packed soil or any other foreign material prior to spreading the bituminous mixture. The mixture shall be spread in the quantity required to obtain the compacted thickness and cross section shown on the plans. The paver shall be operated at a speed that will give the best results. The rate of delivery of the mixture to the paver shall be coordinated to provide, where practical, a uniform rate of placement without intermittent operation of the paver. On small areas and on areas that are inaccessible to mechanical spreading and finishing equipment, the mixture may be spread and finished by hand methods when permitted by the engineer.

402.10.5.1 Irregularities. The mixture shall be spread without tearing the surface and struck off such that the surface is smooth and true to cross section, free from all irregularities and of uniform density throughout. Care shall be used in handling the mixture to avoid segregation. Areas of segregated mixture shall be removed and replaced with suitable mixture. The outside edge alignment shall be uniform and any irregularities shall be corrected by adding or removing mixture before compacting.

402.10.5.2 Pavement Edge Differential. No pavement edge differential shall be left in place for more than seven days, without written approval from the engineer.

402.10.6 Joints. Transverse joints shall be formed by cutting back on the previous run to expose the full depth of the layer. When a transverse vertical edge is to be left and opened to

traffic, a temporary depth transition shall be built as approved by the engineer. The longitudinal joint shall be at the lane lines of the traveled way except that the placement width of bituminous surface may be adjusted such that temporary raised pavement markers will not fall on a longitudinal joint. Each side of the joint shall be flush and along true lines.

402.10.7 Compaction. The mixture shall be thoroughly compacted by at least three complete coverages over the entire area with either a pneumatic tire roller or a tandem-type steel wheel roller each weighing no less than 10 tons. All rollers used shall be in satisfactory condition, capable of reversing without backlash, and steel wheel rollers shall be equipped with scrapers. Rollers shall have a system for moistening each roll or wheel. Rolling shall begin as soon after spreading the mixture as the new surface will bear the weight of the roller without undue displacement. Final rolling shall be done by the steel wheel roller. Rolling shall be performed at proper time intervals and shall be continued until there is no visible evidence of further consolidation and until all roller marks are eliminated.

402.10.8 Surface Condition. The surface of the mixture after compaction shall be smooth and uniform. Any mixture showing an excess of asphalt binder or that becomes loose and broken, mixed with dirt or is in any way defective shall be removed and replaced at the contractor's expense with a satisfactory mixture, which shall be immediately compacted to conform to the surrounding area.

402.10.9 Hauling Over Completed Surface. Hauling of plant mix bituminous mixture over any completed portion of the project will not be permitted unless allowed by special provision.

402.11 Method of Measurement. The weight of the mixture will be determined from the batch weights if a batch-type plant is used. If other types of plants are used, the weight of the mixture will be determined by weighing each truck load on scales in accordance with [Sec 310](#). Measurement will be made to the nearest 0.1 ton for the total tonnage of material accepted.

402.12 Basis of Payment. The accepted quantities of plant mix bituminous surface leveling will be paid for at the contract unit price for each of the pay items included in the contract.