



SECTION 402

PLANT MIX BITUMINOUS SURFACE LEVELING

402.1 Description. This work shall consist of a mixture of aggregate, filler if needed, and asphalt binder prepared in a stationary bituminous mixing plant in such proportions that the resulting mixture meets the grading requirements of the job-mix formula. The material shall be spread in one course. There will be no spot wedging required.

402.2 Material. All material shall conform to Division 1000, Materials Details, and specifically as follows:

Item	Section
Coarse Aggregate	1002.1.1 to 1002.1.3, incl.
Fine Aggregate	1002.2.1
Mineral Filler	1002.3
Asphalt Binder, Performance Graded (PG)	1015

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

402.2.1 The gradation of coarse aggregate shall be such that the total aggregate meets the gradation requirements specified for the work prior to being fed into the cold aggregate feeders.

402.2.2 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, it shall meet the requirements for coarse aggregate except that the percentage of wear specified in [Sec 1002.1.1](#) shall not apply.

402.3 Composition of Mixture.

402.3.1 Gradation of Combined Aggregates. The total aggregate for mixtures other than those containing wet bottom boiler slag in lieu of coarse aggregate, at the time of mixing with asphalt binder shall meet the following gradation requirements:

Sieve Size	Percent Passing by Weight (Mass)
3/4 inch (19.0 mm)	100
1/2 inch (12.5 mm)	95-100
No. 4 (4.75 mm)	60-90
No. 8 (2.36 mm)	40-70
No. 30 (600 µm)	15-35
No. 200 (75 µm)	4-12

402.3.1.1 The total aggregate for mixtures containing wet bottom boiler slag in lieu of coarse aggregate, at the time of mixing with asphalt binder shall meet the following gradation requirements:

Sieve Size	Percent Passing by Weight (Mass)
1/2 inch (12.5 mm)	100
No. 4 (4.75 mm)	90-100
No. 8 (2.36 mm)	65-95
No. 30 (600 μm)	20-40
No. 200 (75 μm)	3-10

402.3.2 The combinations of material as required in this section shall meet the gradation requirements specified for the work.

402.3.2.1 If gravel, wet bottom boiler slag or flint chat as produced in the Joplin area is used, not less than 15 percent nor more than 30 percent crushed stone screenings, or dolomite chat screenings as produced in the Southeast Missouri Lead Belt Area, or not less than 4 percent mineral filler by weight (mass), shall be added as a separate ingredient. Screenings shall consist of tough durable particles of approved quality, shall be free from dirt or other objectionable material and shall have 100 percent passing the 3/8-inch (9.5 mm) sieve.

402.3.2.2 If crushed stone, or if dolomite chat as produced in the Southeast Missouri Lead Belt area is used, not less than 15 percent nor more than 30 percent natural siliceous sand, porphyry sand or flint sand of approved quality shall be added as a separate ingredient. Wet bottom boiler slag of approved quality may be used as sand. Sand shall have 100 percent passing the 3/8-inch (9.5 mm) sieve and not more than 8 percent passing the No. 200 (75 μm) sieve.

402.3.2.3 If porphyry is used, sand as described in [Sec 402.3.2.2](#) or mineral filler may be added to meet gradation requirements.

402.3.2.4 With written approval of the engineer, combinations of gravel, crushed stone, dolomite chat or porphyry, or combinations of flint chat, crushed stone, dolomite chat or porphyry may be used. Not less than 15 nor more than 30 percent sand as specified in [Sec 402.3.2.2](#) shall be added as a separate ingredient. Each size and type of aggregate shall be kept separate and fed through separate calibrated cold aggregate feeders to ensure proper proportioning. No mixture will be approved which contains less than 30 percent of any one type of coarse aggregate in the combination. In addition, all plus No. 8 (2.36 mm) sieve fractions shall contain material from each type of coarse aggregate in the approved combination.

402.3.3 The composition of mixtures other than those containing wet bottom boiler slag in lieu of coarse aggregate shall conform to the following limits by weight (mass):

	Percent
Total Mineral Aggregate	92.0 - 96.5
Asphalt Binder	3.5 - 8.0

402.3.3.1 The composition of mixtures containing wet bottom boiler slag in lieu of coarse aggregate shall conform to the following limits by weight (mass):

	Percent
Total Mineral Aggregate	91.0 - 95.0
Asphalt Binder	5.0 - 9.0

402.3.4 At least 30 days prior to preparing any of the mixture on the project, the contractor shall obtain in the presence of the engineer representative samples of asphalt binder and

mineral aggregates for tests. The samples of the material shall be of the size specified by the engineer and shall be submitted to the Central Laboratory for testing. The contractor shall also submit for the engineer's approval a job-mix formula for the mixture to be supplied for the project. No mixture will be accepted for use until the job-mix formula for the project is approved by the engineer. The job-mix formula shall be within the gradation range for bituminous surface leveling and shall include the type and sources of all material, the gradations of the aggregates and the relative quantity of each ingredient and shall state a definite percentage for each fraction of aggregate. No job-mix formula will be approved which does not permit within the limits specified in [Sec 402.3.1](#), at least 1/2 the tolerance specified in [Sec 402.3.6](#) for material passing the No. 200 (75 µm) sieve. The job-mix formula approved for the mixture shall be in effect until modified in writing by the engineer. When unsatisfactory results or other conditions make it necessary or should a source of material be changed, a new job-mix formula may be required.

402.3.5 The engineer will make such changes in the proportions of asphalt binder and aggregates as considered necessary. The proposed mixture will be compacted and tested in the laboratory in accordance with AASHTO T 167 or AASHTO T 245, at the option of the engineer and modified as follows. The test method used shall be modified by aging the mixture for two hours, at the specified compaction temperature range of the asphalt binder, just prior to compaction of the specimens. The mixture of mineral aggregate and asphalt binder shall result in a bituminous mixture which will be durable and retain satisfactory cohesion in the presence of moisture. Chemical additives approved by the engineer may be made to the asphalt binder or to the mixture.

402.3.6 Gradation Control. In producing mixture for the project, the plant shall be operated so that no intentional deviations from the job-mix formula are made. Mixture as produced shall be subject to the following tolerances and control:

(a) The total aggregate gradations shall be within the master range specified in [Sec 402.3.1](#).

(b) Material passing the No. 200 (75 µm) sieve shall not vary from the job mix formula by more than ±2.0 percentage points.

(c) The quantity of asphalt binder introduced into the mixer shall be that quantity specified in the job-mix formula. No change may be made in the quantity of asphalt binder specified in the job-mix formula without written approval of the engineer. The quantity of asphalt binder determined by calculation or tests on the final mixture shall not vary more than ±0.5 percentage point from the job-mix formula.

402.3.7 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.

402.4 Field Laboratory. The contractor shall provide a Type 3 Field Laboratory meeting the requirements of [Sec 601](#). No direct payment will be made for providing the laboratory.

Construction Requirements

402.5 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 (10 C), (2) on any wet surface or frozen pavement, or (3) when weather conditions prevent the proper handling or finishing of the mixture. Temperatures shall be obtained in accordance with MoDOT Test Method T20.

402.6 Bituminous Mixing Plants. Bituminous mixing plant and preparation of material and mixtures shall conform to the requirements of [Sec 404](#).

402.7 Subgrade Preparation. The subgrade upon which the bituminous mixture is to be placed shall be tacked as specified in the contract, in accordance with [Sec 407](#).

402.8 Hauling Equipment. Trucks used for hauling bituminous mixtures shall comply with the requirements of [Sec 404](#).

402.9 Spreading. The existing surface shall be cleaned of all dirt, packed soil or any other foreign material prior to spreading the bituminous mixture. When placed on the roadbed, the mixture shall have a temperature of not less than 260 F (127 C). It shall be spread with an approved spreading and finishing machine and 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 so as to provide, where practicable, a uniform rate of placement without intermittent operation of the paver. On small areas, and on areas which are inaccessible to mechanical spreading and finishing equipment, the mixture may be spread and finished by hand methods when permitted by the engineer.

402.9.1 The mixture shall be spread without tearing the surface and struck off so 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 edges of the pavement shall be constructed to an angle of approximately 45 degrees with the surface of the roadbed. The outside edge alignment shall be uniform and any irregularities shall be corrected by adding or removing mixture before compacting.

402.9.2 No pavement edge differential shall be left in place for more than seven calendar days, unless approved by the engineer.

402.10 Joints. Longitudinal and transverse joints shall be carefully made and well bonded. Transverse joints shall be formed by cutting back on the previous run so as 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. A single lane of any layer shall not be constructed to a length for which the adjacent lane cannot be completed on the succeeding operating day. 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.

402.11 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 (having a mass of) not less than 10 tons (9 Mg). 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 it will bear the weight (mass) 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.

402.12 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 with satisfactory mixture, which shall be immediately compacted to conform with the surrounding area.

402.13 Hauling Over Completed Surface. Hauling of plant mix bituminous mixture over any completed portion of the project will not be permitted.

402.14 Method of Measurement. The weight (mass) of the mixture will be determined from the batch weights (masses) if a batch-type plant is used; and will be determined by weighing (by determining the mass of) each truck load on scales conforming to the requirements of [Sec 310.4.3](#) if other types of plants are used.

402.14.1 Measurement of asphalt binder, to the nearest 0.1 ton (0.1 Mg) for the total tonnage (quantity) used in the accepted work, will be determined by the use of the job-mix formula applied to the weight (mass) of accepted mixture of mineral aggregate and asphalt binder.

402.14.2 Measurement of the weight (mass) of mineral aggregate, to the nearest ton (megagram), will be determined by subtracting the weight (mass) of the asphalt binder from the weight (mass) of the mixed mineral aggregate and asphalt binder.

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