**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..

**402.2 Material.** All material shall be in accordance with [Division 1000](../Text/Div1000.xhtml#toc_marker-1), Material Details, and specifically as follows:

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| **Item** | **Section** |
| Bituminous Asphalt Mixes | 490 |
| Coarse Aggregate | [1004.2](../Text/Sec1004.xhtml#S1004_2) |
| Fine Aggregate | [1002.3](../Text/Sec1002.xhtml#S1002_3) |
| Mineral Filler | [1002.4](../Text/Sec1002.xhtml#S1002_4) |
| Asphalt Binder, Asphalt Emulsions | [1015](../Text/Sec1015.xhtml%22%20%5Cl%20%22S1015_3) |
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**402.2.1 Job Mix Formula (JMF).** At least 30 days prior to placing any mixture on the project, the contractor shall submit a mix design in accordance with Sec 490 for approval by Construction and Materials. Surface Leveling (SL) mixtures as designated by the plans are used for Section 402 pay items. In producing mixture for the project, the plant shall be operated such that no deviations from the job mix formula are made.

**402.2.1.1 Mixture Approval.** No mixture will be accepted for use until the job mix formula for the project is approved by Construction and Materials. The job mix formula approved for each mixture shall be in effect until modified in writing by the engineer. When unsatisfactory results or other conditions occur, or should a source of a material be changed, a new job mix formula may be required. In lieu of a new laboratory design, mixtures requiring adjustment beyond the limits allowed in [Sec 401.6](#S401_8_2).1 may be designed in the field based on characteristics of plant-produced mixture in accordance with [Sec 401](#S401) and verified by Construction and Materials, which may require new aggregate characteristics.

**402.2.1.2 Mixture Adjustments.** In producing mixtures for the project, the plant shall be operated such that no intentional deviations from the job-mix formula are made except as follows. Aggregate only bin changes are allowable so long as the original gradation tolerances are met. Anytime the gradation tolerances are exceeded or there is a change to binder providing components, the contractor shall verify the mix still meets the Sec 490 requirements for recycle contribution, VMA and VFA with the adjusted Gsb, and D/B ratio. The contractor shall provide a record of the time and tonnage of all mixture adjustments as well as all verification testing to the engineer. No changes may be made to the quantity of asphalt binder specified in the job mix formula without written approval from the engineer.

**402.2.2 Substitutions.** At the option of the contractor and at no cost to the Commission, the contractor may use a BP-3 mixture as an allowable substitution for Section 402 mixtures.

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**402.3 Mixing Plants and Hauling Equipment.** Bituminous mixing plants, hauling equipment, and preparation of material and mixtures shall be in accordance with [Sec 404](../Text/Sec404.xhtml%22%20%5Cl%20%22S404).

**402.4 Field Laboratory.** The contractor shall provide a Type 3 field laboratory in accordance with [Sec 601](../Text/Sec601.xhtml%22%20%5Cl%20%22S601). The contractor shall furnish the bituminous mixture equipment to perform all required test methods for QC and QA work. A field laboratory shall not be required for small quantity work.

**402.5 Construction Requirements.**

**402.5.1 Weather Limitations.** Bituminous mixtures shall not be placed on any wet surface or when either the air temperature or the temperature of the surface on which the mixture is to be placed is below 50 F.

**402.5.2 Application of Tack.** On the first day of production, the contractor shall demonstrate proper application of tack coat in the presence of the engineer. Application of tack coat shall be in accordance with  Sec 407.

**402.5.3 Spreading and Rolling.**   Prior to spreading and rolling the bituminous mixture, the existing surface shall be cleaned of all dirt, packed soil or any other foreign material. On the first day of production, the contractor shall demonstrate successful spreading and compaction of the mixture, including proper rolling patterns, in the presence of the engineer. The mixture shall be spread in the quantity required to obtain the compacted thickness and cross section shown on the plans.

**402.5.4 Roadway Irregularities.** When provided for in the plans, additional tons of mixture will be provided for irregularities in the existing roadway surface. The tonnage specified for irregularities is an estimated quantity and shall only be placed at locations where it is necessary to fill ruts and other low points. Prior to placing the mixture, the contractor and engineer shall evaluate the entire route and develop a plan that best utilizes the tonnage needed for irregularities. Any excess quantity of irregularities shall not be placed.

**402.5.5 Segregation.** No segregation will be permitted in handling the mixture at the plant, from the truck or during spreading operations on the roadbed. Mixture production shall immediately cease if either criteria of MoDOT Test Method TM 75 fail. Segregated mixture shall be removed and replaced to the limits determined by the engineer.

**402.5.7 Pavement Edge Treatment.**  For roadways constructed under traffic, pavement edge treatments as described in Standard Plan 619.10 shall be required. No pavement edge treatments shall be left in place for more than seven days, unless approved by the engineer.

**402.5.8 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.

**402.5.9 Compaction.** The mixture shall be thoroughly compacted by at least three complete passes 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.

**402.5.10 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.

**402.5.11 Hauling Over Completed Surface.** Hauling of mixture over any completed portion of the project will not be permitted.

**402.6 Quality Control.** The contractor shall control and monitor the quality of the work. At the engineer’s discretion, testing may be waived when production does not exceed 200 tons per day. Mixture suppliers shall have either a standard quality control plan on file with the Construction & Materials division for the applicable plant or be included in the contractor’s quality control plan.

**402.6.1 Retained Samples.** One half of the contractor’s sample for mixture gradation, aggregate deleterious content, and mixture asphalt content as well as all cores shall be retained for the engineer.  The contractor shall retain the samples for 7 days after testing has been completed and the results accepted by the engineer.

**402.6.2 Temperature of Air and Base.**  The contractor shall monitor the environmental conditions that affect asphalt production and laydown operations. Temperatures shall be obtained in accordance with MoDOT Test Method TM 20.

**402.6.3 Mixture Temperature.** The contractor shall periodically record the temperature of mix before it leaves the plant.

**402.6.4 Mixture 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.

**6.5 Mixture.** The gradations of the total aggregate will be determined from samples taken from the hot bins on batch-type plants or continuous mixing plants or from the composite cold feed belt on drum mix plants. The mixture gradation may be determined directly by using residual aggregate from the binder ignition process or by mathematical combination of the cold feed and recycled materials gradations. When the mathematical combination method is used, the RAS gradation shall be from the JMF and RAP gradation from the ignition or extraction residual aggregate. Sec 490 for Surface Level mixtures.

**402.6.6 Mixture Asphalt Content.** 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.

**402.6.7 Aggregate Deleterious.** The deleterious content of the total aggregate shall be determined from samples taken per Sec 401.6.3. The deleterious content of the material retained on the No. 4 sieve for the combined virgin aggregates shall not exceed the limits specified in [Sec 1004.2](../Text/Sec1004.xhtml%22%20%5Cl%20%22S1004_2). QC Deleterious testing shall be waived when independent QA deleterious and plasticity index tests compare favorably.

**402.6.8 Aggregate Plasticity Index.**  All individual aggregate fractions shall be tested for plasticity. Samples for plasticity index shall be taken from the stockpile. The plasticity index shall be within two of the Job Mix Formula. QC plasticity index testing shall be waived when independent QA deleterious and plasticity index tests compare favorably.

**402.6.9 Binder Monitoring.** Original asphalt binder delivery tickets shall accompany the report submitted to the engineer. The contractor shall take a daily QC sample of asphalt binder which will be collected by the engineer and shipped to the MoDOT Central Lab for random testing.

**402.6.10 RAP Gradation.**  The contractor shall test the residual aggregate from the RAP asphalt content testing to determine its gradation.

**402.6.11 RAP Asphalt Content.**  RAP shall be sampled from the RAP feeding system on the asphalt plant. Solvent extraction or binder ignition methods shall be used to determine RAP percent asphalt contents. If AASHTO T 308 is used to determine the asphalt content, the binder ignition oven shall be calibrated in accordance with MoDOT Test Method TM 77.

**402.6.12 RAP Durability.** All RAP material not from a MoDOT roadway shall be tested in accordance with AASHTO T 327, Method of Resistance of Coarse Aggregate Degradation by Abrasion in the Micro-Deval Apparatus. Samples of RAP for this test shall have the asphalt coating removed either by extraction or binder ignition. The RAP percent loss shall not exceed the loss of the combined virgin material by more than five percent.

**402.6.13 Tack Uniformity.**  When the engineer is not present to witness the application of tack coat, the contractor shall document the tack application uniformity by taking a minimum of two high-resolution date/time stamped photographs of the tacked surface per one-mile segment. Pictures should be taken just in front of the paver in order to account for the loss of tack from truck tires.

**402.6.12 Tack Usage.**  The contractor shall take distributor readings at the beginning and ending of each shift and document the quantity used. The contractor shall monitor and document the application rate.

**402.6.13 Segregation Limits.** Areas in question will be tested in accordance with MoDOT Test Method TM 75. QC shall ensure MoDOT has the opportunity to witness TM 75 being performed.

**402.6.14 Binder Quality.** The contractor shall ensure the binder is handled and stored in a manner that does not affect its quality. When the contractor is modifying the binder after delivery, additional quality control requirements apply. QC shall either assist QA in taking samples or obtain the QA sample directly in the inspector’s absence.

**402.6.15 Roadway Compaction.** The contractor shall monitor all roadway production procedures and document them daily. The use of approved Intelligent Compaction technology is an allowable substitute for daily documentation of compaction.

**402.7 Quality Assurance.** The engineer or designated representative will be responsible for monitoring the work and quality control efforts of the contractor.

**402.7.1 Independent QA Samples.** Unless otherwise stated, a favorable comparison shall be obtained when independent QA samples meet the same specification criteria as QC. A QA test for plasticity index will be performed by the engineer on an independent sample during the first day’s production and results furnished to the contractor within 24 hours of obtaining the sample.

**402.7.2 Split QC/QA Samples.** Split samples shall be clearly labeled and stored by the contractor in a manner that prevents contamination. Uncollected split samples shall be retained by the contractor until the engineer authorizes disposal or until the Final Inspection, whichever occurs earlier. A favorable mixture gradation comparison shall be obtained when QA is within 5% of QC on all sieves and within 2% of QC on the No. 200. A favorable mixture asphalt content comparison shall be obtained when QA is within 0.5% of QC. A favorable comparison for deleterious content shall be obtained when QA is within one half the Sec 1004.2 requirements of the QC results. If the results of a split sample do not compare, another split sample will be taken jointly and tested by both QC and QA. If the second test results do not compare, production shall cease until the testing discrepancy is resolved.

**402.8 QC/QA Frequency Table.**

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| **Tested Property** | **QC Frequency** | **QA Frequency** | **QC Small Quantity Frequency** |
| **Independent Samples** | **Split Samples** |
| Temperature of Base and Air | As Needed | As Needed | - | As Needed |
| Mixture Temperature | 4 per Day | 1 per Project | 4 per Day |
| Mixture Moisture | 1 per Day | 1 per Week | - |
| Mixture Gradation | 1 per 10,000 Tons | 1 per 10,000 Tons | 1 per Project |
| Mixture Asphalt Content  |
| Aggregate Deleterious  |
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| Aggregate Plasticity Index | 1 per Mix | 1 per Mix | - | - |
| Binder Monitoring | 1 per Day | 1 per Project |
| RAP Gradation | - |
| RAP Asphalt Content |
| RAP Deleterious |
| RAP Durability\* | 1 per 1500 Tons |
| Tack Uniformity | 2 per Mile | 2 per Day |
| Tack Usage | 1 per Day | 1 per Day |
| Segregation Limits | As Needed | As Needed | - |
| Binder Quality | - | As Needed |
| Roadway Compaction | Daily | - | Daily |
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 \* Testing of this property is conditional based on other specification requirements.

**402.9 Monitoring Quantity.** The contractor shall monitor the quantity of Surface Level mix placed and report that information to the engineer and production staff as specified herein.

1. The contractor shall verify that the quantity of mixture in the contract for each route is sufficient to cover the roadway as shown on the typical sections, including any surface irregularities. Any discrepancies shall be brought to the engineer’s attention in writing prior to the pre-construction conference. Plan quantity shall be defined as the total tons computed to cover the surface area according to the typical sections, plus any amount pre-approved by the engineer for pavement irregularities.
2. The contractor shall provide temporary log mile reference points at no less than ½ mile intervals along each route to monitor the tons of Surface Leveling mix laid in relation to plan quantity. Entrances, shoulders, or other irregular areas will be monitored as directed by the engineer.
3. During production, the contractor shall document the total tons placed in each one-mile segment, along with the plan quantity and the percent over/under for that segment. The cumulative quantity and percent over/under for the route should also be documented. After each one-mile segment, the contractor shall provide a status report to the production manager and the engineer. When the engineer is not present on the project the contractor shall send an electronic status report to the engineer. The engineer will monitor the status reports and will advise the contractor on how to proceed when there is an excessive variance, exceeding 2%, from the plan quantity. The engineer may decrease the frequency of electronic status reports when the variances are consistently low.
4. The contractor shall collect asphalt tickets from the delivery trucks and group them per each one-mile segment. The contractor shall submit to the engineer a daily summary report that includes all of the information specified in Sec 402.9c. The contractor shall sign the summary report confirming that the information is accurate and that the attached tickets represent the asphalt material placed.
5. The contractor shall be equipped with contractor-furnished cellular device capable of providing and maintaining a reliable means of immediate communication with the engineer when the engineer is not present on the project.

**402.9.1 Excessive Quantity.** If the contractor places Surface Level mixture on any one-mile segment, or any other isolated areas, in excess of plan quantity by 5% or more, without prior approval from the engineer, further investigation may be required to determine if the excess was warranted. If directed by the engineer, the contractor shall core the pavement at locations established by the engineer to determine the amount that was excessive, if any. No payment will be made for the cost to core the pavement or for the tons of mixture that the engineer determines to be excessive. If the amount of mixture is determined to be justified, payment will be made for the mix, and for the cost of coring at the fixed price established in Sec 109. Placement of asphalt in excess of plan quantity for two consecutive segments without prior approval from the engineer may result in issuance of an Order Record to stop work.

**402.10 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 109](../Text/Sec310.xhtml%22%20%5Cl%20%22S310). Measurement will be made to the nearest 0.1 ton for the total tonnage of material accepted

**402.11 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.