**SECTION 403**

**ASPHALTIC CONCRETE PAVEMENT**

**403.1 Description.** This work shall consist of providing a bituminous mixture to be placed in one or more courses on a prepared base or underlying course as shown on the plans or as directed by the engineer.

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**403.2 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 Mixtures | 490 |
| Aggregate | [1002](../Text/Sec1002.xhtml) |
| Asphalt Binder | [1015](../Text/Sec1015.xhtml) |
| Asphalt Emulsions | [1015](http://sharepoint/systemdelivery/CM/FieldOffice/Shared%20Documents/Text/Sec1015.xhtml) |
| Fiber Additive | [1071](../Text/Sec1071.xhtml) |
| Anti-Strip Additive | [1071](../Text/Sec1071.xhtml) |

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**403.2.1 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 to Construction and Materials. Superpave (SP) and Stone Mastic (SM) mixtures intended for Section 403 pay items as shown on the plans. The

**403.2.2 Substitutions.** At the option of the contractor and at no cost to the Commission, the contractor may substitute a smaller nominal maximum size mixture for a larger sized mixture. Specifications governing the substitute mixture shall apply. For multi-lift or single-lift construction paid for by area, the total plan pavement thickness shall be maintained. The contract unit price for the original mixture shall be used.

**2.3**Sec 403.

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**403.2.4 Mixture Approval.** No mixture will be accepted for use until the JMF for the project is approved by Construction and Materials.

**2.5**

**403.2.5.1 Redesign Approval.** New mix designs established in the field shall be submitted for approval to Construction and Materials. Upon approval, Construction and Materials will assign a new mix number to the mixture.

**403.2.5.2 Resume Production.** No mixture shall be placed on the project until the new field mix design is approved.

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

**403.4 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.

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**403.5 Acceptance and Payment for Work Types.** Acceptance of bituminous mixtures will be by the QC/QA process as designated within. The applicable pay adjustments shall be based on the type of work performed.

**403.5.1 Multiple Lift Mainline Construction.** For mainline traveled way work consisting of placing multiple lifts all QC/QA requirements and pay adjustments shall apply. Shoulders placed integrally with the mainline shall be included in the QC/QA lot process and adjustments for mainline.

**5.1.1**pay adjustmentsor with density being included in the pay factor total.

**403.5.2 Non-Integral Shoulders.**  All QC/QA requirements shall apply for mixtures used on non-integral shoulders, surfacing medians, and similar areas, except that density acceptance is as described in Sec. 403.11.11.2. All pay adjustments shall apply except for when an established roller pattern is utilized, no density related pay adjustment shall be made. No unconfined joint cores or pay factor shall apply to non-integral shoulder work.

**403.5.3 Mill and Fill.**  For resurfacing projects specifying a milling operation prior to mixture placement, the QC/QA requirements and pay adjustments of multiple lift construction shall apply.

**403.5.4 Single Lift or Leveling Course.**  For resurfacing projects without milling specifying a single lift overlay or for leveling course work all QC/QA requirements shall apply. All applicable adjustments shall be used in determining payment for acceptable work except that the density adjustment shall be used in lieu of including the pavement density in the pay factor total.

**403.5.5 Base Widening and Entrances.**  For base widening and entrance work, all QC/QA requirements shall apply. For base widening mixture and entrance work, compaction may be performed and accepted in accordance with Sec 403.11.11.2. No pay adjustments shall be made. Payment for these mixtures will be made at 100 percent of contract unit price for material that otherwise meets the specifications.

**403.5.6 Temporary Pavement.**  All QC/QA requirements shall apply for mixture placed for temporary work items except that moisture susceptibility and surface smoothness testing is not required. The Superpave adjustment without the density payfactor as well as the density adjustment shall apply to temporary work.

**5.7y**When is called for it shall be considered a small quantitydesignation For small quantities the contractor may elect to perform either the full QC/QA process or the modified process using the QC Small Quantity frequencies listed in the Sec 403.14 table. QA frequency for small quantities will be determined by the engineer. All applicable adjustments shall be used in determining payment for acceptable work except that when the QC Small Quantity frequencies are used, the Superpave adjustment shall not apply.

**403.5.8 Certifiable Quantity.** At the engineer’s discretion, QC/QA requirements may be waived when production does not exceed 200 tons per day. The contractor shall certify the proper proportions of a previously proven mixture were used. No price adjustments shall be made, payment for these mixtures will be made at 100 percent of contract unit price for material that otherwise meets the specifications.

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**403.11 Construction Requirements.**

**403.11.1 Weather Limitations.** Bituminous mixtures shall not be placed on any wet or frozen surface.

**403.11.2 Application of Prime or Tack.** The prime coat, if specified, shall be applied in accordance with [Sec 408](../Text/Sec408.xhtml#S408). A tack coat shall be applied on all existing pavement and shoulder surfaces that will be overlaid with a bituminous mixture. A tack coat shall also be required between all lifts of bituminous pavements placed within the driving and turn lanes, unless otherwise specified in the contract. All construction requirements of a tacked surface shall be in accordance with [Sec 407](../Text/Sec407.xhtml#Sec407), and specified herein. The tack coat shall be applied uniformly and shall completely cover the surface upon which the bituminous mixture is to be placed. Placement of a bituminous mixture shall not be placed upon a tacked surface that is not uniformly covered or surfaces that have experienced excessive loss of tack due to tracking. Re-application of tack due to excess tracking or non-uniform coverage shall be at the contractor’s expense.

**403.11.3 Spreading and Finishing.** The base course, primed or tacked surface, or preceding course or layer shall be cleaned of all dirt, packed soil or any other foreign material prior to spreading the asphaltic mixture. Truck loads not free of lumps or crusted material shall be rejected. The thickness and width of each course shall conform to the typical section in the contract. The contractor may elect to construct each course in multiple layers. The minimum compacted thickness shall be 0.75 inches for SP048, 1.25 inches for SP095, 1.75 inches for SP125, 2 inches for SP190, and 3 inches for SP250.

**403.11.3.1 Transitions.** All layers shall be feathered out, by hand raking if necessary, in transitioning the depth of the surface to meet present grades at bridges or ends of projects, to provide a uniform, smooth riding surface free of irregularities. Where only the top layer of the surfacing continues across a bridge, the bottom layers shall be feathered out.

**403.11.4 Paving Widths.** The following shall apply for roadways constructed under traffic. For pavements having a width of 16 to 24 feet, inclusive, the asphaltic concrete pavement shall be laid in lanes approximately one half the full width of the completed pavement, and the full width shall be completed as soon as practical. Unless otherwise permitted, a single lane of any course shall not be constructed to a length that cannot be completed to full width of the pavement the succeeding operating day. For pavements greater than 24 feet wide, single lane width construction shall be limited to one day's production and completion to full width shall be accomplished as soon as practical. Uneven pavement shall be left in place for no more than seven days, unless approved by the engineer. Removal of pavement to be in accordance with this specification shall be at the contractor’s expense.

**403.11.5 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.

**403.11.6 Release to Traffic.** If the asphaltic concrete construction consists of more than a single layer, each layer shall be compacted as specified and allowed to cool to the ambient temperature before the next layer is placed. The contractor shall keep traffic off the asphaltic concrete until the surface of the asphaltic concrete is 140 F or below and the asphaltic concrete has cooled sufficiently to prevent flushing of the asphalt binder to the surface, marking or distorting the surface or breaking down the edges.

**403.11.7 Draindown.** Evidence of asphalt binder separation or draindown at delivery will be cause for rejection.

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**403.11.9 Spot Wedging and Leveling Course.** The engineer will specify the locations and thickness of spot wedging and the thickness of leveling course to obtain the smoothest possible riding surface. This procedure may result in spot wedging operations over small areas with feather-edging at high points and ends of wedge areas. Rigid control of the placement thickness of the leveling course shall be required. Leveling course, consisting of a layer of asphaltic concrete of variable thickness used to superelevate curves and eliminate irregularities in the existing base, shall be spread uniformly to the specified profile grade and cross section. The mixture shall be uniformly spread and compacted, with only minor segregation as accepted by the engineer. Type SP125 or finer mixtures, as applicable, shall be used for the spot wedging and for the leveling course.

**403.11.10 Base Widening.** All base widening shall be constructed in accordance with [Sec 401.5.2.1](../Text/Sec401.xhtml%22%20%5Cl%20%22S401_7) and subsections.

**403.11.11 Compaction.** After the asphaltic mixture has been spread, struck off and surface irregularities adjusted, the asphaltic mixture shall be compacted thoroughly and uniformly by rolling to obtain the required compaction while the mixture is in a workable condition. Excessive rolling, to the extent of aggregate degradation, will not be permitted. A pneumatic tire roller shall be used as the initial or intermediate roller on any course placed as a single lift, as a wedge or leveling course. Rollers shall not be used in the vibratory mode when the mixture temperature is below 225 F. When warm mix technology is used, as approved by the engineer, rollers shall not be used in the vibratory mode when the mixture temperature is below 200 F .

**403.11.11.1 Rolling.** Any displacement occurring as a result of starting, stopping or changing direction of a roller, or from other causes, shall be avoided. Excess liquid, to prevent adhesion of the mixture to the rollers, will not be permitted. Diesel fuel, fuel oil or other detrimental products shall not be used as wetting agents. Along forms, curbs, headers, walls and other places not accessible to the roller, the mixture shall be thoroughly compacted with hot hand tampers, smoothing irons or with mechanical tampers.

**403.11.11.2 Non-Traffic Area Compaction.** Mixtures used for non-integral shoulders, surfacing medians, and similar areas shall be compacted to the specified densities for the mixture. Once an established rolling pattern has been demonstrated to provide the required density for shoulders, at the engineer's discretion, the pattern may be used in lieu of density tests provided no changes in the material, typical location or temperatures are made. Regardless of the method, density will still be required and subject to testing as deemed necessary by the engineer.

**403.11.12 Transverse Joints.** Transverse joints shall be formed by any method that will produce a dense, vertical section for use when laying is resumed. 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 joint formed when the fresh mixture is placed shall be dense, well sealed, and the grade, line and surface texture of the succeeding surface shall conform to that of the joined surface If directed by the engineer for properly sealing the transverse joint, a light coating of bituminous material shall be applied to the exposed edge before the joint is made. Hand manipulation of the mixture shall be minimized to avoid unsightly surface texture.

**403.11.13 Longitudinal Joints.**  Longitudinal joints shall be formed by the use of an edging plate fixed on both sides of the finishing machine. Care shall be taken to obtain a well bonded and sealed longitudinal joint by placing the hot mixture in a manner ensuring maximum compaction at this point. If directed by the engineer for properly sealing the longitudinal joint, a light coating of bituminous material shall be applied to the exposed edge before the joint is made. Each side of the joint shall be flush and along true lines.

**403.11.14 Surface Smoothness.** The finish of the pavement surface shall be substantially free from waves or irregularities and shall be true to the established crown and grade.

**11.15Coring**

**403.12 Quality Control.** The contractor shall control and monitor the quality of the work. 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. The contractor's test results will be used when applicable to determine the PWL, provided the contractor's QC tests and the engineer's QA tests compare favorably, and provided the engineer's inspection and monitoring activities indicate the contractor is following the approved QC Plan.

**403.12.1 Lots/Sublots.** Loose mix material will be sampled from the roadway behind the paver in lots or sublots on a random basis through the use of a random number system and evaluated using a Quality Level Analysis (QLA). A QLA will determine payment based on a combination of the total PWL (PWLt) determined for each pay factor item for each lot of material produced. The lot size shall be designated in the contractor’s QC Plan. Each lot shall contain no less than four sublots with a maximum sublot size of 1,000 tons. Sublots from incomplete lots shall be combined with the previous complete lot for determination of pay factors. When no previous lot exists, the mixture shall be treated as a small quantity A new lot shall begin when the asphalt content of a mixture is adjusted in accordance with Sec 403.2.5.

**403.12.2 Random Numbers.** The engineer will generate random numbers for density cores and loose mix sampling locations.For the purpose of QLA, all mixture placed on the roadway shall be subject to random testing, except mixture placed within 6 inches of an unconfined longitudinal joint shall not be subject to pavement density evaluation. Random loose mix samples taken in the same day may be separated by 200 tons.

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**403.12.4 Temperature of Base and Air.** 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.

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

**403.12.6 Mixture Moisture Content.** The asphaltic concrete mixture, when sampled and tested in accordance with AASHTO T 329, shall not contain more than 0.5 percent moisture by weight of the mixture. In addition to the minimum frequency listed in the table, mixture moisture content shall be taken any time the aggregate stockpiles’ moisture content is significantly changed.

**403.12.7 Mixture Gradation.** The gradations of the total aggregate will be determined using AASHTO T 27 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. Mixtures as produced shall be subject to the maximum tolerance in the table below.

|  |  |
| --- | --- |
| **Sieve Size** | **Percent Passing by Weight** |
| **Tolerance** |
|  | SP095SM | SP125SM | SP048 | SP095 | SP125 | SP190 | SP250 |
| 3/4 inch | - | - | - | - | - | - | 0 - 92 |
| 1/2 inch | JMF ±4 | 0 - 92 | - |
| 3/8 inch | JMF ±4 | JMF ±4 | 0 - 92 | - |
| No. 4 | JMF ±3 | JMF ±3 | 0 - 92 | - |
| No. 8 | JMF ±3 | JMF ±3 | 0 - 92 | 30 - 69 | 26 - 60 | 21 - 51 | 17 - 47 |
| N0. 16 | - | - | 28 - 62 | - | - | - | - |
| No. 200 | JMF ±2 | JMF ±2 | 7 - 12 | 2 - 10 | 2 - 10 | 2 - 8 | 1 - 7 |

**403.12.8 Aggregate Deleterious** The deleterious content of the total aggregate shall be determined using AASHTO T 11 from samples taken from the composite cold feed belt. The deleterious content of the material retained on the No. 4 sieve shall not exceed the limits specified in [Sec 1002.2](../Text/Sec1002.xhtml%22%20%5Cl%20%22S1002_2).

**403.12.9 Aggregate Consensus Properties.** Aggregate properties include fine aggregate angularity (FAA), course aggregate angularity (CAA), sand equivalent, and thin, elongated particles as defined in [Sec 490](#S403_2) on the composite cold feed belt aggregate shall be as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Design** | **FAA Minimum %** | **CAA w/One Fractured Faces Minimum %** | **CAA w/Two Fractured Faces Minimum %** | **Sand Equivalent Minimum %** | **Thin, Elongated 5:1 Particles Maximum %** |
| F | - | 50 | - | 35 | 12 |
| E | 38 | 70 |
| C | 43 | 90 | 85 |
| B | 43 | 95 | 95 |

**403.12.10 Mixture Asphalt Content.**  All loose mix samples for determination asphalt binder content shall be taken from the roadway at random locations designated by the engineer. The quantity of asphalt binder determined by AASHTO T 308 tests on the final mixture shall be within ±0.3 percent of the approved job-mix formula. The aggregate correction factor shall be applied to ignition oven results. The ignition oven temperature shall match the temperature used to when determining the correction factor.

**403.12.11 Volumetric Properties.** All loose mix samples for determination of volumetrics shall be taken from the roadway at random locations designated by the engineer. A volumetric properties including Voids in Coarse Aggregate (VCA), Voids in the Mineral Aggregate (VMA), Air Voids (Va), Voids Filled with Asphalt (VFA), Theoretical Maximum Specific Gravity (Gmm), and Mixture Bulk Specific Gravity (Gmb) shall be determined by the contractor. (Gsb) shall be used in calculations. If the bin percentages have been altered, a new Gsb shall be calculated and used in volumetrics calculations.s

**403.12.11.1 VCA.** No acceptance criteria exist.

**403.12.11.2 VMA.** The VMA shall be within – 0.5 and + 2.0 percent of the minimum required for each type of mixture at Ndes gyrations in Sec. 490.

**403.12.11.3 Va.** Air voids shall be within ±1.0 percent of the approved JMF at Ndes gyrations.

**403.12.11.4 VFA.** No acceptance criteria exist.

**403.12.11.5 Gmm.**  No acceptance criteria exist. Gmm shall be determined in accordance with Sec 490.9

**12.11.6 Gmb.**Two gyratory specimens shall be compacted for each sample and the average of the two specimens will be used. Bulk specific gravity shall be determined as specified in Sec 490.

**403.12.12 RAP Gradation** The contractor shall test the residual aggregate from the RAP %AC testing to determine its gradation..

**403.12.13 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 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.

**403.12.14 RAP Durability.** All RAP material not from 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.

**403.12.15 RAS Maximum Size.** The contractor shall test shingle material being incorporated into the mixture to ensure that 100% passes a 3/8” sieve. The sample for this test shall be taken from the feed to the plant. The test may be performed on either raw RAS material or residual material from an extraction or ignition process.

**403.12.16 Moisture Susceptibility.** Loose mix samples for determination of Tensile Strength Ratio (TSR) may be taken from the roadway or at the plant at random tonnages designated by the engineer. The TSR shall be greater than or equal to 75 percent as determined from loose mixture taken from the roadway and tested in accordance with AASHTO T 283.

**403.12.17 Surface Smoothness.** See Sec 610 for additional details.

**403.12.18 Lift Thickness.** The finished courses shall have the nominal thickness shown on the plans. Lift thickness shall be determined by the average thickness of pavement density cores taken for each lot. The thickness of the layer to be tested shall be measured on all pavement and joint density cores.

**403.12.19 Full Depth Thickness.** When a full depth pavement is being constructed the following shall apply.

Total thickness samples for new full depth asphalt pavements shall be obtained after all bituminous construction is completed on the project. Full depth pavement cores shall be measured in accordance with AASHTO T 148. Sections of any pavement determined to be less than the thickness shown on the plans by 0.5 inches or more shall be corrected by the contractor. No payment will be made for any costs incurred by the contractor in correcting pavement deficient in thickness. Each core is representative of the pavement thickness for a distance extending one-half the distance to the next core, measured along centerline, or in the case of a beginning or ending core, the distance will extend to the end of the pavement.

**220Pavement Density** The contractor shall cut four inch core samples at locations designated by the engineer. The final, in-place density shall be 94.5 ± 2.5 percent for all mixtures except SMA. SMA mixtures shall have a minimum density of 94.0 percent. Any sublot of material with a pavement density of less than 90.0 percent or greater than 98.0 percent shall be removed and replaced with acceptable material by the contractor. For SMA mixtures, any sublot of material with a pavement density of less than 92.0 percent shall be removed and replaced with acceptable material by the contractor.

**403.12.20.1** Bulk specific gravity shall be determined as specified in Sec 490. The Gmm of production material corresponding with the core being tested shall be used to determine the percent density. All cores shall be a minimum of 4” diameter. Material from underlying layers that remain adhered to the core shall be removed in a manner that does not harm the integrity of the specimen.

**403.12.20.2** A pavement density sample may consist of between one and three cores as stated in the QC plan. When multiple cores are used, the second and third cores shall be obtained at the same offset within one foot of the randomly selected location. The average of the cores cut shall represent the density for that sublot.

**403.12.20.3** For lift thicknesses greater than six times the nominal maximum aggregate size, cores shall be cut in half and the density of each half determined. The lowest percent density from both halves shall count for acceptance and pay adjustments.

**403.12.20.4**

**403.12.21 Unconfined Joint Density** The final, in-place density when unconfined during placement88 percent for non-SMA mixtures and 90 percent for SMA mixtures Testing and handling of joint cores shall be the same as pavement density cores.

**403.12.22 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.

**403.12.23 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.

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

**3Independent QA Samples** QA sQA retained material For volumetric properties, pavement density, and mixture asphalt content favorable comparison will be obtained when the engineer's QA test results are within two standard deviations, or one-half the specification tolerance, whichever is greater, from the mean of the QC’s results for that particular lot. For all other independent QA samples, a favorable comparison will be obtained when QA samples meet the same specification criteria as QC.

**403.13.2 Split QA Samples.** QA will test samples split from QC samples as follows.

**3.2.1Gradation**A favorable mixture gradation comparison shall be obtained when QA is within the below ranges of QCs result.

|  |  |
| --- | --- |
|  | **Range** |
|  | ±5.0% |
|  | ±5.0% |
|  | ±4.0% |
|  | ±4.0% |
|  | ±3.0% |
|  | ±3.0% |
|  | ±3.0% |
|  | ±3.0% |
|  | ±3.0% |
|  | ±2.0% |
|  | ±2.0% |
|  | ±2.0% |
|  | ±1.0% |

**403.13.2.2 Mixture Asphalt Content Comparison.** A favorable comparison of mixture asphalt content shall be obtained when QA is within ±0.1% of QC.

**403.13.2.3 Volumetric Properties Comparison.**  A favorable comparison of volumetric properties shall be obtained when QA is within ±0.005 of QC’s Gmm and within ±0.010 of QC’s Gmb

**324Aggregate ConsensusComparison**A favorable comparison for virgin aggregate properties obtained when QA is the range of QC’s results listed in the following chart.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Property** | **Course Aggregate Angularity** | **Fine Aggregate Angularity** | **Sand Equivalent** | **Thin, Elongated Particles** |
| **Range** | ±5% | ±5% | ±8% | ±1% |

**3.2.5 Comparison** A favorable comparison for virgin aggregate be obtained when the QA is within one half the [Sec 1002.2](../Text/Sec1002.xhtml%22%20%5Cl%20%22S1002_2) requirements of the QC results

**403.13.3 Contractor Responsibility for QA Cores.**  QA density cores that are not in possession of the engineer for the entire time from extraction till testing shall be sealed in tamper proof bags after extraction. QA cores shall be cut and delivered to the engineer no later than the end of the next day following the laydown operation.

**4 QC/QA Frequency Table**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **QC** | **QA**  | **QC Small Quantity Frequency** |
| **Independent Samples** | **Split** **Samples** |
| Temperature of Base and Air | As Needed | As Needed  | - | As Needed |
| Mixture Temperature  | 1 per Sublot | 1 per Day | 1 per Day  |
| Mixture Moisture | 1 per Week | 1 per Project  | - |
| Mixture Gradation | 1 per 2 Sublots | 1 per 4 Sublots | 1 per Week | 1 per 750 Tons |
| Aggregate Deleterious | - |
| Aggregate Consensus Properties  |  per T | - | 1 per Project |
| Mixture Asphalt Content |  per  |  per  | 1 per Week | 1 per 750 Tons |
| Volumetric Properties |
| RAP Gradation | 1 per 4 Sublots | 1 per Project | - | - |
| RAP Asphalt Content |
| RAP Durability | 1 per 1500 Tons |  |
| RAS Maximum Size | 1 per 10,000 Tons | 1 per Project |
| Moisture Susceptibility |  per  |  per  | 1 per Project |
| Surface Smoothness | Per Section 610 |
| Lift Thickness | 1 per QC Core | 1 per QA Core | - | 1 per QC Core |
| Full Depth Thickness | 1 per 1000 Feet | 1 per 5000 Feet | 1 per 1000 Feet |
| Pavement Density | 1 per Sublot | 1 per 4 Sublots | 1 per Day |
| Unconfined Joint Density | 1 per Sublot | 1 per 4 QC Cores | 1 per Day |
| Segregation Limits | As Needed | As Needed | As Needed |
| Binder Quality | - | 1 per Day | - |

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**403.20 Method of Measurement.**

**403.20.1 Weight Determination.** The weight of the mixture will be determined from the batch weights if a batch-type plant is used, and will be determined by weighing each truck load on scales in accordance with [Sec 109](../Text/Sec310.xhtml%22%20%5Cl%20%22S310) if other types of plants are used. Measurement will be made to the nearest 0.1 ton for the total tonnage of material accepted.

**403.20.2 Full Depth.**

**403.20.2.1** The final driving surface area, for the full depth of the pavement, will be used as the area for all underlying bituminous lifts and will not include the additional quantity needed to construct the slope or edge treatment.

**403.20.2.2** Final measurement of the completed pavement will not be made except for authorized changes during construction, or where appreciable errors are found in the contract quantity. Where required, measurement of the pavement complete in place will be made to the nearest 0.1 square yard. The revision or correction will be computed and added to or deducted from the contract quantity.

**403.20.3 Alternate Overlay.**

**403.20.3.1 Field Established Quantity.** When bid as an alternate to a Portland cement concrete overlay, the contractor shall establish the existing roadway profile and set the final overlay profile. The engineer may adjust the final profile as needed. The tons of hot mix asphalt required will be determined by the engineer from the set or adjusted profile. This quantity will be the field established plan quantity.

**403.20.3.2 Overlay Measurement.** Final measurement of the completed pavement will be based on the field established plan quantity except for authorized changes during construction. The revision or correction will be computed and added to or deducted from the contract quantity. Measurement of the pavement complete in place will be made to the nearest 0.1 ton.

**403.21 Basis of Payment.**

**403.21.1 Aggregate Variation.** Due to possible variations in the specific gravity of the aggregates, the tonnage of mixture used may vary from the proposal quantities. No adjustment in contract unit price will be made because of such variation.

**403.21.2 Pavement Density Samples.** Payment for obtaining and delivering QA pavement density samples will be made per sample at the fixed price specified in [Sec 109](../Text/Sec109.xhtml#S109). No direct payment will be made for QC samples.If QA cores are not cut and delivered as required, the asphaltic laydown operation may be suspended and a deduction of 5 percent of the contract unit price of the representative material may be applied, until samples are cut and delivered to the engineer.

**403.21.3 Payment for Blow-ups.** Payment for repairing blow-ups will be made in accordance with [Sec 104](../Text/Sec104.xhtml#S104).

**403.21.4 Surface Smoothness Adjustment.** The contract unit price for all mixes, except wedge or level course, will be adjusted in accordance with [Sec 610.5](../Text/Sec610.xhtml#S610_5).   The contract unit prices for asphaltic concrete pavement will be considered full compensation for all materials entering into the construction of the pavement and for the cost of the smoothness testing and correction.

**403.21.5  Moisture Susceptibility Adjustment.** The contract unit price of each 10,000 tons or fraction thereof for all mixtures shall be adjusted based on moisture susceptibility according to the following:

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| **TSR** |  **Pay Factor** |
| 90% or above | 103 |
| 75-89% | 100 |
| 70-74% | 98 |
| 65-69% | 97 |
| <65% | Remove and Replace |

**403.21.6 Superpave Adjustment.**  Each sublot of material shall have its contract unit price adjusted based off either the pay factor total or the unconfined joint density pay factor. The unconfined joint density pay factor shall only be used for lots where it is less than 100% and it is less than the pay factor total.

**403.21.6.1 Pay Factor Total.** The engineer will make the QLA no more than 24 hours after receipt of the contractor's test results, by determining the PWLt for each designated pay factor item. The total pay factor (PFT) will be equal to the weighted sum of the pay factors for each pay factor item, and is determined as follows:

 PFT = + (0.25) PF Mixture %AC + (0.25) PF VMA + (0.25) PF Va+ (0.25) PF Pavement Density

The PFT on the shoulder or otherwise when the density PWL pay factor is not directly included, shall be equal to the weighted sum of the PF for each pay factor item, and will be determined as follows:

 PFT = + (0.3333) PF Mixture %AC + (0.3333) PF VMA + (0.3333) PF Va

The PF for each pay factor item will be based on the PWLt of each pay factor item and will be determined as follows:

 When PWLt is greater than or equal to 70: PF = 0.5 PWLt + 55

 When PWLt is less than 70: PF = 2 PWLt - 50

**403.21.6.2 Unconfined Joint Density Pay Factor.**  The average of all unconfined joint cores from each lot will be used determine the unconfined joint density pay factor for sublots with an unconfined joint. The unconfined joint payfactor will be in accordance with the following:

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| **For Non- SMA mixtures:** | **For SMA mixtures:** |
| **Unconfined Joint Density** | **Pay Factor** | **Unconfined Joint Density** | **Pay Factor** |
| 98.0 or Above | Remove and Replace | 92.0 or Above | 100 |
| 97.6 to 97.9 | 80 | 91.5 to 91.9 | 90 |
| 97.1 to 97.5 | 90 | 91.0 to 91.4 | 85 |
| 90.0 to 97.0 | 100 | 90.5 to 90.9 | 80 |
| 89.5 to 89.9  | 90 | 90.0 to 90.4 | 75 |
| 89.0 to 89.4 | 85 | Below 90.0 | Remove and Replace |
| 88.5 to 88.9 | 80 | - | - |
| 88.0 to 88.4 | 75 |
| Below 88.0 | Remove and Replace |

**403.21.7 Density Adjustment.** When QC/QA is in effect and pavement density is not included in the Superpave adjustment, the contract unit price shall be adjusted using the following density payfactor table. The density adjustment shall be applied to material represented by each pavement density sample.

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| **For Non- SMA mixtures:** | **For SMA mixtures:** |
| **Mixture Density** | **Pay Factor** | **Mixture Density** | **Pay Factor** |
| 98.0 or Above | Remove and Replace | 94.0 or Above | 100 |
| 97.6 to 98.0 | 80 | 93.5 to 93.9 | 90 |
| 97.1 to 97.5 | 90 | 93.0 to 93.4 | 85 |
| 92.0 to 97.0 | 100 | 92.5 to 92.9 | 80 |
| 91.5 to 91.9  | 90 | 92.0 to 92.4 | 75 |
| 91.0 to 91.4 | 85 | Below 92.0 | Remove and Replace |
| 90.5 to 90.9 | 80 | - | - |
| 90.0 to 90.4 | 75 |
| Below 90.0 | Remove and Replace |
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**403.21.8 Removal and Replacement of Material.**  No additional payment will be made for removal and replacement of material when required by this specification. Replacement material will be subject to the same testing requirements as the original material. Pay for the replacement material will be determined in accordance with the applicable portions of this specification.