

**SECTION 423: HOT MIX ASPHALT (HMA) (MAJOR PAVING)**

**423.1 DESCRIPTION**

This Work consists of constructing one (1) or more pavement courses of Hot-Mix Asphalt (HMA) on a prepared base, to include crushing, stockpiling, hauling, binder, mineral admixture, mix design, mixing, providing cold feeds, process control testing and placement.

**423.2 MATERIALS**

**423.2.1 General**

HMA is a mixture of asphalt binder, aggregate, blending sand, mineral filler, and mineral admixture. Unless otherwise prohibited in the Contract, the Department will allow Recycled Asphalt Pavement (RAP) in HMA mixtures as long as the resulting mixture conforms to all Specification requirements.

The Contractor shall size, uniformly grade, and combine aggregate fractions in accordance with the Contract. The Contractor shall test Materials in accordance with applicable AASHTO/ASTM methods, as modified by the Department (if applicable) or other test procedures as directed by the Department. The State Materials Bureau will decide all questions pertaining to the interpretation of test procedures.

**423.2.2 Aggregate**

The Contractor shall ensure the aggregate gradation of the HMA mixture meets the requirements of Table 540

.2.2.1:1, "HMA Aggregate Gradation Control Points." The Project Manager may require, at no additional cost to the Department, wet preparation, per AASHTO T 146, Method A, if the Project Manager determines there are Deleterious Materials present in the aggregate stockpiles before aggregate gradation testing. The Contract will specify the type of HMA the Contractor is to use. The Department will allow the Contractor to combine Materials from two (2) or more sources to produce aggregate only when each individual aggregate source meets all applicable quality requirements.

**423.2.2.1 Gradation and Quality Requirements**

**Table 423.2.2.1:1  
HMA Aggregate Gradation Control Points**

Sieve size	% passing per HMA type							
	SP-II		SP-III		SP-IV		SP-V	
	Min	Max	Min	Max	Min	Max	Min	Max
Two (2) inch	—	—	—	—	—	—	—	—
1 1/2 inch	100	—	—	—	—	—	—	—
One (1) inch	90	100	100	—	—	—	—	—
3/4 inch	—	90	90	100	100	—	—	—
1/2 inch	—	—	—	90	90	100	100	—
3/8 inch	—	—	—	—	—	90	90	100
No. 8	19	45	23	49	28	58	32	67
No. 200	1.0	7.0	2.0	8.0	2.0	10.0	2.0	10.0

**423.2.2.1.1 Aggregate Quality**

For each Material source, the Contractor shall ensure the HMA coarse aggregate has an AI of 25 or less when calculated in accordance with Section 901, "QUALITY CONTROL/QUALITY ASSURANCE (QC/QA)."

The Contractor shall regulate the crushing of aggregate to:

1. Minimum Fractured Faces content of the plus No. 4 Material complies with the requirements of Table 423.2.2.1.2:1, "Fractured Faces, Sand Equivalent, and Fine Aggregate Angularity," and evaluation by AASHTO 335-09, "Fractured Face Determination for Coarse Aggregate;"
2. Ensure the combined plus 3/8 inch material contains no more than 20% flat, elongated particles with a dimensional ratio of 3:1 or greater as determined by ASTM D 4791 (TTCP Modified);
3. Ensure the combined Material, excluding RAP; passing the No. 40 sieve is non-plastic;
4. Ensure that before the addition of mineral admixtures, the minimum sand equivalent value and the minimum fine aggregate angularity value of the combined aggregate, excluding RAP, complies with the requirements of Table 423.2.2.1.2:1, "Fractured Faces, Sand Equivalent, and Fine Aggregate Angularity;" and
5. Determine the Sand Equivalent value in accordance with AASTHO T 176, Alternate Method No. 1, and Fine Aggregate Angularity value in accordance with AASHTO T 304, Method A.

**423.2.2.1.2 Fractured Faces**

The Department will consider a face to be fractured when at least one-half of the projected particle area exhibits a rough, angular, or broken texture with well-defined edges.

**Table 423.2.2.1.2:1  
Minimum Fractured Faces, Sand Equivalent, and Fine Aggregate Angularity for Virgin Aggregates**

Design Traffic, ESALs <sup>a</sup> x 10 <sup>6</sup>	Fractured Faces <sup>b</sup>	Sand Equivalent (%)	Fine Aggregate Angularity
< 3.0	75.0 / —	45.0	40.0
≥ 3.0 – < 10.0	85.0 / 80.0	45.0	45.0
≥ 10.0 – < 30.0	95.0 / 90.0	45.0	45.0
≥ 30.0	99.0 / 95.0	50.0	45.0

<sup>a</sup>ESALs are based on a 20-year design life for all scenarios.

<sup>b</sup>Under "Fractured Faces," 85.0 / 80.0 denotes that 85.0% of the coarse aggregate has at least one (1) Fractured Face and 80.0% has at least two (2) Fractured Faces.

Ensure RAP provided from sources outside the Project has at least 75% Fractured Faces (one (1) Fractured Face); however, Sand Equivalent and Fine Aggregate Angularity do not apply.

**423.2.2.2 Production**

When producing aggregates for HMA, the Contractor shall:

1. Remove natural fines by screening and stockpiling separately;

2. Use a No. 4 screen, minimum, or a larger screen if needed to properly control the crushing and screening operation;
3. Crush the aggregate retained on the scalping screen and separate the crushed Material into at least two (2) stockpiles of fine and coarse aggregates; and
4. Regulate crushing operations to produce Material that meets design requirements when combined.

#### **423.2.2.3 Stockpiling**

The following requirements apply to stockpiles, the Contractor shall:

1. Place stockpiles upon prepared sites;
2. Make stockpiles neat and regular to prevent segregation;
3. Provide enough storage space for each size of aggregate;
4. Separate the aggregate stockpiles far enough apart to prevent mixing, or with walls or partitions;
5. Prevent contamination (store stockpiles away from vehicular and Equipment traffic);
6. Keep the storage yard neat and orderly and keep the stockpiles accessible for sampling; and
7. Keep the aggregate sizes separated until delivered to the cold feed system that feeds the drier.

#### **423.2.2.4 Combining**

When combining crushed Materials from different stockpiles, including RAP (if in the mixture); the Contractor shall ensure the product is in accordance with the mix design gradation requirements. The Contractor shall use controlled feeders from each stockpile to combine crushed Material.

#### **423.2.3 Asphalt Binder**

The Contract will specify the type and grade of asphalt binder. The Contractor shall provide asphalt binders in accordance with Section 402, "Asphalt Materials and Mineral Admixtures." The Contractor shall not change the asphalt source after approval of the mix design without written approval of the State Materials Bureau.

#### **423.2.4 Mineral Admixtures**

The Contractor shall provide mineral admixtures in accordance with Section 402, "Asphalt Materials and Mineral Admixtures."

#### **423.2.5 Blending Sand**

Blending sand consists of the following:

1. Natural fines from the scalping process;
2. Concrete sand;
3. Sandy Material; or
4. A combination of these, graded to the mix design requirements.

The Contractor shall determine the need for and percentage (a maximum of 20.0%) of blending sand using mix design tests on samples taken from stockpiles during crushing operations and submitted to an approved testing Laboratory.

#### **423.2.6 Mineral Filler**

The Contractor shall, if required by mix design, provide mineral filler in accordance with AASHTO M 17 and approved by the State Materials Bureau. The Department will not allow fly ash as mineral filler for HMA.

#### **423.2.7 Reclaimed Asphalt Pavement (RAP)**

Unless otherwise specified in the Contract, the Contractor may use RAP removed under the Contract consisting of salvaged, milled, pulverized, broken, or crushed asphalt pavement. The Contractor may use RAP produced from outside sources provided the following is met: after the Contractor obtains sufficient quantities of RAP aggregate samples in accordance with AASHTO T 308; the Department will Accept RAP for which the coarse aggregate has a percent wear of 40.0 or less, at 500 revolutions, when tested in accordance with AASHTO T 96. The Contractor shall provide plus No. 4 RAP Material with a minimum of 75% Fractured Faces content (one (1) face). The Department will make no additional payment for the asphalt binder in the RAP or asphalt binder due to asphalt binder grade adjustment.

The Contractor may use a maximum of 15% RAP (by weight) in the production of HMA mixtures without changing the asphalt binder.

For quantities greater than 15% and up to 25% RAP, the Contractor shall:

1. Either lower the asphalt binder's high and low temperature grades by one (1) grade (e.g. lower a PG 76-22 to a PG 70-28); or
2. Extract, recover, and combine the RAP's asphalt binder with a virgin asphalt binder per AASHTO M 323, Appendix A, ensuring the resultant binder meets the entire AASHTO M 320 (excluding direct tension) required Project PG asphalt binder properties indicated on the approved mix design.

For quantities greater than 25% and up to 35% RAP, the Contractor shall:

1. Extract, recover, and combine the RAP's asphalt binder with a virgin asphalt binder per AASHTO M 323, Appendix A; and
2. Ensure the resultant binder meets the entire AASHTO M 320 (excluding direct tension) required Project PG asphalt binder properties indicated on the approved mix design.

The Department will not allow the Contractor to use more than 35% RAP in the production of HMA mixtures.

For Projects of entirely new construction, the Contractor shall:

1. Limit the RAP to 15% in the top mat or extract, recover and combine the RAP's asphalt binder with a virgin asphalt binder per AASHTO M323, Appendix A; and
2. Ensure the resultant binder meets the entire AASHTO M320 (excluding direct tension) required Project PG asphalt binder properties indicated on the approved mix design.

If Plus Grades of PG asphalt binder is specified on the project, for quantities greater than 15% RAP, the Contractor shall extract, recover, and combine the RAP's asphalt binder with a virgin asphalt binder per AASHTO M 323, Appendix A. The Contractor shall ensure the

resultant binder meets the entire AASHTO M 320 required Project PG asphalt binder properties indicated on the approved mix design including the additional Plus Grade requirements for Elastic Recovery and Solubility.

The Contractor shall:

1. Process RAP so that 100% passes a 1-1/2-inch sieve;
2. Maintain adequate stockpile management (i.e. sufficient quantities and shaping of the stockpiles);
3. Address in the Quality Control Plan how RAP will be controlled, such as which screen will be used to split into two (2) stockpiles, or by what method the RAP will be controlled to keep the resultant mix within Acceptable limits;
4. Account for the weight of the binder in the RAP when batching aggregates;
5. Provide RAP that is free of Deleterious Materials; and
6. Perform process control testing in accordance with Section 901, "Quality Control/Quality Assurance (QC/QA)" and Table 901.5:3, "Minimum Process Control Guidelines for Aggregates, Base Course, and RAP (QC);" as RAP is produced and prepared for inclusion in the HMA.

If problems with HMA consistency or compliance with Project Specifications occur, additional efforts taken to achieve Acceptable levels of consistency and compliance with Contract Specifications, at the Contractor's discretion (at no additional cost to the Department), include, but are not limited to:

1. Reduce the top size of the RAP from 1-1/2 inch to one (1) inch;
2. Fractionate the aggregates on a second screen, such as the 3/8 inch or 1/4 inch Screen so that the RAP is maintained in three (3) stockpiles, one being RAP larger than 1-1/2 inch to two (2) inches, Coarse RAP and the third being Fine RAP;
3. Ensure that the RAP used in the HMA mix design is representative of the RAP available on the Project;
4. Cover the RAP pile(s) so that ambient moisture is not absorbed; and
5. Process and maintain the stockpiles so that the RAP Material is equally and uniformly distributed throughout the entire stockpile(s) and is withdrawn such that uniform, non-segregated RAP is delivered to the hoppers.

#### **423.2.8 Mix Design**

The Contractor shall provide a mix design developed by a Department approved testing Laboratory, reviewed and signed by a professional Engineer licensed by the New Mexico Board of Registration for Professional Engineers and Land Surveyors. A list of approved private testing laboratories is available from the State Materials Bureau. The Contractor shall develop the mix design at no additional cost to the Department. The Contractor may develop the mix design at any time prior to the Project Pre-Paving Conference.

The Contractor shall provide to the State Asphalt Engineer the mix design developed in accordance with the Contract documents and AASHTO R35 as modified by NMDOT for review and concurrence. The Contractor shall summarize the mix design results from the Department approved testing Laboratory in a format approved by the State Materials Bureau. Department concurrence of a mix design will not relieve the Contractor of full responsibility for producing an Acceptable mixture. The mix design may require adjustment in accordance with Section 423.2.9, "Job Mix Formula."

The Department will require a minimum of one percent (1.0%) for mix designs that include hydrated lime, anhydrite based Material, or Portland cement. The Contractor shall include these mineral admixtures in the gradation for developing the mix design. AASHTO T 354 may be used in lieu of AASHTO T 84/T 85. If lubricating antistripping is used as a mineral admixture, the percent dosage shall be done in accordance with the manufacturer's recommendation and approved by the Contractor's design Lab. Lubricating antistripping shall be approved by the Department and included in the most current Approved Products List (APL). The mix design shall be in accordance with Table 423.2.8:1, "HMA Superpave Design Requirements for Aggregates with Less Than three percent (3.0%) Absorption," or Table 423.2.8:2, "HMA Superpave Design Requirements for Aggregates with three percent (3.0%) or Greater Absorption."

The Contractor shall test the HMA in accordance with AASHTO T 283, as indicated below:

1. Use six (6) inch diameter specimens; Compact all test specimens in accordance with AASHTO T 312;
2. Conditioned specimens shall include one (1) freeze thaw cycle;
3. On the AASHTO T283 Section 11.3 scale of zero (0)-five (5), with five (5) exhibiting the most damage from moisture, visually estimate the amount of damage caused by moisture on the interior surfaces of each broken specimen; and
4. The tensile stress ratio shall be a minimum of 85%.

The Contractor shall provide a mixture that meets all applicable criteria. If tests indicate the need for additives or modifiers not specified in the Contract or a change in source of binder to satisfy mix design requirements, the Contractor shall perform the required changes at no additional cost to the Department.

**Table 423.2.8:1  
HMA Superpave Design Requirements for Aggregates with Less Than 3.0%  
Absorption**

(a) 20-year design ESALS	N initial	N design (b)	N max	Percent Voids in the Mineral Aggregate (VMA) per nominal maximum aggregate size				Voids Filled with Asphalt (VFA) Range, % (c)	Dust to Binder Ratio Range
				One (1) Inch (SP-II)					
				One (1) Inch (SP-II)	3/4 Inch (SP-III)	1/2 Inch (SP-IV)	3/8 Inch (SP-V)		
< 0.3	<91.5			12.5	13.5	14.5	15.5	72.0–80.0	0.6 to 1.4
0.3-3.0	<90.5	96.0	< 98.0	14.0	15.0	16.0	17.0	68.0–78.0	
≥3.0	<89.0							68.0–75.0	

**Table 423.2.8:1  
HMA Superpave Design Requirements for Aggregates with Less Than 3.0%  
Absorption**

20-year design ESALS	N initial	N design (b)	N max	Percent Voids in the Mineral Aggregate (VMA) per nominal maximum aggregate size				Dust to Binder Ratio Range

<sup>a</sup>In Millions.

<sup>b</sup>Design Air Void Content of four percent (4%).

<sup>c</sup>For one (1) inch nominal maximum size mixtures, the specified lower limit of the VFA shall be 70% for the design traffic level <0.3 million ESALs.

**Table 423.2.8:2  
HMA Superpave Design Requirements for Aggregates with 3.0% or  
Greater Absorption**

20-year design ESALS (a)	N initial	N design (b)	N max	Percent Voids in the Mineral Aggregate (VMA) per nominal maximum aggregate size				Voids Filled with Asphalt (VFA) Range, % (c)	Dust to Binder Ratio Range
				One(1) inch (SP-II)	3/4 inch (SP-III)	1/2 inch (SP-IV)	3/8 inch (SP-V)		
<0.3	<91.5							70.0–80.0	
0.3–<3.0	<90.5	96.5	> 98.0	12.0 – 14.0	13.0 – 15.0	14.0 – 16.0	15.0 – 17.0	65.0–78.0	0.6 to 1.4
≥3.0	<89.0							65.0–78.0	

<sup>a</sup>In Millions.

<sup>b</sup>Design Air Void Content of 3.5%.

<sup>c</sup>For one (1) inch nominal maximum size mixtures, the specified lower limit of the VFA will be 70% for the design traffic level <0.3 million ESALs.

Department reviewed commercial mix designs are Acceptable for use on NMDOT Projects with the concurrence of the State Asphalt Engineer. The commercial mix design will be submitted for review and concurrence by the State Asphalt Engineer for conformance with the Contract documents and re-issued with Project information.

An approved mix design is valid up to one (1) year from the date of review. If the Aggregate Index expires within that year, a new Aggregate Index needs to be established in order to keep the mix design valid. The Contractor shall submit a new mix design if changing the source of Materials.

For Projects that are longer than one (1) year and aggregate Materials are produced and stockpiled the mix design and Aggregate Index (AI) may be approved for an extension by the State Asphalt Engineer.

**423.2.9 Job Mix Formula**

The Job Mix Formula (JMF) must be in accordance with all aggregate gradation requirements and result in a mix that meets all specified mix design requirements. The Department will refer to the result of the Laboratory mix design developed in accordance with Section 423.2.8, "Mix Design," as JMF1.

#### **423.2.9.1 Job Mix Formula Adjustment**

The Contractor may request a modification to the JMF based on field testing of Material produced through the plant. Test results and calculations that verify a proposed JMF adjustment complies with the Specifications will be required prior to being reviewed by the Project Manager, District Lab Supervisor, and concurred by the State Asphalt Engineer. Review and concurrence of a JMF adjustment can only be made after:

1. JMF adjustment results in a new TV that is within the tolerance from the design TV. (Example: If design TV for No. 4 sieve is 30%, then a new TV may be approved in the field from 23% - 37%);
2. Submittal by the Testing Laboratory responsible for the original mix design to the Project Manager with a copy to the State Asphalt Engineer;
3. Confirmation by the Project Manager that the Quality Control Plan is being followed; and
4. If the JMF is adjusted after the Shakedown Period, the Contractor shall terminate the current lot. Once the adjusted JMF has been reviewed and concurred by the Project Manager, Assistant District Engineer for Construction and the State Asphalt Engineer; the Contractor shall begin a new lot with the adjusted JMF.

### **423.3 CONSTRUCTION REQUIREMENTS**

#### **423.3.1 General**

The Contractor shall:

1. Provide sufficient storage space for each size of aggregate and RAP;
2. Keep the different sizes separate and ensure that segregation, degradation, or combination of Materials of different aggregate sizes does not occur until delivery to the cold feed system;
3. Re-screen or waste segregated or degraded Material;
4. Provide separate storage and feeder for mineral filler if the Contract requires mineral filler; and
5. If the Project Manager determines that uncoated aggregate exists, the Contractor shall take corrective action.

#### **423.3.2 Mix and Laydown Temperature Requirements**

The Contractor shall not allow the temperature of the HMA discharged from the mixer into the transport vehicle to be greater or less than ten percent (10%) of the target mixing temperature specified in the mix design, not to exceed 350° F, unless written concurrence by the asphalt binder supplier and design lab are provided to the Project Manager.

HMA delivered to the Project with mix temperatures outside the acceptable laydown temperature range as specified in the mix design shall, at the sole discretion of the Project Manager, be removed and replaced at no cost to the Department.

#### **423.3.3 Addition of Mineral Admixtures**

The Contractor shall:

1. Monitor the out feed of the mineral admixture with sensors that provide audible and visual signals to control the out feed with an accuracy of  $\pm$  three percent (3.0 %) by weight;
2. Control the mineral admixture content such that it meets the range specified in the approved mix design;
3. Add the mineral admixture to the aggregate in an enclosed pug mill immediately after leaving the cold feed and just before introduction into the drier drum or aggregate drier; and
4. Minimize the loss of mineral admixture while adding to the aggregate.

When mixing the aggregate and mineral admixture, the Contractor shall maintain the moisture content of the combined aggregate at the recommended moisture content as shown on the approved mix design.

#### **423.3.4 Equipment**

##### **423.3.4.1 Mixing Plants**

###### **423.3.4.1.1 Plant Scales**

The Contractor shall ensure that the scales are accurate to 0.5% of the maximum allowable load in accordance with the Federal Motor Carrier Safety Administration (FMCSA) publication, as certified by a licensed scale technician. The Contractor shall submit a copy of the certification to the Project Manager.

###### **423.3.4.1.2 Storage of Asphalt Binder Materials**

The Contractor shall provide storage tanks for asphalt binder capable of holding, heating and circulating the asphalt at the required temperatures and measuring the temperature of the asphalt in the tank.

The Contractor shall allow measuring and sampling of asphalt binder from the delivery trucks upon arrival.

###### **423.3.4.1.3 Feeder for Drier**

The Contractor shall equip the plant with an accurate feeding mechanism to deliver the aggregate into the drier and maintain uniform production.

###### **423.3.4.1.4 Drier**

The Contractor shall equip the plant with a system to continuously agitate the aggregate during the heating and drying process. The Contractor shall use a drier that can dry and heat the aggregate and prevent fuel oil or carbon from coating the aggregate. The Contractor shall take corrective action if the aggregate becomes coated with burner fuel.

###### **423.3.4.1.5 Bins**

The Contractor shall equip the plant with storage bins large enough to supply the mixer when it is operating at full capacity and arrange the bins to ensure separate and adequate

storage of the appropriate aggregate sizes. The Contractor shall equip the bins with warning devices that notify the control panel when the bins are low.

#### **423.3.4.1.6 Asphalt Binder Control Unit**

The Contractor shall equip the plant with a scale or meter to control the rate of flow to determine the amount of asphalt binder added to the mix.

#### **423.3.4.1.7 Thermometers**

The Contractor shall equip the discharge chute of the drier with a recording thermometer to register the temperature of the heated aggregates or mix. The Contractor shall provide the Project Manager with a record of discharge temperatures at the end of each week's production or as requested by the Project Manager.

#### **423.3.4.1.8 Truck Scales**

The Contractor shall weigh the HMA on approved plant or truck scales provided by the Contractor or public scales in accordance with Section 109.1, "Measurement of Quantity."

#### **423.3.4.1.9 Requirements for Batching Plants**

##### **423.3.4.1.9.1 Weigh Box or Hopper**

The Contractor shall provide a batching plant that can accurately weigh aggregate in a weigh box or hopper suspended on scales. The Contractor shall use a weigh box or hopper that can hold a full batch. The Contractor shall ensure that the gate of the weigh box or hopper does not allow Material to leak into the mixer while being weighed. The Contractor shall test the scales in accordance with Section 109.1, "Measurement of Quantity."

##### **423.3.4.1.9.2 Mixer**

The Contractor shall provide a batch mixer with a capacity of at least 2,000 lb, capable of producing a uniform mixture within specified tolerances.

##### **423.3.4.1.9.3 Control of Mixing Time**

The Contractor shall equip the mixer with an accurate timing device that signals the end of the mixing time.

##### **423.3.4.1.10 Drum Mix Plants**

The Contractor shall equip the drum mix plant with the following auxiliary Equipment and capabilities:

1. Separate cold feed controls for each Material;
2. An automatic interlocking device for cold feed, asphalt, and mineral admixtures;
3. A means for controlling moisture content of aggregate. A means for sampling individual cold feeds and provisions for sequential sampling of aggregate, RAP, asphalt binder, and mineral admixtures;
4. Equip the bins with mechanical or electrical devices that provide an audible or visual warning when the bins are less than 1/4 full;
5. Bins shall be designed and equipped to prevent segregation;

6. Equip the bin containing fine aggregate and filler, if required, with a device that prevents Material hang-up during plant operation;
7. A minimum of one (1) cold feed bin for each aggregate size in the mix;
8. Equip the cold feed with mechanical or electrical devices that indicate with an audible or visual warning when the cold feed belt is not carrying the proper amount of Material;
9. A separate cold feed for RAP Material. Introduce RAP so that it does not come into direct contact with the burner flame; and
10. Couple the asphalt feed control with the total-aggregate-weight measurement device to automatically vary the asphalt feed rate to maintain the required proportion.

**423.3.4.2 Haul Equipment**

The Contractor shall haul asphalt mixtures with trucks that are tarped and have tight, clean, smooth metal beds and a thin coat (a minimal amount) of a Department approved release agent in accordance with Section 423.3.4.2.1, "Asphalt Release Agent (ARA)."

**423.3.4.2.1 Asphalt Release Agent (ARA)**

The Contractor shall use Asphalt Release Agents (ARA) for prevention of asphalt mixtures adhering to haul trucks and any other type of Equipment that is used for asphalt paving operations. ARA shall meet the requirements of Table 423.3.4.2.1:1, "Asphalt Release Agent Properties" and shall be on the NMDOT's Approved Products List. All testing will be in accordance with NTPEP Evaluation of Asphalt Release Agents AASHTO ARA 14.

**Table 423.3.4.2.1:1  
Asphalt Release Agent Properties**

Test	Result
7-Day Asphalt Stripping Test	
Diluted	No Stripping
Full Strength	No Stripping
Mixture Slide Test (truck beds)	10 g retained, maximum
Asphalt Performance Test	Does not fall after 3 pours

**423.3.4.3 Pavers**

The Contractor shall use self-contained, self-propelled pavers, with activated screeds or strike-off assemblies, heated if necessary, and capable of spreading and finishing courses of HMA in accordance with the Plans.

**423.3.4.4 Compaction Equipment**

The Contractor shall provide a sufficient number, weight, and type of rollers to obtain the required compaction and specified pavement density while the HMA is in a workable condition. All rollers must be capable of reversing direction without shoving or tearing the mixture.

**423.3.5 Placement Operations**

For cold milled surfaces, the Contractor shall prepare the surface in accordance with Section 414, "Cold Milling." The Contractor shall clean the existing surfaces and apply a tack coat as required in the Plans or at an application rate as approved by the Project Manager in accordance with Section 407, "Tack Coat."

The Contractor shall place HMA on prepared Base Course in accordance with Section 303, "Base Course." The Contractor shall apply prime coat as required in the Plans or at an application rate as approved by the Project Manager in accordance with Section 408, "Prime Coat."

The Contractor shall place the HMA on the Accepted surface, spread and compact to specified width, lift thickness, and cross slope in accordance with the Plans.

Materials Transfer Vehicle (MTV): The Contractor shall use a MTV with storage and remixing capabilities on all mainline construction that utilizes greater than 25% RAP when placing HMA State approved designs. The MTV will independently remix and deliver mixture from the hauling Equipment to the paving Equipment.

The Contractor shall furnish an MTV with the following capabilities:

1. An unloading system to receive mixtures from the hauling Equipment;
2. A minimum storage capacity of 13 tons with a remixing system in the MTV storage bin;
3. A discharge conveyor to deliver the mixture to the paver hopper; and
4. The MTV system cannot exceed maximum legal loading on Structures.

Pick-up machines, hopper inserts and Material transfer devices are not considered MTVs.

In the event the MTV malfunctions during paving operations, the Contractor can finish the Day without the MTV. The Contractor shall not resume further mainline mix placement until the MTV is operational.

Consistently overloading the HMA mix into the paving machine is not Acceptable. The Contractor shall coordinate the speed of the paving machine with the production of the plant and keep enough haul Equipment available to achieve continuous operation.

The Contractor shall use the control system on the paving machine to control the grade and the transverse slope by either of the following methods:

1. One end directly and the other indirectly through controlling the transverse slope; or
2. Each end independently, including screed attachments.

The Contractor shall suspend operations if the control system does not achieve the typical section in accordance with the Plans. The Contractor shall place, spread, and finish the courses of HMA according to the following:

1. Without segregation or tearing;
2. True to the line, grade, and crown in accordance with the Plans; and
3. With self-propelled pavers, except as otherwise directed.

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing Equipment impracticable, the Contractor shall dump, spread, and level the HMA by other methods to achieve the required compacted thickness.

#### **423.3.5.1 Weather Limitations**

The Contractor shall not place HMA on wet or frozen surfaces or if weather conditions prevent proper handling, finishing, and compacting. The Contractor shall place HMA when the

Chill Factor is at least 40 °F and rising. If the air temperature is 60 °F or warmer do not consider the Chill Factor.

#### **423.3.5.2 Compaction**

The Contractor shall:

1. Compact the HMA thoroughly and uniformly immediately after placement. Operate rollers at speeds slow enough to minimize displacement of the HMA, including the lines and grades of the asphalt edges. Remove marks from pneumatic rollers;
2. Prevent the HMA from sticking to the roller wheels by keeping the wheels moistened with water; water mixed with very small quantities of detergent or other approved Material. Do not use diesel fuel or other petroleum diluents;
3. At locations inaccessible to the rollers, the Contractor shall compact the HMA with hot hand tampers, smoothing irons, or mechanical tampers;
4. Use a trench roller or cleated compression strips under the roller to transmit compression to depressed areas; and
5. Remove areas that become loose, broken, mixed with dirt, segregated or defective, replace with fresh HMA, and compact to match the surrounding area, at no additional cost to the Department.

#### **423.3.5.3 Not Used**

#### **423.3.5.4 Joints**

The Contractor shall off set longitudinal joints at least six (6) inches relative to the longitudinal joints of the underlying course.

Unless otherwise specified, the Contractor shall taper transverse and longitudinal joints as follows:

1. At least a three (3) ft taper for transverse joints, with a taper slope no steeper than 24:1;
2. At least a one (1) ft taper or a notched taper, for longitudinal joints, with a taper slope no steeper than 6:1 or a notched taper with a one (1) inch vertical edge at the top of the taper connected to a slope no steeper than 6:1;
3. Cut and square off transverse tapers before commencing new Work;
4. Clean and tack coat longitudinal joints from previous operations; and
5. Avoid placing longitudinal joints in the wheel paths, unless approved by the Project Manager.

The Contractor shall completely bond joints and provide smooth surface for each course at the joints. The Department will not allow deviations greater than 3/16 inch when tested with a ten (10) ft straightedge in any direction. When paving under traffic, the Contractor shall schedule the daily surfacing operations so that tapered longitudinal joints are not exposed for longer than seven (7) Days.

#### **423.3.5.5 Surface Tolerances**

The Contractor shall provide a final HMA surfacing course that conforms to Section 401, "Pavement Smoothness Measurement."

#### **423.3.5.6 Plan Surfacing Thickness**

The Contractor shall:

1. Place pavement at the thickness specified in the Contract;
2. Monitor thickness by calculating continuous production yields using the formula found in the MT-1, as maintained by the State Materials Bureau;
3. Calculate the required yield and the corresponding yields for 0.25 inch increase (upper limit) and decrease (lower limit). The Project Manager may adjust the required yield to fit field conditions. If adjusted, the new target yield will be communicated to the Contractor in writing;
4. Control production to keep yield within the upper and lower limits;
5. Correct deficiencies at no cost to the Department;
6. Correct deficient depths during placement; and
7. Address Plan Surfacing thickness in the Quality Control Plan.

#### **423.3.5.7 Test Strip & Shakedown Period**

Prior to the Test Strip & Shakedown Period, the Contractor shall provide binder ignition oven calibration samples in accordance with the State Materials Bureau's, current *Binder Ignition Calibration Procedure*. All Quality Control, Quality Assurance and Independent Assurance ovens must be calibrated by this procedure. The Project Manager will suspend paving operations until calibration of the ovens has been completed. No additional time or compensation will be granted for completion of this requirement.

The "NMDOT Binder Ignition Calibration Procedure" is available by accessing the NMDOT website, and navigating within the Construction and Civil Rights Bureau's (CCRB) link.

The Contractor shall construct a test strip for each HMA mix design to be incorporated in the Project prior to placing the Material on mainline. The test strip will consist of a maximum of 1,000 tons, the minimum test strip size will be 500 tons or as approved by the Project Manager. The Contractor shall construct test strip on shoulders, low volume segments of the pavement, or area approved by the Project Manager.

The Contractor shall obtain a minimum of three (3) Contractor and three (3) agency samples to evaluate the JMF, process control, and placement operations. If necessary, based on the results obtained from the test strip, the Contractor shall develop a revised JMF, modify placement operations, and/or implement adjustments to process control procedures. Production and placement operations performed prior to approval of a revised JMF are at the Contractor's risk.

The test strip will be evaluated for Acceptance according to Table 423.3.5.7:1, "Test Strip Acceptance Limits." If Accepted, the test strip will be paid at the unit price for HMA Complete or HMA per Section 423.5, "Basis of Payment." If rejected, said Material shall be handled in accordance with Section 423.3.6.3.2, "Adherence to Specifications and Rejection of Non-Specification Material." The Contractor shall remove rejected test strip Material placed within the Roadway Prism at no cost to the Department. If the Contractor disagrees with removing and replacing unacceptable Material placed in test strips outside the Roadway Prism, the Assistant District Engineer for Construction, based on engineering judgment, will decide if the Material can remain in place with a maximum pay factor of 50%, or shall be removed and replaced at no cost to the Department.

If the test strip is rejected, the Contractor shall construct a subsequent test strip. The Contractor shall not proceed to full production until an Accepted test strip is produced. After the test strip is Accepted, the Contractor shall continue to evaluate the mix properties and the JMF during the placement of the first two (2) sublots in the first lot. Changes may be made to the JMF or the mix proportions and/or properties with the concurrence of the State Materials Bureau, Project Manager, and Assistant District Engineer for Construction. For changes made prior to the completion of the first two (2) sublots, the adjustments will be applied to the entire lot for purposes of payment.

The Project Manager may waive test strip requirements for the Project, if requested by the Contractor based on prior experience with the JMF.

The Shakedown Period is defined as the first two (2) sublots produced in the first lot.

As the test strip is placed, the Contractor shall evaluate the mix properties and the JMF. Changes may be made to the JMF or the mix proportions and/or properties with the concurrence of the State Materials Bureau, Project Manager, and the Assistant District Engineer for Construction.

**Table 423.3.5.7:1  
Test Strip Acceptance Testing Limits <sup>a,c</sup>**

<b>Characteristic</b>	<b>Allowable Tolerances from TV</b>
Air Voids, %	± 2.0
Pavement Density % <sup>c</sup>	90% to 97%
Mineral Admixture %	±0.2%
Voids in the Mineral Aggregate (VMA), % <sup>a</sup>	± 2.0
Asphalt Content % <sup>a,b</sup>	± 0.50

<sup>a</sup> Asphalt Content will be determined using AASHTO T308 as modified by TTCP.

<sup>b</sup> HMA will not be rejected based on Asphalt Content Determined by AASHTO T 308.

<sup>c</sup> Acceptance will be based on the average test values.

#### **423.3.6 Sampling and Testing**

The Contractor shall sample and test in accordance with Section 901, "Quality Control Quality Assurance General Provisions," and Section 906, "Minimum Testing Requirements." The Department will sample and test in accordance with Section 901, "Quality Control /Quality Assurance General Provisions," and Section 906, "Minimum Testing Requirements."

##### **423.3.6.1 Contractor Quality Control**

The Contractor shall administer a Quality Control Plan, referred to hereafter as "the Plan". The Contractor shall ensure the Plan conforms to Section 902, "Quality Control." The Contractor shall submit the Plan a minimum of two (2) weeks prior to commencement of crushing operations and at a minimum comply with "Contractor Quality Control Plan Guidelines." No HMA operations are allowed until the Plan has been approved by the Project Manager and the District Lab Supervisor. The Contractor shall sample and test the mixture and pavement on a statistically random basis in accordance with Section 906, "Minimum Testing Requirements."

##### **423.3.6.1.1 Contractor Quality Control of Aggregate**

The Contractor shall obtain samples in accordance with Section 902.5, "Sampling."

The Project Manager may sample and test the aggregate at any time during production or stockpiling, or may request to split samples with the Contractor.

**423.3.6.1.2 Contractor Quality Control for Compaction**

The Contractor shall:

1. Monitor the compaction process by determining the density of the HMA with a portable densometer in accordance with the Plan;
2. Establish calibration of the portable densometer from cut pavement samples;
3. Determine the density readings of the cut pavement samples in accordance with AASHTO T 166 (weight, volume method); determine the density readings of the pavement with the portable densometer and correlate these test results;
4. Conduct Quality Control testing in accordance with Division 900, "QUALITY CRITERIA" and provide test results to the Project Manager;
5. Perform Quality Control density testing while the asphalt mixture is hot enough to permit further compaction;
6. Not roll for compaction when it becomes ineffective or damages the HMA; and
7. Not use vibratory mode when it becomes ineffective or damages the HMA.

**423.3.6.2 Department Quality Assurance**

The Department will sample and test the mixture and pavement on a statistically random basis in accordance with Section 906, "Minimum Testing Requirements."

**423.3.6.3 Acceptance**

The Department will evaluate Materials using Contractor and Department test data from each Random sampling Plan for Acceptance in accordance with this section.

**Table 423.3.6.3:1  
Acceptance Testing Tolerances<sup>a</sup>**

Characteristic	Specification limit, percentage points from TV
Air Voids, %	± 1.4
Pavement Density % <sup>c</sup>	± 2.5
Mineral Admixture% <sup>e</sup>	Minimum of JMF Target Value
Voids in the Mineral Aggregate (VMA), % <sup>a,d</sup>	± 1.6
Asphalt Content % <sup>a,b</sup>	± 0.50

<sup>a</sup> All gradation, Asphalt Content, VMA, and VFA values shall be determined using the AASHTO T 308 testing results.

<sup>b</sup> HMA will not be rejected based on Asphalt Content Determined by AASHTO T 308.

<sup>c</sup> Density payment will be adjusted in accordance with Section 901.3.11, "QLA."

<sup>d</sup> If Gmm fluctuates more than ±0.03 on a consistent basis, it is recommended that the Specific Gravity of the aggregates be checked in order to verify VMA.

<sup>e</sup> If Mineral Admixture is below Design TV cease hot mix production, investigate and correct.

Department personnel may test locations other than the random locations generated for statistical analysis. These tests will not be used for pay factor determination, but may be used to determine Acceptance or rejection of localized Material.

#### **423.3.6.3.1 Quality Level Analysis (QLA)**

The Department will determine Acceptance of the Materials in accordance with Section 904, "Quality Level Analysis (QLA)," using the Acceptance limits in Table 423.3.6.3, "Acceptance Testing Tolerances." Acceptance lot sizes shall be determined at the Pre-Paving Conference. The Department will have the final authority for determination of Acceptance lot size. For all QLA Projects, if a composite pay factor of more than one (1.00) is calculated, the composite pay factor will be a one (1.00) for the purposes of payment.

##### **423.3.6.3.1.1 Acceptance of Pavement Density**

The target density for Acceptance of HMA will be 94.50% of the theoretical maximum density as determined from AASHTO T 209. For determination of maximum specific gravity, the Contractor shall obtain and test a minimum of two (2) samples and ensure the Department obtains and tests a minimum of one (1) sample for each Day that the HMA is placed, in accordance with the random sampling Plan. Each individual density test value obtained less than 92.0% or more than 97.0% of the theoretical maximum density will be evaluated in accordance with Section 423.3.6.3.2, "Adherence to Specifications and Rejection of Non-specification Material."

For purposes of Acceptance and pay factor determination:

1. Determine the density from cut pavement sections (cores) with six (6) inch diameters extending through the full thickness of the HMA;
2. Determine the pay factor in accordance with Section 904, "Quality Level Analysis;"
3. To be prepared for dispute resolution, the Contractor shall provide one (1) additional core for each core tested by the Department for Acceptance of density in accordance with section 423.3.7, "Dispute Resolution;" and
4. If a composite pay factor of more than one (1.00) is calculated, the composite pay factor will be a one (1.00) for the purposes of payment.

For Projects consisting of single lift overlays or mill and inlay with a single lift of two and a half inches or less, the Project Manager may grant an exception to the mean density target requirement of at least 94.5% of the theoretical maximum density if the Contractor can demonstrate that a minimum of 92.0% cannot be reasonably obtained because of the existing conditions of the Pavement Structure or Subgrade Materials. The Contractor demonstrates this by providing non-destructive density results obtained during paving operations witnessed by a State Inspector at the location in question. If the Project Manager grants this exemption, the Contractor shall construct a Roadway test strip and develop an HMA compaction process to get the highest possible density based on an approved roller's density gain per pass, in accordance with Section 423.3.4.4, "Compaction Equipment." The Project Manager will approve the process, establish a new target value for density and establish a new Acceptance lot only for the portion of the Project addressed herein (except for the Roadway test strip) before paving begins or continues. Lot density shall not fall below 91%. If a lot does not meet either of the revised density requirements, the Project Manager will, with the concurrence of the Assistant District Engineer for Construction do the following:

1. Accept and pay for the lot of HMA at 50% of the Bid Item Unit Price; or
2. Reject the in-place Material and require the Contractor to remove and replace at no cost to the Department.

#### **423.3.6.3.2 Adherence to Specifications and Rejection of Non-Specification Material**

The Contractor shall produce Material in substantial compliance with all Specification requirements. The Department will evaluate Air Voids, Pavement Density, Void in Mineral Aggregate (VMA), and Asphalt Content test results for Specification compliance. Evaluation of Material that does not meet Specifications will be in accordance with the following:

**Individual Test Results.** If an individual test is outside the Specification limits but is less than two (2) standard deviations from the mean of previously produced Material of the current lot, investigate and propose corrective actions but production may continue and the result will be entered into QLA. If an individual test result (for the current lot) is outside the Specification limits and is two (2) or more standard deviations from the mean of previously produced Material, the Contractor shall cease production, investigate the causes of the failure, and propose corrective actions. The Contractor shall not resume production until the proposed corrections are approved by the Project Manager.

**Consecutive Test Results.** If two (2) consecutive test results of the same property (for the current lot) are outside the Specification limits, cease production, investigate the causes of the failure, and propose corrective action. The Contractor shall not resume production until the proposed corrections are Accepted by the Project Manager in writing. Limit production to a maximum of 1,000 tons, production will include a minimum of two (2) Contractor tests and one (1) Department test. If testing indicates that the problem has been corrected, the Contractor shall resume full operations. If the problem has not been corrected, the Contractor shall perform further trial runs and testing.

**Pavement Density Below 90.000%.** All pavement density tests that are below 90.000% are rejected and the Contractor shall remove and replace all Material represented by the test with Specification Material at the Contractors expense. The Contactor shall submit a Plan in writing for approval by the Project Manager that determines the limits of Material to be removed within 48 hours of reporting a Quality Control test or receiving a Quality Assurance test for pavement density below 90.000% density. If the test below 90.000% is a Department test, the Department will obtain a new test from the Material replaced by the Contractor to replace the density test reported by the Department. If the test below 90.000% is a Contractor test, the Contractor shall obtain a new test from the Material replaced by the Contractor to replace the test reported by the Contractor. The test obtained from the replaced Material will be input into the QLA to replace the test below 90.000%.

All Material that is rejected, at the sole discretion of the Department, shall be removed and replaced with Specification Material at the Contractor's expense. If the Material is allowed to remain in place by the Department all random, sample data will be entered into QLA, this does not apply to pavement density below 90.000% that shall be removed and replaced. Sampling for corrective action will not be entered into QLA.

The Project Manager may reject Material that appears to be defective based on visual inspection.

#### **423.3.6.4 Independent Assurance Testing**

The Department will perform Independent Assurance sampling and testing in accordance with Section 906, "Minimum Testing Requirements."

#### **423.3.7 Dispute Resolution**

For any test incorporated into the pay factor, if a dispute exists the Project Manager and Contractor will investigate to determine why and make corrections if possible. If the

discrepancy cannot be resolved, then either party may invoke the dispute resolution process. The State Asphalt Engineer will maintain a list of labs that are willing and capable of performing referee testing. All referee Labs shall be AASHTO Materials Reference Laboratory (AASHTO RE: SOURCE) certified for the test(s) to be performed. Neither the Department's Project staff, nor the Contractor will know who is performing the referee testing. The State Asphalt Engineer will select a Laboratory, without disclosing the name of the Lab to Department Project personnel or Contractor personnel, from the following, not in priority order:

1. A District Laboratory not from the District in which the Project resides;
2. A Laboratory currently listed on the State Material's Bureau's list of approved testing labs not involved in the subject Project in any manner, such as mix design submittal, preliminary testing for design, etc. Only Laboratories that are in the routine business of providing testing and designs will be considered; or
3. State Materials Bureau Laboratory.

For all testing incorporated into the pay factor, an additional sample from the Department's Acceptance Samples and the Contractor's Quality Control Samples shall be obtained for referee testing purposes. Failure to provide the referee samples will result in the Project Manager suspending the Project at no cost to the Department. Additional time will not be added to the Contract for Project suspension caused by failure to comply with Dispute Resolution Process. Work shall not resume until the Contractor provides the sample(s) and satisfies the Project Manager, in writing, that future samples will be provided in compliance with this requirement. The referee sample(s) is (are) to be retained by the Department. The Department will retain the referee samples at a location determined by the Project Manager. Once the pay factor is determined, the Contractor shall dispose of the unused samples at no cost to the Department. In no case will the unused samples be disposed of prior to the ten (10) Calendar Day period in which the Dispute Resolution process may be invoked.

For Pavement Density, the additional core(s) will be stored and retained in a location approved by the Project Manager. Should the Dispute Resolution Process for Density be invoked, the additional core will be provided to the Referee Lab per the NMDOT REFEREE TESTING POLICY. The original density value obtained will be replaced by the data obtained from the Referee Lab result.

When a referee Lab is used, the referee Lab's test results will be used in determining the pay factor. The request to referee must be invoked in writing within ten (10) Calendar Days of receiving the test results from the other party. If not invoked within ten (10) Calendar Days, the test results are deemed Accepted. The test results from the referee Lab will replace the Department's or the Contractor's test results for the sample in question. If the composite pay factor decreases from applying the referee Lab's results, the Contractor shall pay for the testing performed by the referee Lab. If the composite pay factor increases from applying the referee Lab's results, the Department will pay for the testing performed by the referee Lab. If the composite pay factor remains unchanged, the cost shall be split with each party responsible for 50% of the total cost.

The "NMDOT REFEREE TESTING POLICY" will be used to coordinate the efforts of managing Dispute Resolution by both the Department and Contractor. This policy is made available by accessing the NMDOT website, and navigating within the Construction and Civil Rights Bureau's (CCRB) link.

Failure to comply with the requirements contained herein will result in the pay factor being calculated in accordance with the applicable Sections of 423, "Hot Mix Asphalt (HMA) (Major Paving) and 904, "Quality Level Analysis" and no test results will be replaced by referee results.

**423.4 METHOD OF MEASUREMENT**

If the Department measures *HMA* by the square yard, the Department will use the average width of the HMA in place and the length from station to station along the centerline of the Roadway when calculating quantities.

**423.5 BASIS OF PAYMENT**

<b>Pay Item</b>	<b>Pay Unit</b>
<i>HMA Complete</i>	Ton or Square Yard
<i>HMA</i>	Ton or Square Yard

The Department will pay for Accepted quantities at the Bid Item Unit Price, adjusted in accordance with Section 423.5.1, "Price Adjustments." Providing and transporting all cores, samples and storage containers shall be Incidental to the Pay Items above.

**423.5.1 Price Adjustments**

The Department will pay for Accepted quantities of *HMA* or HMA Complete at the Bid Item Unit Price, adjusted in accordance with Section 904, "Quality Level Analysis (QLA)." The HMA will be evaluated on a lot-by-lot basis at a price determined by multiplying the Bid Item Unit Price by the weighting factor. The Department will use Table 904.1:1, "Weighting Factors," to calculate each lot's composite pay factor. The pay factor for the entire Project will be calculated by applying weighted averages, based on tonnage contained within each lot, to each lot's composite pay factor. If the composite pay factor for a lot is greater than one (1.0), the pay factor will be set at one (1.0).

**423.5.2 Work Included in Payment**

The Department will consider as included in the payment for the pay item(s) listed in this section and will not measure or pay separately for the following Work:

1. Asphalt binder, aggregate, blending sand, mineral filler, mineral admixture, and WMA additive or process as appropriate;
2. Mixing, hauling, placement, and compaction of HMA or WMA;
3. Quality Control in accordance with Section 902, "Quality Control;"
4. Providing and transporting all cores for correlation;
5. Providing Mix Design in accordance with Section 423.2.8, "Mix Design;" and
6. Providing storage container for samples and cores if referee testing is used.