SECTION 403 - HOT MIX ASPHALT (HMA) PAVEMENTS FOR MUNICIPALITIES

403-1 DESCRIPTION. These general specifications apply to plant mixed Hot Mix Asphalt (HMA) for use by municipalities such as Towns, Counties, etc. Modifications of these general requirements will be indicated in the specific requirements for each item. These mixes are suitable for low to moderate traffic volumes.

This work will consist of one or more courses of HMA constructed on the prepared foundation in accordance with these specifications and the specific requirements of the item under contract, and in reasonably close conformance with the lines, grades, thickness and typical sections shown on the plans or established by the Engineer.

Appropriate mix types with corresponding friction aggregates and Performance Graded Binder (PG Binder) grades must be specified and used based on the traffic levels and the project location. When the traffic levels exceed an AADT of 8,000 for two lanes or 13,000 for three or more lanes, then Items in Section 402 must be specified.

403-2 MATERIALS

403-2.01 General. Use all materials for HMA production such as aggregates, PG Binder, Reclaimed Asphalt Pavement (RAP), mineral filler or any other materials meeting the State’s requirements.

403-2.02 Composition of Mixtures. The HMA plant mix will generally be composed of a mixture of aggregate, Reclaimed Asphalt Pavement (RAP), filler if required, and PG Binder. For any HMA required by the plans or itemized proposal, formulate, a job mix formula that satisfies the General Limits imposed by Table 403-1, Composition of Hot Mix Asphalt Mixtures. In addition, the formula will state the mineral aggregate sources, and the PG Binder used in the mixture. For Type 6F2, 6F3, 7F2, and 7F3 mixtures, determine the optimum asphalt content for the proposed gradation using the Marshall Mix Design Method (50 blows).

The resultant mixture shall meet the following Marshall Mix Properties:

<table>
<thead>
<tr>
<th>Mix Property</th>
<th>Type 6F2, 6F3</th>
<th>Type 7F2, 7F3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Voids, %</td>
<td>3.0 - 5.0</td>
<td>3.0 - 5.0</td>
</tr>
<tr>
<td>Voids in Mineral Agg. (VMA), %, min.</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>Voids Filled with Binder (VFB), %</td>
<td>65 - 78</td>
<td>65 - 78</td>
</tr>
</tbody>
</table>

Produce, deliver to the work site, and incorporate the mixture into the work within 10°C of the temperature specified by the Engineer but within the mixing and placing temperature range imposed by Table 403-1, Composition of Marshall Designed Plant Mixtures.
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The aggregates will be those noted in the job mix formulas. The PG Binder will be accepted on the basis of PG Binder supplier's certification.

Perform quality control tests during HMA production to ensure specification compliance. The plant mixed material will be accepted after blending and mixing at the plant. The pavement courses will be accepted after all paving operations are completed.

403-2.03 Aggregates. Fine aggregate will consist of materials conforming to the requirements of §703-01, Fine Aggregate. In addition, fine aggregate may consist of screenings, free from deleterious materials and manufactured from sources of stone, gravel, or slag meeting the requirements §703-02, Coarse Aggregate. Coarse aggregate will consist of crushed stone, crushed gravel, or crushed slag conforming to the requirements of §703-02, except for gradation.

When aggregates from approved natural fine sand sources are combined with coarse aggregates in the mixture, aggregate particles will meet additional requirements as follows:

- Particles in the No. 1A and No. 1 primary sizes will meet the quality requirements of §703-02 and will have a minimum of 85 percent, by weight, of the particles with at least two fractured faces.
- Particles in the No. 2, No. 3 and No. 3A primary sizes will meet the quality requirements of §703-02 and will have a minimum of 75 percent, by weight, of the particles with at least one fractured face.

Slag aggregate may be used only when an alternate pay item which takes the mix yield differential into account is included on the plans or in the itemized proposal.

Aggregates for all mixtures specified in Table 403-1, including Type 6 or 7 (F9), shall meet the requirements of §703-02, Coarse Aggregate. In addition, the aggregate requirements for Type 6F2, 6F3, 7F2, and 7F3 mixtures shall meet one of the following requirements based on the mix type specified in the contract documents:

A. Coarse Aggregate Type F2 Conditions

1. Limestone having an acid insoluble residue content of not less than 20.0%, excluding particles of chert and similar siliceous rocks.

2. Dolomite having an acid insoluble residue content of not less than 17.0%, excluding particles of chert and similar siliceous rocks.

3. Sandstone, granite, chert, traprock, ore tailings, slag or other similar non-carbonate materials.

4. Gravel, or a natural or manufactured blend of the following types of materials: limestone, dolomite, gravel, sandstone, granite, chert, traprock, ore tailings, slag or other similar materials, meeting the following requirements:

   a. Type 6F2 Mixes. Non-carbonate plus 3.2 mm particles must comprise a minimum of 10.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 20.0% of plus 6.3 mm particles must be non-carbonate.

   b. Type 7F2 Mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 10.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 20.0% of plus 3.2 mm particles must be non-carbonate.
### TABLE 403-1
COMPOSITION OF HOT MIX ASPHALT MIXTURES

<table>
<thead>
<tr>
<th>Mixture Requirements(^1)</th>
<th>Base</th>
<th>Binder</th>
<th>Shim</th>
<th>Top(^{3,4})</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type 1</td>
<td>Type 2</td>
<td>Type 3</td>
<td>Type 5, 6F2, 6F3</td>
</tr>
<tr>
<td>Screen Sizes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50.0 mm</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>90-100</td>
<td>-</td>
<td>75 - 100 ±7</td>
<td>100</td>
</tr>
<tr>
<td>25.0 mm</td>
<td>78 - 95 ±5</td>
<td>55 - 80 ±8</td>
<td>95 - 100</td>
<td>-</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>57 - 84 ±6</td>
<td>23 - 42 ±7</td>
<td>70 - 90 ±6</td>
<td>-</td>
</tr>
<tr>
<td>6.3 mm</td>
<td>40 - 72 ±7</td>
<td>5 - 20 ±6</td>
<td>48 - 74 ±7</td>
<td>100</td>
</tr>
<tr>
<td>3.2 mm</td>
<td>26 - 57 ±7</td>
<td>2 - 15 ±4</td>
<td>32 - 62 ±7</td>
<td>80 - 100 ±6</td>
</tr>
<tr>
<td>850 μm</td>
<td>12 - 36 ±7</td>
<td>-</td>
<td>15 - 39 ±7</td>
<td>32 - 72 ±7</td>
</tr>
<tr>
<td>425 μm</td>
<td>8 - 25 ±7</td>
<td>-</td>
<td>8 - 27 ±7</td>
<td>18 - 52 ±7</td>
</tr>
<tr>
<td>180 μm</td>
<td>4 - 16 ±4</td>
<td>-</td>
<td>4 - 16 ±4</td>
<td>7 - 26 ±4</td>
</tr>
<tr>
<td>75 μm</td>
<td>2 - 8 ±2</td>
<td>-</td>
<td>2 - 8 ±2</td>
<td>2 - 12 ±2</td>
</tr>
<tr>
<td>PGB Content, %(^2)</td>
<td>4.0 - 6.0 ±0.4</td>
<td>2.5 - 4.5 ±0.4</td>
<td>4.5 - 6.5 ±0.4</td>
<td>7.0-9.5 ±0.4</td>
</tr>
</tbody>
</table>

NOTES:
1. All aggregate percentages are based on the total weight of the aggregate.
2. The asphalt content is based on the total weight of the mix. When using slag aggregates in the mix, increase the PGB content accordingly, a minimum of 25 percent for all slag mix.
3. 6F2, 6F3, 7F2, 7F3 mix types require friction course aggregates, and are required for mainline driving surface courses.
4. For Type 6 and Type 7 (F9) aggregate requirements, Marshall design will not be required. These mix types are suitable where the State’s requirements for F9 aggregate apply.
5. Introduce the PG Binder into the pugmill between 110°C and 175°C, or as recommended by the PG Binder supplier.
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B. Coarse Aggregate Type F3 Conditions

1. Limestone having an acid insoluble residue content of not less than 20.0%, excluding particles of chert and similar siliceous rocks.

2. Dolomite

3. Sandstone, granite, chert, traprock, ore tailings, slag or other similar non-carbonate materials.

4. Gravel, or a natural or manufactured blend of the following types of materials: limestone, dolomite, gravel, sandstone, granite, chert, traprock, ore tailings, slag or other similar materials, meeting the following requirements:

   a. Type 6F3 Mixes. Non-carbonate plus 3.2 mm particles must comprise a minimum of 10.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 20.0% of plus 6.3 mm particles must be non-carbonate.

   b. Type 7F3 Mixes. Non-carbonate plus 3.2 mm particles must comprise a minimum of 10.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 20.0% of plus 3.2 mm particles must be non-carbonate.

When coarse aggregates for these mixes are from more than one source or of more than one type of material, proportion and blend them to provide a uniform mixture.

403-2.04 Mineral Filler. Mineral filler, if required in the mix to meet gradation requirements, will conform to the requirements of §703-08, Mineral Filler.

403-2.05 Performance-Graded Binder. The PG Binder will meet the requirements of §401-2.04, Performance Graded Binder. Unless the type of PG Binder is specified in the contract documents, use PG 64-22, or a PG Binder specified in Table 6-4, Performance Graded Binder Selection, of Chapter 6 of the Comprehensive Pavement Design Manual, or other suitable PG Grade as approved by the Engineer.

403-2.06 Reclaimed Asphalt Pavement. Reclaimed Asphalt Pavement (RAP) will meet the requirements as written in Materials Method (MM) 5.16, Superpave Hot Mix Asphalt Mixture Design and Mixture Verification Procedures.

403-3 CONSTRUCTION DETAILS. The contractor is responsible for Quality Control (QC). QC is defined as all activities required to produce HMA that meets all specification requirements. The Contractor will produce HMA in accordance with the State approved Control Plan and assume responsibilities for all QC activities at the production facilities. If specified in the contract documents, the Quality Control provisions of Section 401 shall apply.

   Unless modified in the contract document, the details of §401-3, Construction Details, will apply except for the gyratory compactor, specimen mold assembly, and the extractor of §401-3.08 HMA Mixing Plant are not required. The HMA mixing plant inspection facilities shall include mixture design equipment for Marshall method as detailed below.

   The details of §402-3 Construction Details will apply except for §402-3.05 Conditioning of Existing Surface and §402-3.07 Compaction, and §402-3.08 Pavement Density Samples. The requirements for conditioning of the existing surface and compaction are detailed below.

403-3.01 Equipment for Marshall Design Method

   A. Marshall Compactor. A compactor will meet the requirements of AASHTO T245. Mount
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the compactor on a solid base. The compactor will be automatically driven, have a stroke counter, and be capable of automatically stopping after applying the desired number of strokes. The compaction hammer shall weigh 4.536 kilograms (±0.009 kg).

B. Marshall Specimen Mold Assembly. The specimen mold assembly will meet the requirements of AASHTO T245. The assembly shall consist of a compaction mold, base plate, and collar. Provide a minimum of three specimen mold assemblies and an adequate supply of 100 mm paper discs.

C. Marshall Specimen Extractor. Supply an extractor, meeting the requirements of AASHTO T245, to extract the 100 mm Marshall specimens from the compaction molds.

D. Hot Plate. Supply a hot plate suitable for heating the Marshall compaction hammer. A hot plate meeting the requirements of §401-3.08, 13. p. Sample Drying Appliance, will be acceptable.

403-3.02 Conditioning of Existing Surface. Clean the surface of the existing pavement prior to placing any HMA. When specified in the contract documents:

- Clean and fill the joints and cracks under the provisions of Section 633, Conditioning Existing Pavement.
- Apply a thin, uniform tack coat under the provisions of Section 407, Tack Coat, to all contact surfaces of existing HMA and Portland Cement Concrete layers including such areas as adjacent pavement edges, curbing, gutters, manholes and other structures, immediately prior to placing the HMA mixture against them.
- If the pavement surface is rutted, fill all depressions and wheel path ruts prior to the paving of the trueing and leveling course, as directed by the Engineer. For wheel path ruts 7 mm or greater, but 20 mm or less, use Shim Course. Otherwise, for ruts greater than 20 mm, use a Type 7 mixture or other appropriate mixture.
- Place a trueing and leveling course of a minimum variable thickness of proper plant mix necessary to bring the surface of the existing pavement to the same transverse slope and longitudinal grade required for the finished pavement surface. For compacted thickness up to 50 mm, use a Type 6 or Type 7 mixture. For compacted thickness in excess of 50 mm, use a Type 3 mixture. Pay special attention to the proper compaction of thin sections.

403-3.03 Compaction Immediately after the HMA mixture has been spread, struck off and surface irregularities adjusted, thoroughly and uniformly compact it by rolling. Roll the surface when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking or shoving. Initially roll all courses with the roller traveling parallel to the centerline of the pavement beginning at each edge and working toward the center. Roll the banked curves starting at the low side edge and working toward the super-elevated edge.

Correct at once any displacement occurring as a result of reversing the direction of the roller, or from other causes, by the use of rakes and addition of fresh mixture as required. Exercise care in rolling so as not to displace the line and grade of the edges of the HMA mixture. To prevent adhesion of the mixture to the drum(s) and pneumatic tires, keep the drum(s) and the pneumatic tires properly moistened with water or water mixed with small quantities of detergent or other approved material. Any petroleum products or solvents having an adverse effect upon the HMA pavement will not be permitted for use.

There shall be no visible defects, such as shallow ruts, ridges, roller marks, cracking, tearing, segregation, or any other irregularities as determined by the Engineer, in the pavement when the rolling operation is complete. If these defects are present, correct these defects to the satisfaction of the Engineer or relay the pavement at no additional cost.

Along forms, curbs, headers, walls and other areas not accessible to the rollers, thoroughly compact the mixture with mechanical tampers as directed by the Engineer. On depressed areas, use a trench roller or a small vibratory roller with the approval by the Engineer. Cleated compression strips also may
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be used under the roller to transmit compression to the depressed area.

Remove and replace any mixture that becomes loose and broken, mixed with dirt, or is in any way defective with fresh HMA mixture which shall be compacted to conform with the surrounding area. Correct any area showing an excess or deficiency of HMA material to the satisfaction of the Engineer.

When using vibratory compaction, assume full responsibility for the cost of repairing all damages which may occur to the highway components and adjacent property including buried utility and service facilities.

Use either of the two compaction options listed below except that the shim course must be compacted with a minimum of three passes of a pneumatic rubber tired roller unless otherwise approved by the Engineer for variance. Option B - Vibratory Compaction is not permitted when compacting HMA concrete courses on structural bridge decks, or other structures with less than 0.60 meters of cover.

A. Option A. Three Roller Compaction Train. Under this option, initially roll all HMA mixtures with an approved steel-wheel roller operating in a static mode. Overlap the previous roller pass by one-half the width of the roller.

Immediately following the initial rolling, roll the mat with an approved pneumatic rubber-tired roller. A minimum of 3 passes of the rubber-tired roller will be required. One pass is defined as one movement of the roller over any point of the pavement in either direction.

Immediately following the intermediate rolling, finish roll the mat with a steel-wheel roller to remove all shallow ruts, ridges, roller marks, and other irregularities from the surface.

Use this option only when the compacted thickness of the finished mat is 100 mm or less. Unless approved by the Engineer, the roller speeds shall not exceed 5 kilometers per hour. When paving multiple lanes simultaneously, increase the required number of rollers proportionately for each additional full lane width unless otherwise permitted by the Engineer.

B. Option B - Vibratory Compaction. Under this option, use vibratory rollers appearing on the current Approved List - HMA Concrete Vibratory Compaction Equipment. For each project where a vibratory roller is used, furnish a vibrating reed tachometer for the exclusive use of the Engineer. The vibrating reed tachometer must have a frequency range of 17 Hz to 67 Hz with a minimum reed interval of 1 Hz between 17 Hz and 33 Hz and a minimum reed interval of 2 Hz between 33 Hz and 67 Hz.

Operate vibratory rollers at a uniform speed not exceeding 4 kilometers per hour (67 meters per minute) on all pavement courses. Complete all turning of the compaction equipment on material which has had a minimum of one roller pass.

The required number of passes listed in Table 403-2, Number of Passes, is recommended and may be increased or decreased if, in the opinion of the Engineer, adequate density can be achieved. Complete all breakdown roller passes before the mat temperature falls below 120°C. One vibratory pass is defined as one movement of the roller over any point of the pavement in either direction. One static pass is defined as one movement of the roller over any point of the pavement in either direction. Remove all ruts, ridges, roller marks or other irregularities from the surface using static rolling. The Engineer may alter the compaction procedures for small areas where the specified procedures are not practical.

If the Engineer determines that unsatisfactory compaction is being obtained or damage to highway components and/or adjacent property is occurring using vibratory compaction equipment, then immediately cease using this equipment and proceed with the work in accordance with the conventional compaction procedures stipulated under Option A at no additional cost.

When the compaction procedure being used fails to produce results acceptable to the Engineer, adjust the procedure to obtain the desired results. Rollers will move at a slow and uniform speed. The roller drive roll or wheel will be nearest the paver.
### TABLE 403-2
NUMBER OF PASSES

<table>
<thead>
<tr>
<th>Pavement Courses</th>
<th>Option A</th>
<th></th>
<th>Option B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Three Roller Train (Static)</td>
<td>Vibratory Rollers</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Steel Wheel Rollers</td>
<td>Pneumatic Roller</td>
<td>Vibratory Passes</td>
<td>Static Passes</td>
</tr>
<tr>
<td>Base (Open Graded Each Lift)</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Base (Dense-Graded)</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Binder (Dense-Graded)</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Top (Dense-Graded All Types)</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

**403-4 METHOD OF MEASUREMENT.** The Engineer shall measure the quantity of the HMA placed and compacted in the accepted work. The quantity shall be measured in metric tons to the nearest 0.01 and determined from the delivery ticket.

Each delivery vehicle supplying HMA mixture shall be accompanied with a delivery ticket indicating the total quantity in metric tons being delivered. The quantity on the delivery ticket shall be determined from the automated proportioning system or the delivery vehicle weigh system. The delivery ticket shall contain the following minimum information:

- Ticket Number
- Plant Identification
- Contract Number
- Material Description, (including the PG-Binder Grade)
- Quantity of Material in Vehicle
- Date and Time

Make one legible copy of the delivery ticket available to the project inspector prior to the placement of the mixture.

**403-5 BASIS OF PAYMENT.** The unit bid price per ton for all pavement courses shall include the cost of all material, labor and equipment necessary to complete the work, including any cleaning pursuant to §403-3.02; cleaning of foreign material from the pavement as a result of construction operations; all necessary repairs to highway components and/or adjacent property caused by construction operations; any necessary work to correct surface tolerances per §402-3.10; and the scheduling and sequencing of work to conform with weather and seasonal limitations, and all temporary materials and work and/or repairs associated with paving operations outside the specified weather and seasonal requirements. Cleaning, sealing, and filling the cracks will be paid under Section 633. Tack coat will be paid under Section 407, Tack Coat.

**Payment will be made under:**

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>403.118902 M</td>
<td>Hot Mix Asphalt, Type 1 Base Course</td>
<td>Metric Ton</td>
</tr>
<tr>
<td>403.128902 M</td>
<td>Hot Mix Asphalt, Type 2 Base Course</td>
<td>Metric Ton</td>
</tr>
<tr>
<td>403.138902 M</td>
<td>Hot Mix Asphalt, Type 3 Binder Course</td>
<td>Metric Ton</td>
</tr>
<tr>
<td>403.158902 M</td>
<td>Hot Mix Asphalt, Type 5 Shim Course</td>
<td>Metric Ton</td>
</tr>
<tr>
<td>403.178202 M</td>
<td>Hot Mix Asphalt, Type 6 F2 Top Course</td>
<td>Metric Ton</td>
</tr>
<tr>
<td>403.178302 M</td>
<td>Hot Mix Asphalt, Type 6 F3 Top Course</td>
<td>Metric Ton</td>
</tr>
<tr>
<td>403.178902 M</td>
<td>Hot Mix Asphalt Type 6 Top Course</td>
<td>Metric Ton</td>
</tr>
</tbody>
</table>
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403.198202 M  Hot Mix Asphalt, Type 7 F2 Top Course  Metric Ton
403.198302 M  Hot Mix Asphalt, Type 7 F3 Top Course  Metric Ton
403.198902 M  Hot Mix Asphalt Type 7 Top Course  Metric Ton
403.218902 M  Hot Mix Asphalt, True and Leveling Course  Metric Ton

SECTION 404 (VACANT)

SECTION 405 - COLD MIX BITUMINOUS PAVEMENT (OPEN GRADED)

405-1 DESCRIPTION. This work shall consist of constructing one or more courses of cold mix bituminous pavement on a prepared base in accordance with these specifications and in substantial conformance with the lines, grades, thicknesses, and typical cross-sections shown on the plans or established by the Engineer.

405-2 MATERIALS

405-2.01 Bituminous Material. The bituminous materials required for mixing and for sealing shall meet the requirements of section 702, Bituminous Materials. The type and grade of bituminous material shall be that indicated on the plans or in the proposal.

405-2.02 Aggregates. The aggregates shall be Department approved aggregates meeting the requirements of § 703-02, Coarse Aggregates, for the sizes specified. Screened gravel shall not be permitted unless specified on the plans or in the proposal.

405-2.03 Composition of Mixtures. The bituminous cold mix shall be composed of a mixture of aggregate and bituminous material as ordered and approved by the Engineer. The mix shall be proportioned as specified in Table 405-1, Composition of Cold Bituminous Mixtures.

<table>
<thead>
<tr>
<th>TABLE 405-1 COMPOSITION OF COLD BITUMINOUS MIXTURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sieve Size</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>50 mm</td>
</tr>
<tr>
<td>37.5 mm</td>
</tr>
<tr>
<td>25 mm</td>
</tr>
<tr>
<td>12.5 mm</td>
</tr>
<tr>
<td>6.3 mm</td>
</tr>
<tr>
<td>3.2 mm</td>
</tr>
<tr>
<td>75 μm</td>
</tr>
<tr>
<td>Bituminous Material²³</td>
</tr>
<tr>
<td>Description</td>
</tr>
<tr>
<td>Typical Uses</td>
</tr>
</tbody>
</table>

1 Percentage based on total aggregate weight.  2 Total Emulsion Percentage based on total mix weight.
3 When crushed air-cooled blast furnace slag aggregate is selected, the above bituminous material content shall be increased approximately 25%.

4-52  NEW YORK STATE DEPARTMENT OF TRANSPORTATION
STANDARD SPECIFICATIONS of January 2, 2002
405-3 CONSTRUCTION REQUIREMENTS

405-3.01 Weather Limitations. Bituminous material or mixture shall not be applied on any soft surfaces, when the surface is wet, when the temperature of the surface on which the mixture is to be placed is below 7°C, or when other weather conditions would prevent proper construction of the pavement.

405-3.02 Equipment. The following equipment shall be required:
- Either central pugmill mixer and bituminous paver or Travel plant mixer
- Bituminous material distributor
- Steel wheeled roller, 7-11 Metric Ton or Approved vibratory roller
- Chip spreader
- Power broom
- Motor grader, if required
- Miscellaneous equipment to perform the work

All equipment and the condition of the equipment for this work shall be subject to approval of the Engineer at all times.

Mixing shall be done with a rotating twin paddle shaft pugmill providing suitable pressure-kneading action in mixing. Mixing by blading, shoveling and/or scooping will not be permitted.

The materials shall be mixed either by the travel mix plant method or in a central pugmill mixer.

The mixer shall be either a continuous traveling type, central continuous or batch type pugmill designed to accurately proportion wither by volume or by weight, so that when the aggregate and bituminous materials are incorporated in the mix, a thorough and uniform coating will result. The mixer shall be equipped to mechanically or electrically interlock the bituminous feed with the aggregate feed such that uniformity of the mixture is assured at all times. The pugmill mixer, either traveling or central type, shall be provided with weighing, volumetric or other gaging equipment which shall be capable of providing accurate control at all times of the amount of aggregate entering the mixer per time interval. On the central continuous type pugmill a mechanically operated discharge hopper of at least 0.76 cubic meters capacity shall be provided. The mixer shall be equipped with a positive displacement metering system capable of totalizing the quantity of bituminous material applied to the mixing chamber.

405-3.03 Preparation of the Base. The roadway surface to be covered shall be free from holes, depressions, bumps, waves and corrugations. Any unsuitable surface areas shall be repaired by replacement of the unstable materials or by patching with a material to produce a tight surface having the same elevation as the surrounding surface. The roadway surface shall be broomed when ordered by the Engineer to remove loose material.

405-3.04 Mixing and Spreading. The aggregate and asphalt shall be thoroughly mixed so that the bituminous material is uniformly distributed throughout and all aggregate particles are uniformly coated.

The mixture shall be deposited on the prepared base either in a windrow at the back of the travel mixer or mechanically spread in a uniform layer so as to produce the specified thickness after compaction. If deposited in a windrow, it shall be spread over the entire roadway surface by motor grader or other approved spreader to produce the specified thickness after compaction. The maximum allowable compacted thickness shall be 50 mm for the Type 1 mix (Table 405-1) and 100 mm for the Type 2 and Type 3 mixes (Table 405-1).

405-3.05 Compaction. After spreading, the mixture shall be thoroughly and uniformly compacted with a self-propelled steel-wheeled roller or an approved vibratory roller to obtain a thoroughly compacted pavement. The number of roller passes to achieve the desired compaction shall be approved by the Engineer.
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405-3.06 Surface Testing. The finished surface of the pavement shall be tested with a 5 meter straight edge laid parallel with the center line of the pavement. Any area exceeding a 6 mm variation from the surrounding area shall be satisfactorily corrected or removed and replaced.

405-3.07 Pavement Sealing. Either prior to initial compaction or immediately after compacting the mix, No. 1A size key stone meeting the requirements of § 703-02, Coarse Aggregates, shall be uniformly spread upon the surface at the rate of 5-8 kg/m² and the course rolled. No 1 size key stone meeting the requirements of § 703-02, Coarse Aggregates, at the rate of 5-10 kg/m², may be used for key stone on the base course mixes. After placement of the No. 1A size key stone, the pavement shall be opened to traffic for a minimum of 3 days before placing the seal coat.

Prior to the application of the seal coat, the pavement surface shall be thoroughly swept and cleaned of all excess material. The seal coat shall be bituminous material asphalt emulsion meeting the requirements of § 702-3101 or § 702-4101 applied at the rate of 1.4 to 2.3 L/m² (Type 1 mix, Table 405-1) or 2.3 to 2.9 L/m² (Type 2 mix, Table 405-1). This shall be immediately followed by an application of No. 1A cover aggregate at the rate of 8-10 kg/m² which shall then be rolled. In the case where multiple lifts of Cold Mix Bituminous Pavements are used, only the surface of the top course shall require a seal coat. In multiple lift construction, each lift requires an application of key stone to fill voids in the mat.

405-4 METHOD OF MEASUREMENT. The bituminous cold mix pavement shall be measured by the number of metric tons compacted aggregate, including key and cover stone, placed in accordance with the specifications.

The liquid bituminous material shall be measured by the liter.

405-5 BASIS OF PAYMENT. The unit price bid per metric ton shall include the preparation of base, the cost of furnishing all the aggregate, the mixing, placing, compaction and all labor and equipment necessary to complete the work. The bituminous material will be paid for under its appropriate item.

Payment will be made under:

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>405.01 M</td>
<td>Cold Mix Bituminous Pavement (Open Graded)</td>
<td>Metric Ton</td>
</tr>
</tbody>
</table>

SECTION 406 (VACANT)

SECTION 407 - TACK COAT

407-1 DESCRIPTION. This work shall consist of preparing and treating an existing bituminous or portland cement concrete surface with bituminous tack coat in accordance with these specifications and in reasonably close conformity with the limits shown on the plans or established by the Engineer.

407-2 MATERIALS. The bituminous tack coat shall meet the requirements of the following designation:

Asphalt Emulsion for Tack Coat 702-90

The bituminous tack coat will be sampled and tested in accordance with the Department's written instruction.

407-3 CONSTRUCTION DETAILS
§407-5

407-3.01 Equipment. The Contractor shall provide a distributor for applying tack coat.

The distributor shall be designed, equipped, maintained and operated so that the tack coat can be heated and applied uniformly on variable widths of surface up to 4.5 meters at readily determined and controlled rates from 0.14 to 9.10 L/m², with uniform pressure, and with an allowable variation from any specified rate not to exceed 0.10 L/m². Distributor equipment shall include a tachometer, accurate metering device or a calibrated tank, and a thermometer for measuring temperatures of tank contents. Distributors shall be equipped with a power unit for the pump, and full circulation spray bars adjustable laterally and vertically.

The distributor may be equipped with an attached bristle broom designed such that it drags on the pavement behind the spray bars. If the broom is used, it shall be adjustable laterally and vertically so that the full width of the applied tack coat is broomed uniformly into the pavement surface.

Distributors shall be equipped with an approved bituminous material sampling valve. The valve shall be installed as described in Department written instructions. When samples are taken through such valves, they shall be considered representative of all material in the tank.

Smaller power spray units of hand spray equipment will be permitted only in areas where the Engineer determines the use of a distributor is impractical.

407-3.02 Application of Bituminous Material. The tack coat shall be uniformly applied by a pressure distributor to a prepared clean pavement. The tack coat shall be applied as approved by the Engineer to offer the least inconvenience to traffic and to permit the one-way traffic, where practical, to prevent pickup or tracking of the bituminous material.

The tack coat shall not be applied on a wet pavement surface or when the pavement surface temperature is below the temperature requirements outlined in Table 402-2 Temperature and Seasonal Requirements of Section 402-3.01 HMA Pavements, Weather and Seasonal Limitations. The temperature and areas to be treated shall be approved by the Engineer prior to application. The application rate shall be 0.14 to 0.32 L/m² as approved by the Engineer. Table 407-1 contains recommended application rates for tack coat on various surfaces:

<table>
<thead>
<tr>
<th>TABLE 407-1 TACK COAT APPLICATION RATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Type</td>
</tr>
<tr>
<td>-----------------------------------------</td>
</tr>
<tr>
<td>New Hot Mix Asphalt</td>
</tr>
<tr>
<td>Milled Surfaces</td>
</tr>
<tr>
<td>Existing Hot Mix Asphalt</td>
</tr>
<tr>
<td>Portland Cement Concrete</td>
</tr>
<tr>
<td>Vertical Surfaces (curbs, concrete drainage structures and appurtenances)</td>
</tr>
</tbody>
</table>

407-4 METHOD OF MEASUREMENT. The quantity to be paid for will be the number of liters of asphalt emulsion for tack coat measured at 15°C incorporated into the work.

407-5 BASIS OF PAVEMENT. The unit price bid per liter for tack coat shall include the cost of furnishing materials and all equipment and labor necessary to complete the work.

Payment will be made under:

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>407.01 M</td>
<td>Tack Coat</td>
<td>Liter</td>
</tr>
</tbody>
</table>

NEW YORK STATE DEPARTMENT OF TRANSPORTATION
STANDARD SPECIFICATIONS of January 2, 2002

4-55
SECTIONS 408 and 409 (VACANT)

SECTION 410 - BITUMINOUS SURFACE TREATMENT - SINGLE COURSE

410-1 DESCRIPTION. The work shall consist of the construction of a single bituminous surface treatment for both pavements and shoulders in accordance with these specifications in substantial conformance with the limits shown on the plans or established by the Engineer.

410-2 MATERIALS

410-2.01 Bituminous Materials. All the provisions of Section 618 shall apply with the following additions:

A. Bituminous Material Approval. The bituminous material shall be obtained from a storage facility that has been approved by the Director, Materials Bureau within the current calendar year, before the start of work.

B. Bituminous Material Selection. The selected bituminous material shall be compatible with the aggregate to be used. It's the contractors responsibility to ensure compatibility between the bituminous material and aggregate. The selection of bituminous material shall also be subject to the approval of the Engineer. Under the work the Contractor shall select, furnish and apply one of the following bituminous materials to a prepared surface.

1. Bituminous Surface Treatment - Pavement

<table>
<thead>
<tr>
<th>Materials Designation</th>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>702-3101</td>
<td>RS-2</td>
<td>Rapid Setting Asphalt Emulsion</td>
</tr>
<tr>
<td>702-3102</td>
<td>HFRS-2</td>
<td>High Float Rapid Setting Asphalt Emulsion</td>
</tr>
<tr>
<td>702-4101</td>
<td>CRS-2</td>
<td>Cationic Rapid Setting Asphalt Emulsion</td>
</tr>
</tbody>
</table>

When the two-way AADT is greater than 500, the selected bituminous material shall be polymer modified to increase the desired aggregate retention. When the two-way AADT is less than 500, the Contractor may or may not choose to blend the emulsion with a polymer modifier.

2. Bituminous Surface Treatment - Shoulders

<table>
<thead>
<tr>
<th>Materials Designation</th>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>702-3101</td>
<td>RS-2</td>
<td>Rapid Setting Asphalt Emulsion</td>
</tr>
<tr>
<td>702-3102</td>
<td>HFRS-2</td>
<td>High Float Rapid Setting Asphalt Emulsion</td>
</tr>
<tr>
<td>702-3301</td>
<td>HFMS-2</td>
<td>High Float Medium Setting Asphalt Emulsion</td>
</tr>
<tr>
<td>702-4101</td>
<td>CRS-2</td>
<td>Cationic Rapid Setting Asphalt Emulsion</td>
</tr>
</tbody>
</table>

410-2.02 Aggregates. The aggregates for bituminous surface treatments shall conform to the requirements of Section 703-02, “Coarse Aggregate” and be from an approved source. Where aggregates for pavement surface treatment are from more than one source or of more than one type of material, they shall be proportioned and blended to provide a uniform mixture. The procedure used for proportioning shall be approved by the Regional Director or the authorized representative.

A. Bituminous Surface Treatment - Pavement. The aggregate size shall be No. 1ST and meet one of the following:

1. Limestone having an acid insoluble content of not less than 20%, excluding particles of chert and similar siliceous rocks. Blends of siliceous and non-siliceous and non-siliceous limestone will not be permitted.
2. Dolomite

3. Sandstone, granite, chert, trap rock, ore tailings or other similar non-carbonate materials.

4. Gravel, or a natural or manufactured blend of two or more of the following types of material; limestone, dolomite, gravel, sandstone, granite, chert, trap rock, ore tailings, slag or other similar materials meeting the following requirements:
   - Non-carbonate plus 3.2 mm particles must comprise a minimum of 10.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities).
   - A minimum of 20.0% of plus 4.75 mm particles must be non-carbonate.

**B. Bituminous Surface Treatment - Shoulders.** The required aggregate size shall meet the following gradation requirements:

<table>
<thead>
<tr>
<th>Screen Sizes</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.5 mm</td>
<td>100</td>
</tr>
<tr>
<td>6.3 mm</td>
<td>85-100</td>
</tr>
<tr>
<td>3.2 mm</td>
<td>0-15</td>
</tr>
</tbody>
</table>

**410-2.03 Polymer Modifier.** The minimum amount and type of polymer modifier shall be based on the bitumen content and shall be determined by the laboratory performing the mix design. The minimum polymer modifier content shall be 3% polymer solids, based on bitumen weight. The polymer materials shall be milled or blended into the asphalt or blended into the emulsifier solution prior to the emulsification process.

**410-3 CONSTRUCTION DETAILS**

**410-3.01 Bituminous Surface Treatment - Pavements**

**A. Weather and Seasonal Limitations.** Bituminous material shall not be applied to a pavement surface when the:

1. Surface is wet
2. Ambient temperature is less than 10°C in the shade
3. Ambient temperature is greater than 35°C
4. Weather conditions would prevent proper construction of the surface treatment

The surface on which the bituminous material is applied shall have a temperature of 20°C or higher.

Surface treatments shall be placed during the period of May 1st up to the last Saturday in August (inclusive).

**B. Equipment.** The following equipment shall be required:

1. **Self-propelled Rotary Power Broom.** A self-propelled rotary power broom shall be designed, equipped, maintained and operated so that the pavement surface can be swept clean. The broom shall have an adjustment to control the downward pressure. The power broom shall meet the approval of the Engineer.

2. **Bituminous Material Distributor.** The liquid bituminous material distributor shall have been calibrated within the previous 12 months for transverse and longitudinal application rates according to ASTM D2995, Practice for Determining Application Rate of Bituminous Distributors. The bituminous material distributor shall be equipped, maintained, and operated so that the bituminous material can be applied at controlled temperature rates from 0.16 to 6.36 L/m². The distributor shall be capable of applying bituminous material on variable widths up.
to 4.6 meters. The distributor shall uniformly apply the bituminous material to the specified rate with a maximum allowed variation of 0.064 L/m^2. Distributor equipment shall include tachometer, accurate volume measuring devices or a calibrated tank, and a thermometer for measuring temperatures of tank contents. Distributors shall be equipped with a separate power unit for the pump, and full circulation spray bars adjustable laterally and vertically.

The distributor and/or transport shall be equipped with a sampling valve so designed and installed as to be non-clogging and safe. The type of valve and its general location shall be according to Department written instructions. When samples are taken through such valves in accordance with Department instructions, they shall be considered representative of all material in the tank.

3. **Self-propelled aggregate spreader.** The aggregate spreader shall be a self-propelled unit capable of uniformly spreading the aggregate at the required rate on a minimum width of 150 mm wider than the width of the lane to be treated. The spreader shall meet the approval of the Engineer and be calibrated similar to the test method used in ASTM D2995, within the previous 12 months, for transverse and longitudinal application using a portable scale and several sheets of canvas, 0.3 m x 1 m in size.

4. **Pneumatic tire roller.** A minimum of two pneumatic tire rollers will be required for each project. The Engineer will require a sufficient number of pneumatic tire rollers to permit initial rolling of the aggregate to occur within 5 minutes of the application of the bituminous material and the final of the three coverages to be completed within 30 minutes of the application of the bituminous material. The pneumatic tire rollers shall be self-propelled and have oscillating wheels with smooth tread tires and will have a minimum ballasted weight of 9 metric tons. The tire pressure for all wheels shall be uniform within ±0.035 MPa. The rollers shall be operated at a maximum speed of 8 kilometers per hour. To prevent pick-up of the aggregate to the tires, the tires shall be kept properly moistened with water mixed with small quantities of detergent or other material approved by the Engineer. In no case shall a solvent having affect upon the surface treatment be used.

**C. Determination of the Quantities of Materials to be Applied.** The Contractor shall place a minimum of three test patches at locations determined by the Engineer. The site or sites selected to apply the test patches should be representative of the various road surfaces on which the surface treatment is to be applied. The detailed instructions for test patch installations are as follows:

1. **Test Patch Section.** The test patch section shall consist of a minimum of three test patches at varying application rates. Recommended variation of 2.3 L/m^2 both sides of the selected target as suggested in 2.a.. (below). Each test patch shall be a minimum of 1 x 3 meters or big enough to cover sufficient lane width so traffic will drive over it.

2. **Suggested Application for Emulsion and Aggregates**
   
   a. **Emulsion**
   
   i. **High Volume Traffic, Tight Surfaces.** Emulsion application shall be 1.6 liters/meter^2
   
   ii. **Low Volume, Porous Surfaces.** Emulsion application shall be 2.0 liters/meter^2

   b. **Aggregate - 1ST (11-13 kg/m^2).** The actual amount of aggregate should be determined by weighing the amount of aggregate required to completely cover a one square meter area one aggregate layer thick.

3. **Determination of Application Quantities**

   a. **Emulsion Quantity.** Kilograms of Emulsion Per Patch = Application Rate (L/m^2) X
Size of Test Patch (square meters) X Unit Weight of Emulsion (1.0 kilogram per liter).

b. Aggregate Quantity. Kilograms of Aggregate Per Patch = Application Rate (kg/m²) X Size of Patch (square meters).

4. Layout Procedure
a. Clean patch area.
b. Mark out patch with chalk and straight edge.
c. In a pre-tared container weigh out determined amount of aggregate for patch.
d. In a pre-tared container, weigh out determined amount of emulsion for patch. The emulsion should be at the application temperature and work should proceed rapidly to maintain temperature.
e. Immediately pour the emulsion on the marked patch area, spread with a squeegee until emulsion is evenly spread at uniform thickness throughout the patch area. Squeegeeing should be kept to a minimum to minimize breaking of the emulsion. This whole operation should be done quickly to insure the emulsion doesn't set before cover aggregate is applied.
f. Spread preweighed cover aggregate, by hand, over patch area.
g. With pneumatic tire roller, roll the patch area a minimum of three complete passes.

5. Evaluation of Test Patches. After a minimum of 14 days of traffic over the test patches, the Engineer will evaluate the test patches for aggregate retention, flushing or bleeding, aggregate embedment and bonding to the existing pavement.

The selected patch should retain a minimum of 95% of the cover aggregate, show no signs of flushing or bleeding, have 70% embedment of aggregate into the emulsion residue and be securely bonded to the existing pavement.

D. Preparation of Surface. A self-propelled power broom shall be used to clear any loose material from the pavement surface immediately prior to the application of bituminous material. Potholes shall be patched with an appropriate asphalt concrete trueing and leveling course approved by the Engineer. These patched areas shall be fog sealed with the same bituminous material selected for the project at a rate of 1.40 liters/square meter.

Manhole covers, drop inlets, catch basins, curb any other structure within the roadway area shall be protected against the application of surface treatment material.

E. Application of Bituminous Material. Bituminous material shall be applied by means of a pressure distributor in a uniform, continuous spread over the section to be treated and within the temperature range specified. The quantity of bituminous material to be used shall be that established by the test patch unless modified by the Engineer. The allowable variation from this quantity shall not exceed 0.10 L/m². A strip of building paper, at least 1 meter in width and with a length equal to that of the spray bar of the distributor plus 300 millimeters, shall be used at the beginning of each spread. If the cut-off is not positive, the use of paper may be required at the end of each spread. The paper shall be removed and disposed of in a satisfactory manner. The distributor shall be moving forward at the proper application speed at the time the spray bar is opened. If any skipped areas or deficiencies occur, the operation shall be immediately stopped. Junctions of spreads shall be carefully made to assure a smooth riding surface and the deficient areas corrected in a manner approved by the Engineer.

The bituminous material shall not be applied more than 60 meters in advance of the self-propelled stone spreader.

Under no circumstances shall operations proceed in such a manner that bituminous material will be allowed to chill, set up, dry, or otherwise impair retention of the cover aggregate. Traffic will not be allowed to run on uncovered bituminous material.

The distributor, when not spreading, shall be parked so that the spray bar or mechanism will
not drip bituminous material on the surface of the traveled way.

**F. Application of the Cover Aggregate.** Immediately following the application of bituminous material, cover aggregate shall be spread at the rate established for the test patch unless modified by the Engineer. The allowable variation from this rate shall not exceed two kg/m². All aggregate used for bituminous surface treatment shall be clean as determined by the Engineer at the time of placement.

Spreading shall be accomplished in such a manner that the tires of the aggregate spreader at no time contact the uncovered and newly applied bituminous material.

Immediately after the cover aggregate is spread, any deficient areas shall be covered by additional material. Pneumatic tire rolling shall begin immediately. The initial pass shall be completed within 5 minutes of the application of the bituminous material and shall be continued until three complete coverages are obtained within 30 minutes of the application of the bituminous material. Pneumatic tire rollers shall come to a complete stop prior to reversing direction.

Any free bituminous material on the surface caused by a deficient amount of cover aggregate shall be covered by broadcasting additional aggregate over the deficient area. Any excess aggregate material shall be swept from the surface in a manner acceptable to the Engineer.

**G. Opening to Traffic.** “Loose Stone” signs meeting requirements of NYSMUTCD shall be posted at 1.6 kilometer intervals throughout the length of the project. These signs shall be erected before surface treatment starts and removed after contract is accepted.

Unless otherwise specified, the highway shall be kept open to traffic at all times. Traffic shall be discontinued on the lane being surface treated; and as soon as the final layer is applied and rolled, controlled traffic may be permitted thereon. Traffic shall be maintained at a speed not to exceed 24 km/h for a period of four hours after placement of the surface treatment by the use of two-way radio equipped patrol vehicles in accordance with the maintenance and protection of traffic details shown on the plans. All patrol vehicles shall be equipped with signs meeting the requirements of Section 254.5 of the Manual of Uniform Traffic Control Devices. The required number of two-way radio-equipped patrol vehicles shall be as follows:

<table>
<thead>
<tr>
<th>Lane Kilometers Length of Surfacing for past 4 hours</th>
<th>Number of Patrol Vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.6</td>
<td>1</td>
</tr>
<tr>
<td>3.2</td>
<td>3</td>
</tr>
<tr>
<td>4.8 or more</td>
<td>4</td>
</tr>
</tbody>
</table>

Immediately after completion of surface treatment, the section shall be posted for speed limit of 48 km/h for a period of three days. The signs should be posted at 800 meter intervals and signs showing other speed limitations should be covered for this period. All construction signs shall meet the requirements of the NYSMUTCD.

**410-3.02 Bituminous Surface Treatment - Shoulders.** The requirements of §410-3.01 shall apply except that the sections labeled “A. Weather and Seasonal Limitations,” “C. Determinations of the Quantities of Material to be Applied” and “G. Opening to Traffic” do not apply. The following modifications to A. Weather and Seasonal Limitations and C. Determination of the Quantities of Materials to be applied do apply in their place.

**A. Weather and Seasonal Limitations.** Bituminous material shall not be applied on a wet surface, when the ambient temperature is less than 10°C and rising, or when weather conditions would prevent proper construction of the surface treatment. The surface on which the bituminous material is applied shall be placed only during the period of May 1st up to and including the last Saturday of September.

**C. Determination of the Quantities of Materials to be Applied.** The quantity of
§411-2

bituminous material to be used shall be in the range of 1.6-2.3 liters/square meter unless otherwise directed by the Engineer. The cover aggregate shall be spread in a single stone thickness in the range of 8 to 14 kilograms/square meter for the indicated aggregate unless otherwise directed by the Engineer. The actual quantity of bituminous material shall be such that a minimum of 70% of the aggregate particle is embedded in the bituminous material. The actual quantities used will be determined visually by the Engineer at the time of placement.

410-4 METHOD OF MEASUREMENT. Bituminous surface treatments for pavement and shoulders will be measured by the number of square meters of compacted material in place making no deductions for minor untreated areas such as catch basins and manholes.

The bituminous material will be measured by the number liters used.

410-5 BASIS OF PAYMENT

410-5.01 Bituminous Surface Treatment - Pavement and Shoulders. The unit price bid per square meter shall include the cost of all labor, materials, and equipment necessary to perform the work except:

- Bituminous material used for treatment will be paid under separate item.
- Patching material will be paid for under the item for Truing and Leveling.
- Construction signs will be paid for under appropriate items.

The cost of installing test patches and furnishing patrol vehicles when surface treating pavements shall be included in the unit bid price for the surface treatment.

410-5.02 Bituminous Material - Pavement and Shoulders. The unit price bid per liter shall include all the cost of labor, materials, and equipment necessary to perform the work.

Payment will be made under:

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>410.04 M</td>
<td>Bituminous Surface Treatment (Pavement)</td>
<td>Square Meter</td>
</tr>
<tr>
<td>410.05 M</td>
<td>Bituminous Surface Treatment (Shoulders)</td>
<td>Square Meter</td>
</tr>
<tr>
<td>410.07 M</td>
<td>Bituminous Material (Pavement and Shoulders)</td>
<td>Liter</td>
</tr>
</tbody>
</table>

SECTION 411 - STABILIZED GRAVEL SURFACE COURSE

411-1 DESCRIPTION. The work shall consist of placing a stabilized gravel surface course with additive, if specified, on a prepared base in accordance with these specifications and in conformance with the lines and grades shown on the plans or as directed by the Engineer.

411-2 MATERIALS

411-2.01 Gravel. The gravel shall conform to the following gradation requirements:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 mm</td>
<td>100</td>
</tr>
<tr>
<td>6.3 mm</td>
<td>30 - 65</td>
</tr>
<tr>
<td>75 μm</td>
<td>10 - 20</td>
</tr>
</tbody>
</table>

Particles passing the 425 μm sieve size shall have a maximum liquid limit of 30 and a plasticity index ranging from 3 to 8. The maximum loss in 4 cycles of the Magnesium Sulfate Soundness Test shall be 30. If the gravel as obtained from the bank is deficient in any of the requirements specified, such deficiency shall be corrected by screening, processing and/or blending with other acceptable materials before stockpiling. The requirements of §304-2.03, Stockpiling shall apply to all gravel furnished for this work.

NEW YORK STATE DEPARTMENT OF TRANSPORTATION
STANDARD SPECIFICATIONS of January 2, 2002

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§411-2

411-2.02 Chemical Additives. Chemical additives, if required, shall meet the applicable requirements of the following sections:

- Calcium Chloride 712-02
- Sodium Chloride 712-03

411-3 CONSTRUCTION DETAILS

411-3.01 Placement. After the base has been brought to grade and cross section, as shown on the plans, thoroughly compacted, and approved by the Engineer, the Contractor shall place the stabilized gravel surface course.

When calcium or sodium chloride additives are specified, they shall be added by an approved mechanical distributor after the gravel has been spread and prior to the addition of water. Calcium chloride shall be added in the amount of 10 grams per square meter per millimeter of compacted thickness of the course. Sodium chloride shall be added at a rate of 40 grams per square meter per millimeter of compacted thickness of the course which is equivalent to approximately 2% of sodium chloride based on dry weight of aggregate. Water shall then be added to the material in amounts as directed by the Engineer.

If the Contractor so elects, only the calcium chloride may be added to the gravel material as a water solution. In such cases the Contractor shall submit to the Engineer a detailed description in writing of the proposed procedure of operations. Construction shall not be started until the Engineer’s approval is obtained in writing.

411-3.02 Mixing

**A. Gravel Without Additive.** Water shall be thoroughly dispersed by any appropriate methods which will insure a uniform consistency and moisture content within the limits for proper compaction.

**B. Gravel With Additive.** The water and the chemical additive shall be thoroughly and uniformly incorporated with the gravel for the full depth of the course, by mixing with an approved power-driven rotary type mixing machine. Mixing shall continue until the material is of uniform composition. The Contractor may elect to mix the materials in an approved plant of the pugmill type. Mixing by blading, shoveling and/or scooping will not be permitted.

411-3.03 Compaction. When the in-place material is of uniform consistency and has a moisture content within the limits for proper compaction, as determined by the Engineer, it shall be thoroughly compacted by the use of self-propelled pneumatic tired or vibratory compactor in accordance with the requirements of §203-3.12. During the compaction operation, light grading shall be done as required to maintain the surface of the course true to grade and cross-section. In confined areas, inaccessible to rollers, mechanical rammers shall be used to obtain the compaction required in §203-3.12. The finished surface of the stabilized gravel course shall be rolled in a float of free water with a smooth steel wheeled roller weighing not less than nine metric tons. In all cases, the material must be so thoroughly compacted that it will not displace under the roller.

This course shall not be placed in excess of 150 linear meters without being shaped, compacted and finish rolled.

When posts for guide railing are to be installed adjacent to a stabilized gravel surface course, extreme care shall be taken during installation of the posts so that the stabilized gravel surface course is not disturbed.
§490-2

411-3.04 Surface Preparation for Treatment

A. Calcium Chloride Stabilized Gravel Surface Course. After the calcium chloride stabilized gravel surface course has been completed, water shall be applied to the surface in amounts as directed by the Engineer. Immediately following the application of water, calcium chloride shall be applied on the surface with an approved mechanical spreader at the rate of one-quarter kilogram per square meter.

B. Sodium Chloride Stabilized Gravel Surface Course. After the sodium chloride stabilized gravel surface course has been brought to final grade and cross section and rolling has been completed, the course shall be permitted to cure for a minimum of 10 days at a minimum temperature of 15°C before any additional pavement courses are applied. The cured completed surface course shall be broomed to remove dust, before application of the overlying course.


411-4 METHOD OF MEASUREMENT. The quantity for payment, in cubic meters of material, shall be computed within the payment lines shown on the plans or otherwise ordered in writing by the Engineer, and in accordance with the plans and specifications.

411-5 BASIS OF PAYMENT. The unit bid price per cubic meter shall include the cost of furnishing all labor, materials and equipment necessary to complete the work, except that the water, the calcium chloride, and the sodium chloride shall be paid for under their appropriate items. No direct payment will be made for any losses of material which may result from shrinkage, compaction, foundation settlement, waste, overflow, erosion, leakage, or any other causes; the cost of such losses shall be included in the price bid for this work.

Payment will be made under:

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>411.01 M</td>
<td>Stabilized Gravel Surface Course</td>
<td>Cubic Meter</td>
</tr>
<tr>
<td>411.02 M</td>
<td>Calcium Chloride Stabilized Gravel Surface Course</td>
<td>Cubic Meter</td>
</tr>
<tr>
<td>411.03 M</td>
<td>Sodium Chloride Stabilized Gravel Surface Course</td>
<td>Cubic Meter</td>
</tr>
</tbody>
</table>

SECTIONS 412 THRU 489 (VACANT)

SECTION 490 - COLD MILLING

490-1 DESCRIPTION. This work shall consist of the milling, shaping and removal of portions of existing surfaces by a cold milling process, and subsequent cleaning, utilizing equipment and procedures meeting the requirements in this specification.

The work shall consist of Miscellaneous Cold Milling or Production Cold Milling of bituminous or portland cement concrete as indicated in the contract documents and as shown on the plans.

490-2 MATERIALS

490-2.01 Equipment. Milling machines shall be power operated, self-propelled machines capable of removing the desired thickness of existing surfaces. The machines shall have sufficient power, traction and stability to accurately maintain depth of cut and slope. They shall be capable of producing a finished profile and cross slope to within 6 mm of that required and shall produce a uniform surface texture free from gouges and ridges greater than 10 mm in depth.

The machines shall be equipped with a means to control dust and other particulate matter created by the cutting action.
§490-2

The machines shall have an integral loading system or sufficient equipment shall be provided to accomplish complete removal of milled material at a rate equivalent to the milling rate.

Vacuum trucks, street sweepers or power brooms shall be used to clean the milled surfaces. The Engineer may disallow the use of power brooms in urban, residential or other sensitive areas if the dust raised by the broom is deemed by the Engineer to be objectionable.

490-2.02 Disposal of Material. Material removed during the milling process, including foreign debris within or on the pavement, shall become the property of the Contractor and shall be disposed of at a site obtained by the Contractor.

490-3 CONSTRUCTION DETAILS

490-3.01 General. Milling shall be performed at the locations and in accordance with the details indicated on the plans.

When indicated on the plans, profile and cross slope shall be controlled by a taut reference string line. The reference elevation and string line shall be established by the Contractor and subject to the approval of the Engineer.

Areas not accessible to the milling machine, such as around and/or adjacent to inlets, manholes, curbs and transverse joints on structures, may be removed by a small milling machine, handwork or other methods approved by the Engineer.

All milled material, including that removed by other means, shall be immediately removed from the milled surfaces and adjacent surfaces. Surfaces shall be cleaned of all fines and dust prior to opening to traffic. The Contractor shall conduct operations in such a manner that dust is controlled and is not objectionable. Milled and adjacent surfaces shall be cleaned again, as directed by the Engineer, prior to the placement of tack coats, or pavement courses if traffic has been allowed on the milled surface and/or if more than 48 hours have elapsed since the initial cleaning.

Milled longitudinal or transverse vertical faces exceeding 30 mm in height that would be exposed to traffic during non-work hours shall be sloped or tapered in a manner approved by the Engineer so as not to create a traffic hazard. Milling operations shall be conducted to preclude the possibility of pavement runoff collecting along milled joints and creating a traffic hazard.

The Contractor shall maintain drainage at catch basins, according to the details shown on the plans, or in a manner approved by the Engineer.

When working adjacent to traffic, the Contractor shall immediately remove material that is spilled on the traveled way.

Milled surfaces to be overlaid with asphalt concrete shall be covered with at least a single course of asphalt concrete before the end of the paving season. Portland cement concrete overlays shall be completed over milled surfaces before the end of the paving season. Damage to milled surfaces resulting from traffic or other causes such as, but not limited to, raveling, fuel spillage or any contaminants which would inhibit bond, shall be repaired or remilled by the Contractor in a manner approved by the Engineer.

490-3.02 Production Cold Milling. Production cold milling of bituminous or portland cement surfaces shall be performed in accordance with the details and at the locations indicated on the plans.

490-3.03 Miscellaneous Cold Milling. Miscellaneous cold milling of bituminous or portland cement surfaces shall be performed in accordance with the details and at the locations indicated on the plans.

490-4 METHOD OF MEASUREMENT. The quantity shall be measured as the number of square meters of pavement surface milled in accordance with the plans and this specification.

In no case will a deduction in area be made for minor unmilled areas due to catch basins, manholes, transverse joints, or minor low areas in pavements from the measured surface area that has been milled. Minor unmilled or low areas are those areas of 10 square meters or less.
§490-5

490-5 BASIS OF PAYMENT. The unit price bid per square meter shall include the cost of furnishing all labor and equipment necessary to complete the milling, including the removal of pavement by other means, the removal and disposal of milled material, the removal and hauling of milled material to a designated storage area when indicated in the contract documents and cleaning the resultant surface after milling. No payment will be made for additional cleaning that may be necessary just prior to placement of any overlaying pavement courses or tack coats. The cost of maintaining drainage shall be included in the price bid for maintenance and protection of traffic. The cost of providing temporary pavement wedges of asphalt concrete around drainage structures, manholes, valve boxes, bridge abutments and beginning and ends of milled pavement shall be paid for as outlined in §619-5.12 of the Standard Specifications.

Tack coats and overlay courses shall be paid for under their respective items.

Payment will be made under:

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>490.10 M</td>
<td>Production Cold Milling of Bituminous Concrete</td>
<td>Square Meter</td>
</tr>
<tr>
<td>490.20 M</td>
<td>Production Cold Milling of Portland Cement Concrete</td>
<td>Square Meter</td>
</tr>
<tr>
<td>490.30 M</td>
<td>Miscellaneous Cold Milling of Bituminous Concrete</td>
<td>Square Meter</td>
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<tr>
<td>490.40 M</td>
<td>Miscellaneous Cold Milling of Portland Cement Concrete</td>
<td>Square Meter</td>
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SECTION 491 THRU 499 (VACANT)