BASE CONSTRUCTION

2211  AGGREGATE BASE

2211.1 DESCRIPTION
This work consists of placing aggregate base.

2211.2 MATERIALS
A  Aggregate .................................................................3138

Provide the class of aggregate as required by the contract.

2211.3 CONSTRUCTION REQUIREMENTS
All forms and the Grading and Base Manual are available on the Grading and Base Website. Unless otherwise designated all test procedures are in the Grading and Base Manual.

A  General
Remove aggregate base, placed under the contract that saturates subgrade soils, and then dry and re-compact the subgrade.

Compact and shape the aggregate base, to the plan dimensions, before suspending operations.

B  Contractor Quality Control (QC) Testing
Test according to the Schedule of Materials Control.

Certify materials on Form G&B-104 (Certification of Aggregate and Granular Materials). Attach all required aggregate test results to Form G&B-104.

Retest corrected base, which fails either QC or Verification Testing (VT). Correct failing material, before placing the next lift and provide copies to the Engineer before VT.

B.1  Aggregate Production
Perform the following QC tests during production:

(1)  Gradation,
(2)  Crushing,
(3)  Aggregate quality and
(4)  Bitumen content

B.2  Aggregate Placement
Perform the following QC tests during placement:

(1)  Gradation and
(2)  Moisture content during compaction using test methods approved by the Engineer.

Test for the moisture content in areas that appear least likely to meet specifications.

Provide the Engineer a copy of the test results on a daily basis.

C  Placing and Compacting
Ensure the underlying layer meets QC and VT requirements before the next layer is placed.

Maintain the moisture content per Table 2211-1.
Table 2211-1
Moisture Required for Base Compaction

<table>
<thead>
<tr>
<th>Classification</th>
<th>Moisture Content (% by dry weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 3 and 4</td>
<td></td>
</tr>
<tr>
<td>(&lt; 2.5% bitumen content)</td>
<td>≥ 7%</td>
</tr>
<tr>
<td>Class 5, 5Q and 6</td>
<td></td>
</tr>
<tr>
<td>(&lt; 2.5% bitumen content)</td>
<td>≥ 5%</td>
</tr>
<tr>
<td>Classes 3, 4, 5, 5Q and 6</td>
<td></td>
</tr>
<tr>
<td>(≥ 2.5% bitumen content)</td>
<td>3% ≥ moisture content ≤ 7%</td>
</tr>
</tbody>
</table>

Ensure the aggregate material has a uniform consistency before compaction.

Place and compact lifts per Table 2211-2.

Table 2211-2
Rollers Required for Compaction

<table>
<thead>
<tr>
<th>Base Lift Thickness / Bitumen Content</th>
<th>Required Rollers</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 3 in [75 mm] / Any Bitumen Content</td>
<td>Use Pneumatic Rollers only</td>
</tr>
<tr>
<td>&gt; 3 in [75 mm] to ≤ 6 in [150 mm] / Bitumen Content ≤ 2.5%</td>
<td>Use both Vibratory and Pneumatic Rollers</td>
</tr>
<tr>
<td>&gt; 3 in [75 mm] to ≤ 6 in [150 mm] / Bitumen Content &gt; 2.5%</td>
<td>Use both Vibratory Pad Foot roller weighing at least 25,000 lb [11,300 kg] and 25 ton [22.7 tonne] Pneumatic Roller</td>
</tr>
</tbody>
</table>

Place and compact the base to support traffic, while allowing no greater than ½ inch [13 mm] of surface displacement, when measured using a straightedge. Construct the aggregate layer to ±0.05 ft [15 mm] of the profile and cross-section as required by the contract in accordance with 2112, “Subgrade Preparation.” Maintain the compaction, quality, integrity, and properties of the aggregate material in each lift until the next lift or layer is placed.

Uniformly compact each lift to meet the VT criteria listed in the Contract. Use the 2211.3.D.2.c, “Penetration Index Method”.

Correct, blend and re-compact aggregate material represented by failing tests.

D Agency Verification Testing (VT)
Test according to the Schedule of Materials Control.

D.1 Gradation and Aggregate Quality Sampling and Testing
Sample aggregates from the roadway after spreading but before compaction using the random sampling method in the Grading and Base Manual.

Test the entire lot or area of corrected material with new random samples. The Engineer will perform retests of gradation failures and provide results to the Contractor within 24 hours of receiving passing QC retests.

The Engineer will test materials for the contract item Stockpile Aggregates before delivery and stockpiling.

D.2 Compaction
The Engineer will test for compaction in the areas with the greatest rutting or deflection.

The Engineer will perform a new test in corrected areas with the greatest rutting or deflection.
The Engineer will test the compacted aggregate material using the Penetration Index Method per 2211.3.D.2.c, “Penetration Index Method”, unless designated otherwise in the Contract. Other compaction testing methods include 2211.3.D.2.a, “Specified Density Method” and 2211.3.D.2.b, “Quality Compaction Method” and are listed below.

D.2.a Specified Density Method
Use the specified density method on virgin aggregates only.

Verify by testing that each lift is compacted to at least 100 percent of maximum density.

D.2.b Quality Compaction Method
Verify visually that each lift shows no further evidence of consolidation during compaction or under traffic.

D.2.c Penetration Index Method
Verify that each lift meets the penetration index and seating value per Table 2211-3.

<table>
<thead>
<tr>
<th>Grading Number †</th>
<th>Moisture Content ‖</th>
<th>Maximum Allowable SEAT, [mm]</th>
<th>Maximum Allowable DPI, [mm/blow]</th>
<th>Test Layer, in [mm] *</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 – 3.5</td>
<td>&lt; 5.0</td>
<td>40</td>
<td>10</td>
<td>4 – 6 [100–150]</td>
</tr>
<tr>
<td></td>
<td>5.0 – 8.0</td>
<td>40</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 8.0</td>
<td>40</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>3.6 – 4.0</td>
<td>&lt; 5.0</td>
<td>40</td>
<td>10</td>
<td>4 – 6 [100–150]</td>
</tr>
<tr>
<td></td>
<td>5.0 – 8.0</td>
<td>45</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 8.0</td>
<td>55</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>4.1 – 4.5</td>
<td>&lt; 5.0</td>
<td>50</td>
<td>13</td>
<td>5 – 6 [125–150]</td>
</tr>
<tr>
<td></td>
<td>5.0 – 8.0</td>
<td>60</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 8.0</td>
<td>70</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>4.6 – 5.0</td>
<td>&lt; 5.0</td>
<td>65</td>
<td>15</td>
<td>6 – 12 [150–300]</td>
</tr>
<tr>
<td></td>
<td>5.0 – 8.0</td>
<td>75</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 8.0</td>
<td>85</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>5.1 – 5.5</td>
<td>&lt; 5.0</td>
<td>85</td>
<td>17</td>
<td>7 – 12 [175–300]</td>
</tr>
<tr>
<td></td>
<td>5.0 – 8.0</td>
<td>95</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 8.0</td>
<td>105</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>5.6 – 6.0</td>
<td>&lt; 5.0</td>
<td>100</td>
<td>19</td>
<td>8 – 12 [200–300]</td>
</tr>
<tr>
<td></td>
<td>5.0 – 8.0</td>
<td>115</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 8.0</td>
<td>125</td>
<td>28</td>
<td></td>
</tr>
</tbody>
</table>

† As determined by Form G&B-204
‖ Percent of dry weight.
* If layer to be placed is thinner than the Test Layer, use 2211.3D.2b, “Quality Compaction Method”.
Note: When bitumen content is ≥ 2.5%, compact to achieve a penetration index value of 0.4 in [10 mm] and a seating value of 1.5 in [40 mm], as determined by Form G&B-205.

E Aggregate for the Contract Item Stockpile Aggregate
Produce and certify the class of material required by the contract using form G&B-104.
Deliver and stockpile certified material to the designated sites listed in the contract.

2211.4 METHOD OF MEASUREMENT
The Engineer will measure the aggregate base per 1901, “Measurement of Quantities”. The Engineer will not deduct the mass or volume of water and admixtures.

Mass and Volume conversion tables are in the Grading and Base Manual.

2211.5 BASIS OF PAYMENT
The contract unit price for the accepted quantities of Aggregate Base includes the costs of production, testing, placement and compaction.

The contract unit price for the accepted quantities of Stockpile Aggregate includes the costs of production, testing, delivery and stockpiling at the designated site.

Aggregate base placed before the Engineer accepts the Contractor’s certification is unauthorized work in accordance with 1512, “Unacceptable and Unauthorized Work.”

The Engineer may allow the Contractor to accept a monetary price adjustment instead of correcting failing material in accordance with:

- Table 2211-4,
- Table 2211-5,
- Table 2211-6,
- The monetary price adjustment table for aggregate base quality on the Grading and Base website.

The Department will add monetary price adjustments for each failing aggregate quality, crushing, sieve and bitumen content results.

The maximum monetary price adjustment is 50%.

The Department will apply the monetary price adjustment against the entire quantity represented by the failing test or lot.

<table>
<thead>
<tr>
<th>Percent Passing Outside Specified Limits for Sieves</th>
<th>No. 10 &amp; No. 40 [2.00 mm &amp; 425 μm]</th>
<th>No. 200 [75 μm]</th>
<th>Monetary Price Adjustment %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 in, 1½ in, 1 in, ¾ in, ⅜ in &amp; No. 4 [50, 37.5, 25, 19, 9.5, 4.75 mm]</td>
<td>3-5 1 0.1 5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>0.2 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>0.3 9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>0.4 11</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>0.5 13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 10 &gt; 2 &gt; 0.6 Corrective action required</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2211-4
Aggregate Gradation Monetary Price Adjustment Schedule
Based on the Average of 4 Samples per Lot
Table 2211-5
Aggregate Gradation Monetary Price Adjustment Schedule
Based on an Individual or average of two or three Sample(s)

<table>
<thead>
<tr>
<th>Percent Passing Outside Specified Limits for Sieves</th>
<th>2 in, 1½ in, 1 in, ¾ in, ⅜ in &amp; No. 4 [50, 37.5, 25, 19, 9.5, 4.75 mm]</th>
<th>No. 10 &amp; No. 40 [2.00 mm &amp; 425 µm]</th>
<th>No. 200 [75 µm]</th>
<th>Monetary Price Adjustment %</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-5</td>
<td>1</td>
<td>0.1 – 0.6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>—</td>
<td>0.7</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>—</td>
<td>—</td>
<td>0.8</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>—</td>
<td>0.9 – 1.0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>—</td>
<td>—</td>
<td>1.1</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>—</td>
<td>1.2</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>—</td>
<td>—</td>
<td>1.3</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>—</td>
<td>1.4</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>—</td>
<td>2</td>
<td>1.5</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>—</td>
<td>1.6 – 1.7</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>—</td>
<td>—</td>
<td>1.8</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>—</td>
<td>—</td>
<td>1.9</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>—</td>
<td>—</td>
<td>2.0</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>—</td>
<td>—</td>
<td>2.1</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>—</td>
<td>3</td>
<td>2.2–2.5</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>&gt;10</td>
<td>&gt;3</td>
<td>&gt;2.5</td>
<td>Corrective action required</td>
<td></td>
</tr>
</tbody>
</table>

Table 2211-6
Bitumen Content Monetary Price Adjustment Schedule

<table>
<thead>
<tr>
<th>Bitumen Content (Composite Mixture), %</th>
<th>Monetary Price Adjustment %</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.6</td>
<td>0% Substantial Compliance</td>
</tr>
<tr>
<td>3.7</td>
<td>1</td>
</tr>
<tr>
<td>3.8</td>
<td>2</td>
</tr>
<tr>
<td>3.9</td>
<td>3</td>
</tr>
<tr>
<td>4.0</td>
<td>4</td>
</tr>
<tr>
<td>4.1</td>
<td>6</td>
</tr>
<tr>
<td>4.2</td>
<td>8</td>
</tr>
<tr>
<td>4.3</td>
<td>10</td>
</tr>
<tr>
<td>4.4</td>
<td>12</td>
</tr>
<tr>
<td>4.5</td>
<td>15</td>
</tr>
<tr>
<td>&gt;4.5</td>
<td>Corrective action required</td>
</tr>
</tbody>
</table>

The Department will pay for aggregate base on the basis of the following schedule:

<table>
<thead>
<tr>
<th>Item No.:</th>
<th>Item:</th>
<th>Unit:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2211.501</td>
<td>Aggregate Base, Class ___</td>
<td>ton [metric ton]</td>
</tr>
<tr>
<td>2211.502</td>
<td>Aggregate Base (LV), Class ___</td>
<td>cubic yard [cubic meter]</td>
</tr>
<tr>
<td>2211.503</td>
<td>Aggregate Base (CV), Class ___</td>
<td>cubic yard [cubic meter]</td>
</tr>
<tr>
<td>2211.505</td>
<td>Stockpile Aggregate, Class ___</td>
<td>ton [metric ton]</td>
</tr>
<tr>
<td>2211.506</td>
<td>Stockpile Aggregate (LV), Class ___</td>
<td>cubic yard [cubic meter]</td>
</tr>
<tr>
<td>2211.507</td>
<td>Stockpile Aggregate (SV), Class ___</td>
<td>cubic yard [cubic meter]</td>
</tr>
</tbody>
</table>
2212 DRAINABLE AGGREGATE BASE

2212.1 DESCRIPTION
This work consists of constructing a drainable Aggregate Base on a finished base or filter layer.

2212.2 MATERIALS
Provide the drainable base of the type designated in the Contact.

A Drainable Bases

2212.3 CONSTRUCTION REQUIREMENTS
All forms and the Grading and Base Manual are available on the Grading and Base Website. Unless otherwise designated all test procedures are in the Grading and Base Manual.

A General
Before placing the drainable base, shape the underlying surface in accordance with the contract and 2112.3.E, “Tolerances.”

Maintain a uniform gradation during placement.

B Contractor Quality Control (QC) Testing
Test according to the Schedule of Materials Control.

Certify materials on Form G&B-104, “Certification of Aggregate and Granular Materials”. Attach all required aggregate test results to Form G&B-104.

Retest corrected drainable aggregate base, which fails either QC or Verification Testing (VT).

B.1 Aggregate Production
Perform the following QC tests during production:

(1) Gradation,
(2) Crushing and
(3) Aggregate quality.

B.2 Aggregate Placement
Perform QC gradation testing during placement.

Correct failing material before placing the next layer. Sample and test material after correction.

C Placing and Compacting
Maintain the moisture content from 3 to 7 percent by dry weight during compaction.

Provide placement equipment meeting the following requirements:

(1) Will not rut the in-place surface,
(2) Will not displace or damage the geotextile and
(3) Capable of placing the required thickness without creating segregation.

Vibratory rollers are not allowed. Do not allow traffic on the drainable base after final placement and compaction. Use the quality compaction method per 2211.3.D.2.b, “Quality Compaction Method.” Maintain drainage.
Construct the aggregate layer to ±0.05 ft [15 mm] of the profile and cross-section as required by the contract in accordance with 2112, “Subgrade Preparation.” Maintain the surface, quality, integrity, and properties of the aggregate material in each lift until the next lift or layer is placed.

D Agency Verification Testing (VT)
Test according to the Schedule of Materials Control.

Sample and test from the roadway after spreading but before compaction using the random sampling method in the Grading and Base Manual.

Test the entire lot or area of corrected material with new random samples. The Engineer will perform retests of gradation failures and provide results to the Contractor with 24 hours of receiving passing QC retests.

Verify compaction per 2211.3.D.2.b, “Quality Compaction Method.”

2212.4 METHOD OF MEASUREMENT
Measure the material in accordance with 1901, “Measurement of Quantities”.

2212.5 BASIS OF PAYMENT
The contract unit price for the accepted quantities of Drainable Aggregate Base includes the costs of production, testing, placement and compaction.

Drainable aggregate base placed before the Engineer accepts the Contractor’s certification is unauthorized work in accordance with 1512, “Unacceptable and Unauthorized Work.”

The Engineer may allow the Contractor to accept a monetary price adjustment, instead of correcting failing material in accordance with drainable aggregate gradation and quality monetary price adjustment tables on the Grading and Base website.

The Department will add price adjustments for each failing sieve and quality content result.

The maximum monetary price adjustment is 50%.

The Department will apply the price adjustment against the entire quantity represented by the failing test or lot.

The Department will pay for drainable base on the basis of the following schedule:

<table>
<thead>
<tr>
<th>Item No.:</th>
<th>Item:</th>
<th>Unit:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2212.501</td>
<td>Drainable Aggregate Base, Type (1) (CV)</td>
<td>cubic yard [cubic meter]</td>
</tr>
</tbody>
</table>

Note (1): Specify Type either OGAB or DSB.

2215 FULL DEPTH RECLAMATION (FDR)

2215.1 DESCRIPTION
This work consists of pulverizing and blending the in-place bituminous pavement with a portion of the underlying material to produce a uniformly mixed aggregate base.

This work will include spreading, watering, compacting, shaping and maintaining the blended reclaim material to the specified profile and cross-section.

2215.2 MATERIALS
A Modified Aggregate Bases .............................................................. 3135
2215.3 CONSTRUCTION REQUIREMENTS
All forms and the Grading and Base Manual are available on the Grading and Base Website. Unless otherwise designated all test procedures are in the Grading and Base Manual.

A General
Remove all reclaimed pavement pieces that would be retained on the three inch sieve, from the right-of-way.

Repair structures damaged by Contractor operations.

Bituminous FDR may only be used within or above the road core as defined in 2105, “Excavation and Embankment”.

B Equipment Requirements

B.1 Reclaiming Machine
Use a road reclaiming machine capable of uniformly pulverizing the pavement and the underlying layer to the specified depth and gradation.

B.2 Rollers

B.2.a Pneumatic-Tired Roller
Use a pneumatic-tired roller weighing at least 25 ton [22.7 tonne] or 616 lb per in [111 kg per cm] of rolling width. Ensure the tire arrangement allows compaction over the full width of the roller with each pass.

B.2.b Pad Foot Vibratory Roller
When required in 2215.3E, use a pad foot roller weighing at least 25,000 lb [11,300 kg].

C Contractor Quality Control (QC) Testing
Test according to the Schedule of Materials Control.
Submit results to the Engineer within 24 hours of the completion of the tests.
Measure the reclaim depth.
Sample and test for gradation within the first 500 ft [150 m] of production and within 500 ft [150 m] after a failing gradation.
Chart all data on a Quality Control Chart per Grading and Base Manual Section 5-692.111. Chart all data daily and provide to the Engineer when requested.
Correct and retest all failing areas, which fail either Quality Control or Verification Testing.

D Pulverizing Operation
Before beginning pulverization, remove vegetation and topsoil adjacent to the surface.
Blend, add water, spread, compact, and shape pulverized material by the end of the workday.
Uniformly spread additional aggregate material across the roadway surface before blending it into the reclaim mixture.
Protect and avoid damaging existing structures during pulverization.
Correct reclaim sections represented by a failing gradation.

E  Placing and Compacting
Uniformly mix reclamation material before spreading.

Spread and compact the reclamation material to the profile and cross section shown on the plans before placing the next layer.

Maintain the moisture content from 3 to 7 percent by dry weight during compaction.

Place and compact reclamation materials in maximum 3-inch [75 mm] lifts using a pneumatic-tired roller in compliance with 2215.3.B.2a.

For lifts thicknesses from 3 inches [75 mm] to 6 inches [150 mm] compact using both a pneumatic-tired and pad foot vibratory rollers in compliance with 2215.3.B.2.

The Engineer may allow the contractor to compact using a lift thickness up to 12 inches [300 mm], as long as good compaction results are obtained.

The Contractor may use excess reclamation material from other locations on the project to attain the profile or cross-section as shown on the plans.

Compact to achieve a penetration index value of 0.4 in [10 mm] and a seating value of 1.5 in [40 mm] as measured by the MnDOT Standard Dynamic Cone Penetrometer (DCP) method, as determined by Form G&B-205.

Place and compact to support traffic, while allowing no greater than ½ inch [13 mm] of surface displacement, when measured using a straightedge. Construct the layer to ±0.05 ft [15 mm] of the profile and cross-section as required by the contract in accordance with 2112, “Subgrade Preparation.” Maintain the compaction, quality, integrity, and properties of the aggregate material in each lift until the next lift or layer is placed.

F  Agency Verification Testing (VT)
Test according to the Schedule of Materials Control.

Test compaction using the Penetration Index Method.

Sample for gradation, according to the Grading and Base Manual, after spreading but before compaction. Measure the reclaim depth.

The Engineer will sample and test the reclaim material after receiving acceptable test results from the Contractor.

G  Workmanship, Quality, Repair and Maintenance
The Engineer will provide staking to re-establish the centerline, when Contractor-staking is not required by the contract.

Repair ruts, potholes, wash-boarding and other distortions by scarifying to a depth of 2 inches [50 mm] below the deepest distortion and re-compact.

2215.4 METHOD OF MEASUREMENT
The Engineer will measure the reclamation area by the length and width.

2215.5 BASIS OF PAYMENT
The contract unit prices for the reclamation material contract items includes the cost of production, testing, placement, occasional variations in the bituminous pavement thickness, removing vegetation and topsoil adjacent to the surface, repair to structures damaged by Contractor’s operations and necessary maintenance.
The Department will pay for reclamation on the basis of the following schedule:

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Item</th>
<th>Unit:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2215.501</td>
<td>Full Depth Reclamation</td>
<td>square yard [square meter]</td>
</tr>
<tr>
<td>2215.502</td>
<td>Haul Full Depth Reclamation (LV)</td>
<td>cubic yard [cubic meter]</td>
</tr>
</tbody>
</table>

2221  SHOULDER BASE AGGREGATE

2221.1  DESCRIPTION
This work consists of placing Contractor-certified aggregate on shoulder base adjacent to pavements.

2221.2  MATERIALS
A  Aggregate .................................................................................................................................3138
Use the class of aggregate required by the contract.

2221.3  CONSTRUCTION REQUIREMENTS
A  General
All forms and the Grading and Base Manual are available on the Grading and Base Website. Unless otherwise designated all test procedures are in the Grading and Base Manual.

B  Contractor Quality Control (QC) Testing
Comply with the requirements of 2211.3.B, “Contractor Quality Control (QC) Testing.”

C  Shoulder Preparation
Comply with the requirements of 2211.3.C, “Placing and Compacting”; however, compact the existing material using the Quality Compaction Method as specified in 2211.3.D.2.b, “Quality Compaction Method.”

Remove vegetation and replace contaminated material as directed by the Engineer.

Shape the bottom of the proposed shoulder aggregate to the grade and cross section as shown on the plans.

Do not place shoulder aggregate on the existing pavement surface.

Immediately sweep spilled material from the pavement surface.

D  Agency Verification Testing (VT)
Comply with the requirements of 2211.3.D, “Agency Verification Testing”. Test according to the Schedule of Materials Control.

E  Tolerances
Construct aggregate shouldering in accordance with 2112.3.E, “Tolerances.”

2221.4  METHOD OF MEASUREMENT
The Engineer will measure the shoulder aggregate in accordance with 1901, “Measurement of Quantities.”

The Engineer will not deduct the mass or volume of water and admixtures.

Mass and Volume conversion tables are in the Grading and Base Manual.

2221.5  BASIS OF PAYMENT
The contract unit price for placing shoulder base aggregate includes the costs of the removing vegetation, production, testing, placement, compaction and shaping.
All shoulder base aggregate placed before the Engineer accepts the Contractor’s certification is unauthorized work in accordance with 1512, “Unacceptable and Unauthorized Work.”

The Engineer may allow the Contractor to accept a monetary price adjustment instead of correcting failing material in accordance with:

- Table 2211-4,
- Table 2211-5,
- Table 2211-6 and
- The monetary price adjustment table for shoulder base aggregate quality on the Grading and Base website.

The Department will add monetary price adjustments for each failing aggregate quality, crushing, sieve and bitumen content results.

The Department will apply the monetary price adjustment against the entire quantity represented by the failing test or lot.

The maximum monetary price adjustment is 50%. The Department will pay for shoulder base aggregate on the basis of the following schedule:

<table>
<thead>
<tr>
<th>Item No.:</th>
<th>Item:</th>
<th>Unit:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2221.501</td>
<td>Shoulder Base Aggregate, Class ___</td>
<td>ton [metric ton]</td>
</tr>
<tr>
<td>2221.502</td>
<td>Shoulder Base Aggregate (LV), Class ___</td>
<td>cubic yard [cubic meter]</td>
</tr>
<tr>
<td>2221.503</td>
<td>Shoulder Base Aggregate (CV), Class ___</td>
<td>cubic yard [cubic meter]</td>
</tr>
</tbody>
</table>

2231 BITUMINOUS SURFACE RECONDITIONING

2231.1 DESCRIPTION
This work consists of reconditioning the existing pavement surface before constructing a bituminous overlay or surfacing courses.

2231.2 MATERIALS
A Bituminous Patching Mixture
Provide bituminous patching material matching the type of material used in the first layer of bituminous surfacing placed on the reconditioned surface.

B Mixture for Joints and Cracks
Provide a mixture for joints and cracks consisting of a prepared mix of fine aggregate and bituminous material in accordance with the following requirements:

<table>
<thead>
<tr>
<th>Table 2231-1 Joint and Cracks Mixture Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>Aggregate gradation*:</td>
</tr>
<tr>
<td>½ in [12.5 mm] sieve</td>
</tr>
<tr>
<td>No. 8 [2.00 mm] sieve</td>
</tr>
<tr>
<td>No. 200 [75 µm] sieve</td>
</tr>
<tr>
<td>Aggregate spall</td>
</tr>
</tbody>
</table>

* Percent passing requirement.
† Match PG grade to grade used on first lift of plant mixed asphalt.
† Percent by weight.
C  Joint and Crack Filler
Provide joint and crack filler in accordance with the special provisions.

2231.3 CONSTRUCTION
A  Surface Repair
Remove loose, unstable, or deteriorated portions of the existing pavement to provide a stable surface after completion of the patching operation. Remove waste or surplus material from the project. Repair and fill the holes and depressions with mix in accordance with the special provisions. Compact the mix using conventional pneumatic tire roller or mechanical tampers in areas inaccessible to conventional roller equipment.

B  Joint Repair

B.1  Concrete Pavement
Clean and refill joints and cracks at least ¼ in [6 mm] wide.

B.2  Bituminous Pavement
Rout and seal cracks ¼ in to ¾ in [6 mm to 20 mm] wide. For cracks greater than ¾ in [20 mm] wide, fill with the mixture for joints and cracks and tamp in place.

2231.4 METHOD OF MEASUREMENT
The Engineer will separately measure the accepted quantities of bituminous patching mixture, mixture for joints and cracks, and joint and crack filler, as provided and placed, by the weight or by the loose volume of material as shown on the plans.

2231.5 BASIS OF PAYMENT
The contract unit prices for Bituminous Patching Mixture, for Mixture for Joints and Cracks, and for Joints and Crack Filler include the cost of removing and disposing of the existing deteriorated materials.

If the contract does not specify a specific contract pay item for removing concrete base or pavement in accordance with 2104, “Removing Pavement and Miscellaneous Structures,” the Department will pay for the removal of a concrete base or pavement to full depth and width between existing joints, or by sawing, as extra work in accordance with 1402, “Contract Revisions.”

The Department will pay for bituminous surface reconditioning on the basis of the following schedule:

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Item:</th>
<th>Unit:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2231.501</td>
<td>Bituminous Patching Mixture</td>
<td>ton [metric ton]</td>
</tr>
<tr>
<td>2231.502</td>
<td>Bituminous Patching Mixture</td>
<td>cubic yard [cubic meter]</td>
</tr>
<tr>
<td>2231.505</td>
<td>Mixture for Joints and Cracks</td>
<td>pound [kilogram]</td>
</tr>
<tr>
<td>2231.507</td>
<td>Joint and Crack Filler</td>
<td>pound [kilogram]</td>
</tr>
</tbody>
</table>

2232  MILL PAVEMENT SURFACE

2232.1 DESCRIPTION
This work consists of removing the existing pavement by cold milling.

2232.2 MATERIALS — (BLANK)
2200’s

2232.3 CONSTRUCTION REQUIREMENTS

A Equipment

Mill the existing pavement with a power operated, self-propelled cold milling machine capable of removing concrete and bituminous materials to the profile, cross-slope, grade, and elevation uniformly across the pavement surface as shown on the plans. Use automatic controls to control grade, elevation, cross-slope, and profile. Use a machine with ski, matching shoe, or an independent grade control to reference the existing pavement and automatically establish profile grades along each edge of the machine within ±¼ in [6 mm].

B Operations

Mill the pavement surface to the depth, width, grade, and cross-slope as shown on the plans. Perform milling without tearing or gouging the underlying material. Surface irregularities exceeding ½ in [6 mm] under a 10-foot [3-meter] straightedge laid transversely and longitudinally after milling is complete are unacceptable. Reference the milling operation from an independent grade control in areas directed by the Engineer. Establish and maintain grade control as approved by the Engineer.

Mill the entire pavement width to a flush surface at the end of each work period, when the pavement is open to traffic. If uncompleted operations result in a vertical or near vertical longitudinal face, re-slope the longitudinal face to provide a taper, construct a temporary bituminous taper or provide protective measures, as approved by the Engineer. Taper transverse cutting faces at the end of each working period where pavement is open to traffic. Construct temporary bituminous tapers at intersecting streets, around utility appurtenances, and appropriated entrances during the milling operations, as directed by the Engineer.

Mill areas inaccessible to the milling machine using other equipment or methods as approved by the Engineer.

The Contractor may recycle the surfacing removed by the milling operations and use on the project in accordance with 3138, “Aggregate for Base and Surface Courses,” or 3139, “Graded Aggregate for Bituminous Mixtures,” or dispose of the millings outside the right-of-way in accordance with 2104.3, “Removing Pavement and Miscellaneous Structures, Construction Requirements.”

After milling to the depth shown on the plans, sweep or vacuum clean the milled area with equipment approved by the Engineer. Clean the milled area as approved by the Engineer. Dispose of debris from milling and cleaning operations outside of the right-of-way in accordance with 2104.3, “Removing Pavement and Miscellaneous Structures, Construction Requirements,” except as otherwise approved by the Engineer.

Mill previously patched areas to the specified depth below the pavement surface that existed before placement of the previous patch, and not from the surface of the patch.

Avoid disturbing or damaging existing drainage or utility structures on the project. Repair damage resulting from the milling operations at no additional cost to the Department.

Keep the milled pavement surface free of all loose materials and dust.

2232.4 METHOD OF MEASUREMENT

The Engineer will measure pavement milling by the area of each type of surface removed. The Engineer will measure areas milled, based on actual finished dimensions of the work.


2232.5 **BASIS OF PAYMENT**

The contract unit price for pavement milling includes the cost of traffic safety, cleanup, and disposal operations.

The cost of constructing a temporary milled taper and providing, placing, and removing temporary bituminous tapers is included in the contract unit price for other relevant contract items.

The Department will pay for mill pavement surface on the basis of the following schedule:

<table>
<thead>
<tr>
<th>Item No.:</th>
<th>Item:</th>
<th>Unit:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2232.501</td>
<td>Mill Bituminous Surface ___ in [___mm]</td>
<td>square yard [square meter]</td>
</tr>
<tr>
<td>2232.502</td>
<td>Mill Concrete Surface ___ in [___mm]</td>
<td>square yard [square meter]</td>
</tr>
</tbody>
</table>