ITEM P-208 AGGREGATE SURFACE COURSE

DESCRIPTION

208-1.1 This item consists of an aggregate surface course composed of crushed or uncrushed coarse aggregate bonded with either soil or fine aggregate or both. It shall be constructed on a prepared course according to these Specifications and to the dimensions and typical cross section shown on the Plans.

MATERIALS

208-2.1 GENERAL. Aggregates shall consist of hard, durable particles or fragments of stone or gravel mixed or blended with sand, stone dust, or other similar binding or filler materials produced from approved sources. The aggregate shall be free from vegetation, lumps, or excessive amounts of clay and other objectionable substances. The coarse aggregate shall have a minimum degradation value of 45 when tested according to ATM 313. The aggregate shall have a percent of wear not more than 50 at 500 revolutions as determined by AASHTO T 96 and shall not show evidence of disintegration nor show loss greater than 12% when subjected to 5 cycles of sodium sulfate accelerated soundness test using AASHTO T 104.

208-2.2 CRUSHED AGGREGATE SURFACE COURSE. The aggregates shall consist of both fine and coarse fragments of crushed stone or crushed gravel mixed or blended with sand, screenings, or other similar approved materials. The material shall consist of hard, durable particles or fragments of stone and shall be free from excess soft or disintegrated pieces, dirt, or other objectionable matter.

The fractured particles in the finished product shall be as uniform as practicable. At least 75% by weight of material retained on the No. 4 sieve shall have one or more fractured faces, when tested according to WAQTC FOP for AASHTO TP 61.

If necessary to meet this requirement, or to eliminate an excess of fine, uncrushed particles, the gravel shall be screened before crushing.

208-2.3 UNCRUSHED AGGREGATE SURFACE COURSE. This material may consist of natural pit-run aggregate. However, screening, blending, ripping, washing, and/or necessary mixing of the material or other processing may be necessary to meet the gradation and performance requirements of this specification.

208-2.4 GRADATION. The gradation of the uncrushed or crushed material shall meet the requirements of the gradations indicated in Table 1, when tested according to WAQTC FOP for AASHTO T 27/T 11.

<table>
<thead>
<tr>
<th>Sieve Designation(Square Openings)</th>
<th>Percentage by weight passing sieves For E-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 in.</td>
<td>100</td>
</tr>
<tr>
<td>3/4 in.</td>
<td>70-100</td>
</tr>
<tr>
<td>3/8 in.</td>
<td>50-85</td>
</tr>
<tr>
<td>No. 4</td>
<td>35-65</td>
</tr>
<tr>
<td>No. 8</td>
<td>20-50</td>
</tr>
<tr>
<td>No. 50</td>
<td>15-30</td>
</tr>
<tr>
<td>No. 200</td>
<td>8-15</td>
</tr>
</tbody>
</table>

The specified gradations represent the limits of suitability of aggregate for use from the sources of supply. The final gradations decided on, within the specified limits, shall be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieves, or vice versa.

The portion of the material passing the No. 40 sieve shall have a liquid limit not more than 25 and a plasticity index not more than 6, when tested according to WAQTC FOP for AASHTO T 89 and T 90.
208-2.5 FINES FOR BLENDING. If additional fine material is necessary, it shall be obtained from approved sources and uniformly blended with the aggregate at the crushing plant, the mixing plant, or as approved by the Engineer. Silt, stone dust, or other similar fine material may be used as binder.

CONSTRUCTION METHODS

208-3.1 (Not Used)

208-3.2 PREPARING UNDERLYING COURSE. The underlying course will be checked and accepted by the Engineer before placing and spreading operations are started. Any ruts or soft areas shall be corrected and compacted to the required density before placing aggregate surface course.

To protect the underlying course and to ensure proper drainage, the spreading of the aggregate surface course shall begin along the centerline on a crowned section or on the high side of sections with a one-way slope.

208-3.3 METHODS OF PRODUCTION.

   a. Plant Mix. When selected by the Contractor and approved by the Engineer, the material shall be uniformly mixed in an approved plant.

   b. Travel Plant. When the use of a traveling plant is approved by the Engineer, the plant shall mix the materials in a single pass. If needed to achieve optimum moisture, water shall be thoroughly mixed with the aggregates during this operation.

       If using a windrow-type of travel plant, the windrows shall be placed parallel to the embankment centerline. The windrow volume shall be sufficient to cover exact areas as planned. The windrow contents shall produce a mixture of the required gradation and bonding qualities.

       If using a travel plant that mixes previously spread aggregates in-place, the material shall have been spread in such thickness and proportions as may be handled by the machine to develop a course of the thickness of each layer and of the gradation required.

   c. Materials of Proper Gradation. Material which meets the requirements for quality, gradation, and consistency, and which contains approximately the proper moisture for compaction, may be placed directly on the grade, without further mixing.

       Any minor deficiency or excess of moisture may be corrected by surface watering or by aeration. Some mixing or manipulation may be required immediately preceding compacting to obtain the required moisture content.

208-3.4 PLACING. The surface course shall be constructed without segregation of the aggregate. The material shall be placed in uniform, equal-depth layers, each not exceeding 6 inches of compacted depth. No material shall be placed in snow or on a soft uncompacted, muddy, or frozen course.

During the mixing and spreading process, sufficient caution shall be exercised to prevent the incorporation of subgrade, subbase, or shoulder material in the surface course mixture.

The Contractor shall install test strips of aggregate surface course with minimum dimensions of 100 feet by 16 feet by typical section thickness in an area heavily traveled by construction equipment, as approved by the Engineer. The stability and compaction characteristics of the material will be observed. The percentage of material passing the No. 200 sieve will be varied within the limits specified in the gradation in the Special Provisions while the stability and compaction are investigated.
The test strip results will be used to define the final gradation to be placed on the project based on the stability characteristics. Once the optimum percentage of fines passing the No. 200 sieve has been determined, it shall not vary more than ±2% from the optimum. Separate test strips are required for aggregate surface course from each materials source, if more than one source is used.

No aggregate surface course shall be placed on the project, other than in the test strips, until the Engineer has determined which percentage of fines performs most satisfactorily and results in the best stability. Test strip material accepted by the Engineer will be measured for payment.

208-3.5 COMPACATION. Immediately upon completion of the spreading operations, the aggregate shall be thoroughly compacted to the required density. The moisture content of the material shall be approximately that required to obtain maximum density.

208-3.6 ACCEPTANCE SAMPLING AND TESTING FOR DENSITY. The surface course will be accepted for density when the field density is not less than 95% of the maximum density, as determined according to WAQTC FOP for AASHTO T99/T 180 or ATM 212. The in-place field density and moisture content will be determined according to WAQTC FOP for AASHTO T 310. If the specified density is not attained, the material shall be reworked and/or recompacted until the specified density is reached.

208-3.7 FINISHING. The surface of the aggregate surface course shall be finished by blading or with automated equipment specifically designed for this purpose.

In no case shall thin layers of material be added to the top of surface course to meet grade. If the compacted elevation of the top layer is 0.05 foot or more below grade, it shall be scarified to a depth of at least 3 inches, new material added, and the layer shall be blended and compacted to bring it to grade. If the finished surface is above plan grade, it shall be cut back to grade and recompacted.

208-3.8 SURFACE TEST. After the course has been completely compacted, the surface will be tested by the Engineer for smoothness and accuracy of grade and crown. The finished grade elevation shall not vary more than 0.05 foot from the design elevation. The finished surface shall not vary more than 3/8 inch from a 12-foot straightedge when applied to the surface parallel with, and at right angles to, the centerline. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be corrected to within the specified tolerances.

208-3.9 PROTECTION. Work on the surface course shall not be accomplished during freezing temperatures or when the subgrade is wet. When the aggregates contain frozen materials or when the underlying course is frozen, the construction shall be stopped.

Hauling equipment may be routed over completed portions of the surface course, provided no damage results and provided that such equipment is routed over the full width of the surface course to avoid rutting or uneven compaction. However, the Engineer in charge will have full and specific authority to stop all hauling over completed or partially completed surface course when, in their opinion, such hauling is causing damage. Any damage resulting to the surface course from routing equipment over the surface course shall be repaired by the Contractor at their own expense.

208-3.10 MAINTENANCE. Following the completion of the aggregate surface course, the Contractor shall satisfactorily remove all blue tops, fill and compact the voids, and perform all maintenance work on this surface until final acceptance unless otherwise stated in the Specifications. The surface course shall be properly drained at all times.

METHOD OF MEASUREMENT

208-4.1 Aggregate Surface Course will be weighed by the ton or measured by the cubic yard in final position according to Subsection GCP-90-02.

BASIS OF PAYMENT
208-5.1 Aggregate Surface Course will be paid for at the contract price, per unit of measurement, accepted in place.

Payment will be made under:

- Item P-208a Crushed Aggregate Surface Course - per cubic yard
- Item P-208b Uncrushed Aggregate Surface Course - per cubic yard
- Item P-208c Crushed Aggregate Surface Course - per ton
- Item P-208d Uncrushed Aggregate Surface Course - per ton

**TESTING REQUIREMENTS**

- AASHTO T 96 Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- AASHTO T 104 Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
- ATM 212 The Standard Density of Coarse Granular Materials Using the Vibratory Compactor
- ATM 313 The Degradation Value of Aggregates
- WAQTC FOP for AASHTO T 27/T 11 Sieve Analysis of Aggregates & Soils
- WAQTC FOP for AASHTO T 89 Liquid Limit of Soils
- WAQTC FOP for AASHTO T 90 Plastic Limit and Plasticity Index of Soils
- WAQTC FOP for AASHTO T 99/T 180 Moisture-Density Relations of Soils
- WAQTC FOP for AASHTO T 310 In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods
- WAQTC FOP for AASHTO TP 61 Percentage of Fracture in Coarse Aggregate
ITEM P-209 CRUSHED AGGREGATE BASE COURSE

DESCRIPTION

209-1.1 This item consists of a base course composed of crushed aggregates constructed on a prepared course according to these Specifications and to the dimensions and typical cross section shown on the Plans.

MATERIALS

209-2.1 AGGREGATE. Aggregates shall consist of clean, sound, durable particles of crushed stone or crushed gravel and shall be free from vegetable matter, excess coatings of clay, silt, and other objectionable materials and shall contain no clay balls.

Fine aggregate passing the No. 4 sieve shall consist of fines from the operation of crushing the coarse aggregate. If necessary, fine aggregate may be added to produce the correct gradation. The fine aggregate shall be produced by crushing stone and gravel that meet the requirements for wear and soundness specified for coarse aggregate.

The crushed aggregate portion which is retained on the No. 4 sieve shall have at least 75% by weight with 2 fractured faces as determined by WAQTC FOP for AASHTO TP 61.

The percentage of wear shall not be greater than 45% when tested according to AASHTO T 96. The sodium sulfate soundness loss shall not exceed 12%, after 5 cycles, when tested according to AASHTO T 104. Aggregates shall have a minimum degradation value of 45 when tested according to ATM 313.

The fraction passing the No. 40 sieve shall have a liquid limit no greater than 25 and a plasticity index of not more than 4 when tested according to WAQTC FOP for AASHTO T 89 and T 90. The fine aggregate shall have a minimum sand equivalent value of 35 when tested according to WAQTC FOP for AASHTO T 176.

a. Sampling and Testing. The Engineer will sample aggregates for quality testing before the start of production. The Engineer, at no expense to the Contractor, will make all tests necessary to determine whether aggregate quality is in compliance with the specifications.

The Engineer will sample aggregates for acceptance according to WAQTC FOP for AASHTO T 2, and test aggregates for acceptance according to WAQTC FOP for AASHTO T 27/T 11.

b. Gradation Requirements. The gradation of the final mixture shall fall within the range indicated in Table 1, when tested according to WAQTC FOP for AASHTO T 27/T 11. The final gradation shall be continuously well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on an adjacent sieve or vice versa.
TABLE 1. REQUIREMENTS FOR GRADATION OF AGGREGATE

<table>
<thead>
<tr>
<th>Sieve Designation (Square Openings)</th>
<th>Percentage by weight passing sieves</th>
<th>C-1</th>
<th>D-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1/2 in</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.00 in</td>
<td></td>
<td>100</td>
<td>--</td>
</tr>
<tr>
<td>3/4 in</td>
<td></td>
<td>70-100</td>
<td>100</td>
</tr>
<tr>
<td>3/8 in</td>
<td></td>
<td>60-90</td>
<td>70-100</td>
</tr>
<tr>
<td>No.4</td>
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<td>45-75</td>
<td>50-80</td>
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<tr>
<td>No. 8</td>
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<td>30-60</td>
<td>35-65</td>
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<tr>
<td>No. 50</td>
<td></td>
<td>22-52</td>
<td>20-50</td>
</tr>
<tr>
<td>No. 200</td>
<td></td>
<td>8-30</td>
<td>8-30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0-6</td>
<td>0-6</td>
</tr>
</tbody>
</table>

Note: Unless otherwise specified, Gradation D-1 shall be used.

CONSTRUCTION METHODS

209-3.1 PREPARING UNDERLYING COURSE. Placing and spreading operations shall not commence until the underlying course has been accepted, in writing, by the Engineer. Any ruts or soft areas shall be corrected and compacted to the required density before placing the base course. Crushed aggregate base course shall not be placed on frozen material.

209-3.2 MIXING. The aggregate shall be uniformly blended during crushing operations or mixed in a plant. The plant shall blend and mix the materials to meet the Specifications.

209-3.3 PLACING. The crushed aggregate base material shall be placed on the approved subgrade in uniform, equal-depth layers, each not exceeding 6 inches of compacted depth.

The previously constructed layer shall be cleaned of loose and foreign material prior to placing the next layer. The surface of the compacted material shall be kept moist until covered with the next layer.

209-3.4 COMPACTION. Immediately upon completion of the spreading operations, the aggregate shall be thoroughly compacted to the required density. The moisture content of the material shall be approximately that required to obtain maximum density.

209-3.5 ACCEPTANCE SAMPLING AND TESTING FOR DENSITY. Base course will be accepted for density when the field density is not less than 100% of the maximum density, as determined according to WAQTC FOP for AASHTO T 99/T 180 or ATM 212. The in-place field density and moisture content will be determined according to WAQTC FOP for AASHTO T 310. If the specified density is not attained, the material shall be reworked and/or remolded to meet the specified density.

209-3.6 FINISHING. The surface of the aggregate base course shall be finished by blading or with automated equipment specifically designed for this purpose.

In no case shall thin layers of material be added to the top of base course to meet grade. If the compacted elevation of the top layer is 0.05 foot or more below grade, it shall be scarified to a depth of at least 3 inches, new material added, and the layer shall be blended and compacted to bring it to grade. If the finished surface is above plan grade, it shall be cut back to grade and remolded.

209-3.7 SURFACE TEST. After the course has been completely compacted, the surface will be tested by the Engineer for smoothness and accuracy of grade and crown. The finished surface shall not vary more than 3/8 inch from a 12-foot straightedge when applied to the surface parallel with, and at right angles to, the centerline. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be corrected to within the specified tolerances.
209-3.8 THICKNESS CONTROL. The thickness of the finished base course will be determined by the Engineer by taking before and after elevation measurements, or by depth tests, at random locations. The completed thickness of the base course shall be within 1/2 inch of the design thickness. Where the thickness is deficient by more than 1/2 inch, it shall be corrected to within the specified tolerances.

209-3.9 MAINTENANCE. The base course shall be maintained in a condition that will meet all specification requirements until the work is accepted. Equipment used in the construction of an adjoining section may be routed over completed portions of the base course, provided no damage results and provided that the equipment is routed over the full width of the base course to avoid rutting or uneven compaction.

METHOD OF MEASUREMENT

209-4.1 Crushed Aggregate Base Course will be weighed by the ton or measured by the cubic yard in final position according to Subsection GCP-90-02.

BASIS OF PAYMENT

209-5.1 Crushed Aggregate Base Course will be paid for at the contract price, per unit of measurement, accepted in place.

Payment will be made under:

- Item P-209a Crushed Aggregate Base Course - per cubic yard
- Item P-209b Crushed Aggregate Base Course - per ton

TESTING REQUIREMENTS

- ATM 212 Determining the Standard Density of Coarse Granular Materials Using the Vibratory Compactor
- ATM 313 Degradation Value of Aggregates
- AASHTO T 96 Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- AASHTO T 104 Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
- WAQTC FOP for AASHTO T 2 Sampling Aggregates
- WAQTC FOP for AASHTO T 27/T 11 Sieve Analysis of Aggregates & Soils
- WAQTC FOP for AASHTO T 89 Liquid Limit of Soils
- WAQTC FOP for AASHTO T 90 Plastic Limit and Plasticity Index of Soils
- WAQTC FOP for AASHTO T 99/T 180 Moisture-Density Relations of Soils
- WAQTC FOP for AASHTO T 176 Sand Equivalent
- WAQTC FOP for AASHTO T 310 In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods
- WAQTC FOP for AASHTO TP 61 Percentage of Fracture in Coarse Aggregate