00745.00  

Section 00745 - Asphalt Concrete Pavement - Statistical Acceptance

Description

00745.00 Scope - This Work consists of constructing one or more Courses of hot mix or warm mix asphalt concrete Pavement, plant mixed into a uniformly coated mixture, laid on a prepared foundation, compacted to specified density, and finished to a specified smoothness to the lines, grades, thickness, and Cross Sections shown or established.

00745.01 Abbreviations:

- Gmm - Maximum Specific Gravity of Mixture
- HMAC - Hot Mix Asphalt Concrete
- MAMD - Moving Average Maximum Density
- MDT - Maximum Density Test
- MDV - Mix Design Verification
- Pbe - Effective Asphalt Content
- RAM - Recycled Asphalt Material
- RAS - Recycled Asphalt Shingles
- SDC - Surface Damp Condition
- TSR - Tensile Strength Ratio
- Va - Air Voids in Compacted Mixture
- VFA - Voids Filled with Asphalt
- VMA - Voids in Mineral Aggregate
- WMAC - Warm Mix Asphalt Concrete

00745.02 Definitions:

Asphalt Concrete Pavement - Uniformly coated mixture of asphalt cement, graded Aggregate, and additives as required. The use of ACP in this section refers to either hot mix or warm mix asphalt concrete.

Hot Mix Asphalt Concrete - A hot plant mixed, uniformly coated mixture of asphalt cement, graded Aggregate and additives as required.

Level 1 ACP - ACP for use in applications with very low traffic and only limited exposure to trucks.

Level 2 ACP - ACP for use in applications with low traffic volumes and low volume truck traffic.

Level 3 ACP - ACP for use in applications exposed to moderate truck traffic.

Level 4 ACP - ACP for use in applications exposed to very heavy traffic volumes or heavy truck traffic.

Lot Size - A lot is the total quantity of material or Work produced per JMF per Project. The following circumstances will require a different lot:

- A new JMF is used. A JMF adjusted according to 00745.16 is not considered a new JMF.
- The method for measuring compaction is changed.
A new compaction specification limit is required according to 00745.49(b)(3).

A change from one test procedure for measuring asphalt content to another test procedure for measuring asphalt content occurs.

WMAC technology is used.

The Engineer may allow material for irregular areas not completed during the main paving operations, such as driveways or guardrail flares to be evaluated as a separate lot.

**Recycled Asphalt Material** - The combination of reclaimed asphalt Pavement (RAP) and recycled asphalt shingles (RAS).

**Sublot Size** - A sublot is 1,000 tons of ACP.

**Surface Damp Condition** - When the outside of the Aggregates are damp with moisture, but little or no free water is present.

**Warm Mix Asphalt Concrete** - An asphalt concrete mix following all requirements of HMAC, except that through use of approved additives or processes, it is mixed, placed, and compacted at lower temperatures.

**Wearing Course** - The top Lift of ACP, regardless of thickness.

**Materials**

**Aggregate** - When requested by the Engineer, supervisory personnel of the Contractor and any Subcontractors who are to be involved in ACP Aggregate crushing shall meet with the Engineer at a mutually agreed upon time to discuss accomplishing all phases of the crushing Work.

(a) **New Coarse and Fine Aggregates** - Provide and stockpile new Aggregates according to the following requirements:

(1) **General** - Produce and stockpile Aggregate as follows:

a. **Separated Sizes** - Advise the Engineer of the separated sizes of coarse and fine Aggregate that will be used and the proposed targets for each individual sieve size for each stockpile. A minimum of one coarse Aggregate and one fine Aggregate stockpile is required. If the Contractor proposes to produce coarse and fine Aggregates in separated sizes other than those specified, request the proposed size changes in writing, and state the proposed target value and specified tolerance for each of the individual sieve sizes of the proposed materials.

The number of fine Aggregate separated sizes selected by the Contractor does not relieve the Contractor of providing a JMF and producing ACP meeting the air voids, VMA, and VFA requirements of 00745.13(a) and 00745.16(b)(1)(a). Perform recrushing, rescreening, or other special processing of the fine Aggregates necessary to achieve the air voids, VMA, or VFA requirements at no additional cost to the Agency.

b. **Scalping** - Scalp the Rock on a 3/4 inch sieve screen deck. For quarry Rock, scalp the Rock after it has passed through the primary crusher. The material remaining may be accepted for use by visual inspection. The Engineer may perform verification testing of the gradation. The material shall meet the following:
**Sieve Size** | **Percent Passing (by Weight)**
---|---
8" | 95 - 100
3/4" | 5 max.

c. **Soundness** - Provide coarse and fine Aggregate with a weighted loss not exceeding 12 percent when subjected to five cycles of the soundness test using sodium sulfate solution according to AASHTO T 104.

d. **Durability** - Provide Aggregate not exceeding the following maximum values:

<table>
<thead>
<tr>
<th>Test</th>
<th>Test Method</th>
<th>ODOT</th>
<th>AASHTO</th>
<th>Aggregates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abrasion</td>
<td></td>
<td>T 96</td>
<td></td>
<td>30.0%</td>
</tr>
<tr>
<td>Degradation</td>
<td></td>
<td></td>
<td>TM 208</td>
<td>30.0%</td>
</tr>
<tr>
<td>Passing No. 20 sieve</td>
<td></td>
<td></td>
<td></td>
<td>3.0&quot;</td>
</tr>
<tr>
<td>Sediment Height</td>
<td></td>
<td>TM 208</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

e. **Fractured Faces** - Provide crushed Aggregate with not less than the minimum number of fractured faces as determined by AASHTO T 335 as follows:

<table>
<thead>
<tr>
<th>Percent of Fracture (by Weight)</th>
<th>Material Retained on 1 1/2&quot;, 1&quot;, 3/4&quot;, 1/2&quot; and No. 4 Sieve</th>
<th>Material Retained on No. 8 Sieve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Mix</td>
<td>(two fractured faces)</td>
<td>(one fractured face)</td>
</tr>
<tr>
<td>All ACP</td>
<td>75</td>
<td>75</td>
</tr>
</tbody>
</table>

f. **Harmful substances** - Do not exceed the following values:

<table>
<thead>
<tr>
<th>Test</th>
<th>Test Method</th>
<th>ODOT</th>
<th>AASHTO</th>
<th>Aggregates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lightweight pieces</td>
<td></td>
<td>T 113</td>
<td></td>
<td>1.0%</td>
</tr>
<tr>
<td>Wood Particles</td>
<td></td>
<td>TM 225</td>
<td></td>
<td>0.10%</td>
</tr>
<tr>
<td>Elongated Pieces (at a ratio of 5:1)</td>
<td></td>
<td>TM 229</td>
<td></td>
<td>10.0%</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td>T 90</td>
<td></td>
<td>0 or NP</td>
</tr>
<tr>
<td>Sand Equivalent</td>
<td></td>
<td>T 176</td>
<td></td>
<td>45 min. (^1)</td>
</tr>
</tbody>
</table>

\(^1\) 50 min. for Level 4 ACP

(2) **Coarse Aggregate** - Provide coarse Aggregate meeting the following:

a. **General Requirements** - Produce coarse Aggregate from crushed Rock or other inert material of similar characteristics.

b. **Separated Sizes** - Allowable separated sizes of coarse Aggregate are as follows:

<table>
<thead>
<tr>
<th>Type of Asphalt Concrete Mixture</th>
<th>Allowable Separated Sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1/4&quot; - 3/4&quot;</td>
<td>3/4&quot; - No. 4</td>
</tr>
<tr>
<td>1&quot; ACP</td>
<td>Yes</td>
</tr>
<tr>
<td>3/4&quot; ACP</td>
<td>–</td>
</tr>
<tr>
<td>1/2&quot; ACP</td>
<td>–</td>
</tr>
</tbody>
</table>
c. **Grading** - Determine sieve analysis according to AASHTO T 27 and AASHTO T 11. Establish the target values for each allowable separated size after a maximum of 10 percent of planned stockpile quantity has been produced. Produce the Aggregate within the following listed tolerances (T):

<table>
<thead>
<tr>
<th>Separated Sizes</th>
<th>1 1/4&quot; - 3/4&quot;</th>
<th>3/4&quot; - No. 4</th>
<th>3/4&quot; - 1/2&quot;</th>
<th>1/2&quot; - No. 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sieve Size</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>T</td>
</tr>
<tr>
<td>1 1/2&quot;</td>
<td>–1</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>1 1/4&quot;</td>
<td>±5</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>1&quot;</td>
<td>±10</td>
<td>–1</td>
<td>–1</td>
<td>–</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>±5</td>
<td>±5</td>
<td>±7</td>
<td>–1</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>–</td>
<td>±8</td>
<td>±8</td>
<td>±5</td>
</tr>
<tr>
<td>3/8&quot; *</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>No. 4</td>
<td>±3</td>
<td>±8</td>
<td>±8</td>
<td>±8</td>
</tr>
<tr>
<td>No. 8</td>
<td>–</td>
<td>±5</td>
<td>±5</td>
<td>±5</td>
</tr>
<tr>
<td>No. 16 *</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>No. 30</td>
<td>±1</td>
<td>±3</td>
<td>±3</td>
<td>±3</td>
</tr>
<tr>
<td>No. 50 *</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>No. 100 *</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>No. 200</td>
<td>–</td>
<td>±1.0</td>
<td>±1.0</td>
<td>±1.0</td>
</tr>
</tbody>
</table>

* Report percent passing sieve when no tolerance is listed

(3) **Fine Aggregate** - Provide fine Aggregate meeting the following:

a. **General** - Produce fine Aggregate from crushed Rock or other inert material of similar characteristics and if allowed, blend sand.

b. **Separated Sizes** - Allowable separated sizes for fine Aggregates are:

   - No. 4 - 0
   - No. 4 - No. 8
   - No. 8 - 0

c. **Grading** - Determine sieve analysis according to AASHTO T 27 and AASHTO T 11. Establish the target values for each allowable separate size after a maximum of 10 percent of planned stockpile quantity has produced. Produce the Aggregate within the following listed tolerances (T):

<table>
<thead>
<tr>
<th>Separated Sizes</th>
<th>No. 4 - 0</th>
<th>No. 4 - No. 8</th>
<th>No. 8 - 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sieve Size</td>
<td>T</td>
<td>T</td>
<td>T</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>–1</td>
<td>–1</td>
<td>–</td>
</tr>
<tr>
<td>No. 4</td>
<td>±7</td>
<td>±10</td>
<td>–1</td>
</tr>
<tr>
<td>No. 8</td>
<td>±7</td>
<td>±7</td>
<td>±10</td>
</tr>
<tr>
<td>No. 16 *</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>No. 30</td>
<td>±7</td>
<td>±5</td>
<td>±8</td>
</tr>
<tr>
<td>No. 50 *</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>No. 100 *</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>No. 200</td>
<td>±3.0</td>
<td>±2.0</td>
<td>±4.0</td>
</tr>
</tbody>
</table>

* Report percent passing sieve when no tolerance is listed
d. Combination of Fine Aggregate for Testing - Blend together fine Aggregate produced in two separate sizes at a 1:1 ratio when testing for sand equivalent.

e. Blend Sand - No natural or uncrushed blend sand will be allowed in Level 4 ACP. Blend sand is allowed for Levels 1, 2, and 3 mixes. For these mixes, establish the target gradation and produce all material within the following tolerances (T):

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing (by Weight)</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8&quot;</td>
<td>-1</td>
<td></td>
</tr>
<tr>
<td>No. 4</td>
<td>±5</td>
<td></td>
</tr>
<tr>
<td>No. 8</td>
<td>±15</td>
<td></td>
</tr>
<tr>
<td>No. 30</td>
<td>±20</td>
<td></td>
</tr>
<tr>
<td>No. 200</td>
<td>±5.0</td>
<td></td>
</tr>
</tbody>
</table>

Determine sieve analysis according to AASHTO T 27 and AASHTO T 11. Do not use more than 6 percent natural or uncrushed blend sand, by weight, in the total Aggregate. Provide a means of verifying and documenting the amount of blend sand added to the Aggregate.

(b) Reclaimed Asphalt Pavement - RAP material used in the production of new ACP is optional. No more than 30 percent RAP will be allowed in Level 1, Level 2, and Level 3 ACP. No more than 30 percent RAP will be allowed in Level 4 Base Courses. No more than 20 percent RAP will be allowed in Level 4 wearing Courses. Establish the amount of asphalt cement in the RAP in the mixture design phase according to ODOT TM 319 and the ODOT Contractor Mix Design Guidelines for Asphalt Concrete or other method if approved by the Engineer. Additional testing may be requested at any time by the Agency or the Contractor during the production of the RAP mixture to verify the amount of asphalt cement in the RAP. Conduct new tests by a laboratory mutually agreed upon by the Agency and the Contractor. The party requesting the additional testing pays the cost of the additional testing.

(c) Recycled Asphalt Shingles - RAS used in the production of new ACP is optional. Either manufacturer waste (post-manufacturer) RAS or tear-off (post-consumer) RAS may be used. Manufacturer waste RAS is processed asphalt shingle material derived from manufacturer's shingle scrap. Tear-off RAS is processed asphalt shingle material derived from shingle scrap removed from Structures. All percentages are based upon dry weights for calculations.

(1) Processing Shingles - Process the RAS by grinding without adding moisture so that 100 percent of the shredded pieces are less than 1/2 inch in any dimension and that 90 percent are less than 3/8 inch in any dimension when sampled according to AASHTO T 2 and tested according to AASHTO T 27. Sample and test the processed RAS according to the MFTP.

(2) Harmful Substances - Certify that the RAS does not contain asbestos fibers according to the policies and procedures established by the Department of Environmental Quality. Test deleterious materials according to ODOT TM 335 according to the MFTP. Limit the percentage of deleterious materials to 1.0 percent. If fine Aggregate is added as an anti-clumping agent, sample and test processed RAS for harmful substances before adding the fine Aggregates.

(3) Anti-Clumping Additive - Fine Aggregate meeting the requirements of 00745.10(a)(3)(c) may be added to the RAS in a quantity not to exceed 4 percent by weight of RAS to keep the material workable and to prevent conglomeration of the shingle particles in the stockpile. RAS
may also be blended with RAP in controlled percentages to preclude clumping. Do not contaminate stockpiled RAS with dirt or other foreign materials.

(4) Allowable Percentages - No more than 5.0 percent RAS by total weight of Aggregate is allowed in ACP mixtures. Restrict the maximum allowable percentage of asphalt binder replacement to 20.0 percent for Base Courses and 15.0 percent for wearing Courses in ACP containing only RAS.

When RAS is used in conjunction with RAP, restrict the maximum allowable percentage of binder replacement to 30.0 percent for Base Courses and 25.0 percent for wearing Courses.

(5) Establishing Mix Design Inputs - For ACP mixtures containing RAS or RAM, following any addition of fine Aggregate as an anti-clumping agent, test the material according to ODOT TM 319 to establish the asphalt content, material specific gravities, and gradation. Develop mixture designs according to the ODOT Contractor Mix Design Guidelines for Asphalt Concrete. Additional testing may be requested by the Agency or the Contractor at any time during the production of the RAS or RAM mixture to verify the amount of asphalt cement in the RAS or RAM. Conduct new tests by a laboratory mutually agreed upon by the Agency and the Contractor. The party requesting the additional testing pays the cost of the additional testing.

(d) Reclaimed Asphalt Pavement and Recycled Asphalt Shingle Aggregate - Blend the RAP, RAS, or RAM material with new Aggregate to provide a mixture conforming to the JMF within the tolerances specified. Have a CAT-I perform sampling and testing of RAP and RAS Aggregates according to Section 00165 and the MFTP.

(e) Stockpiling - Prepare the ground for the stockpile site to prevent contamination. Prevent segregation and contamination, as much as possible, when stockpiling and removing the Aggregate.

(f) Aggregate Production Quality Control - Have a CAT-T perform sampling and testing of Aggregates according to Section 00165 and the MFTP. Statistically evaluate the Aggregates according to Section 00165 and the MFTP. Sample before treating with hydrated lime, when lime is required.

(g) Preproduced Aggregate - Compliance of Aggregates produced and stockpiled before the Award date or Notice to Proceed of this Contract will be determined by (1) or (2) below. The material shall meet the requirements of 00745.10.

1. Continuing production records meeting the requirements of Section 00165 and the MFTP.

2. Sampling and testing of the entire stockpile according to Section 00165 and the MFTP.

00745.11 Asphalt Cement, Additives, and Aggregate Treatment - Furnish the following asphalt cement, additives and Aggregate treatments:

(a) Asphalt Cement - Use the grade of asphalt specified in the Contract Documents. Provide asphalt cement conforming to the requirement of ODOT's publication "Standard Specifications for Asphalt Materials". Copies of the publication are available from ODOT's Pavement Services Engineer. The applicable Specifications are those contained in the current publication on the date the Project is advertised.

PG 64-22 or PG 64-28 asphalt cement may be substituted for the grade of asphalt cement specified in the Contract for guardrail flares, mailbox turnouts, road approaches, driveways, and non-travel lane areas of restricted widths that are less than 8 feet wide, excluding Shoulders. Use of substitute asphalt cement for these areas will not require a new JMF.
(b) Asphalt Cement Additives - Use standard recognized asphalt cement additive products that are of known value for the intended purpose and approved for use on the basis of laboratory tests and capable of being thoroughly mixed. Do not use asphalt cement additives that have deleterious effects on the asphalt material. Do not use silicones as an additive. Add the following asphalt cement additives when required by the JMF:

- Anti-stripping asphalt cement additives to prevent stripping or separation of asphalt coatings from Aggregates to satisfy the TSR specified in 00745.13.
- Asphalt cement admixtures used to aid in the mixing.

When WMAC is used, select one of the WMAC technologies and process and additive types identified on ODOT's publication "Approved WMAC Technologies".

Submit the proposed WMAC technology to be used and a plan for its implementation at the pre-construction conference.

Comply with the manufacturer's recommendations for incorporating additives and WMAC technologies into the mix. Comply with manufacturer's recommendations regarding receiving, storing, and delivering the additives.

(c) Aggregate Treatment - When lime treated Aggregate is specified in the Contract Documents or required to satisfy the TSR specified in 00745.13, treat new crushed Aggregates, except those in RAP, RAS, or RAM materials, with dry hydrated lime meeting the requirements of Section 02090. Treat Aggregate as follows:

(1) General:

a. Mix the hydrated lime, water, and Aggregate thoroughly in a pug mill.

b. Determine the quantity of lime in Aggregate for each sublot according to ODOT TM 321. If the rates of application specified in 00745.11(c)(2)(b) are not met, take corrective action. Document the corrective action and notify the Engineer.

(2) Treatment During Production:

a. Mix dry lime, water (if necessary to achieve SDC), and Aggregates thoroughly in a pug mill before they enter the paving plant dryer.

b. Proportions of hydrated lime (percent by dry weight of dry Aggregates) and Aggregate moisture:

<table>
<thead>
<tr>
<th>Hydrated Lime (%)</th>
<th>1.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lime Tolerance (%)</td>
<td>-0.2/+0.5</td>
</tr>
<tr>
<td>Moisture Content of Aggregate</td>
<td>SDC</td>
</tr>
</tbody>
</table>

00745.12 Mix Type and Broadband Limits - Furnish the mix type specified in the Contract Documents within the broadband limits according to the following:

(a) Mix Type - Furnish the types of ACP shown or as directed. When the Plans allow an option of two types for a Course of Pavement, use only one type throughout the Course.

(b) Broadband Limits - Provide a JMF for the specified mix type within the control points listed below:
### Sieve Size Control Points

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>3/4” ACP Control Points (% passing by Weight)</th>
<th>1/2” ACP Control Points (% passing by Weight)</th>
<th>3/8” ACP Control Points (% passing by Weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1”</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>3/4”</td>
<td>90</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>1/2”</td>
<td>–</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>3/8”</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>No. 4</td>
<td>–</td>
<td>–</td>
<td>90</td>
</tr>
<tr>
<td>No. 8</td>
<td>23</td>
<td>49</td>
<td>28</td>
</tr>
<tr>
<td>No. 200</td>
<td>2.0</td>
<td>8.0</td>
<td>2.0</td>
</tr>
</tbody>
</table>

#### 00745.13 Job Mix Formula Requirements

- Do not begin production of ACP for use on the Project until the JMF is reviewed by the Engineer and written consent is provided to proceed. The JMF proposed for use on the Project will be evaluated based on the criteria identified in 00745.13(a) and 00745.13(b) and the latest ODOT Contractor Mix Design Guidelines for Asphalt Concrete. A new JMF is required if the asphalt cement grade, any additives, or the source of the Aggregate change during production. A change in the source of asphalt cement requires a new passing TSR.

Provide a range of proposed JMF targets to the CMDT. The CMDT will select targets from within the proposed range if all of the JMF requirements of 00745.13(a) are met.

A separate JMF will be issued for WMAC. Do not use RAS in WMAC mixes with minimum compaction temperatures less than 260 °F.

When WMAC is used, provide the following information in addition to the requirements listed for HMAC:

- WMAC technology and WMAC additives information.
- WMAC technology manufacturer’s established recommendations of usage.
- WMAC technology manufacturer’s established target rate for water and additives, and the acceptable variation for production.
- WMAC technology material safety data sheets if applicable.
- Temperature range for mixing.
- Temperature range for compacting.
- Except for foaming technology, asphalt binder performance grade test data of the asphalt binder and chemical additive at the manufacturer’s recommended dosage rate.
- Except for foaming technology, WMAC mixture performance test results. Perform testing for foaming technology on the production mix on specimens compacted at WMAC compaction temperatures.

Have a CMDT prepare, sign and submit a JMF to the Engineer for each mixture required at least 10 Calendar Days before the anticipated use in ACP, and according to the latest copy of the ODOT Contractor Mix Design Guidelines for Asphalt Concrete. If requested, submit material samples 10 Calendar Days before use.

#### (a) Job Mix Formula Requirements

Provide a JMF meeting the following mixture requirements:
### Performance Test

For Level 3 wearing Course mixes and all Level 4 mixes, the mix design submittal shall include the results of performance testing as outlined in the latest ODOT Contractor Mix Design Guidelines for Asphalt Concrete.

### 00745.14 Tolerances and Limits

- For gradation, measure the sieves with a weighting factor of one or more according to 00745.95. Produce and place ACP within the following JMF tolerances and limits:

<table>
<thead>
<tr>
<th>Gradation Constituent</th>
<th>3/4&quot;</th>
<th>1/2&quot;</th>
<th>3/8&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot;</td>
<td>JMF ± 5% *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>90 - 100%</td>
<td>JMF ± 5% *</td>
<td></td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>JMF ± 5%</td>
<td>90 - 100%</td>
<td>JMF ± 5% *</td>
</tr>
<tr>
<td>3/8&quot; **</td>
<td>-</td>
<td>-</td>
<td>90 - 100%</td>
</tr>
<tr>
<td>No. 4</td>
<td>JMF ± 5%</td>
<td>JMF ± 5%</td>
<td>JMF ± 5%</td>
</tr>
<tr>
<td>No. 8</td>
<td>JMF ± 5%</td>
<td>JMF ± 5%</td>
<td>JMF ± 5%</td>
</tr>
<tr>
<td>No. 16 **</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>No. 30</td>
<td>JMF ± 4%</td>
<td>JMF ± 4%</td>
<td>JMF ± 4%</td>
</tr>
<tr>
<td>No. 50 **</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>No. 100 **</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>No. 200</td>
<td>JMF ± 2.0%</td>
<td>JMF ± 2.0%</td>
<td>JMF ± 2.0%</td>
</tr>
</tbody>
</table>

* Maximum not to exceed 100 %

** Report percent passing sieve when no tolerance is listed

- When a JMF tolerance applies to a constituent, full tolerance will be given even if it exceeds the control points established in 00745.12(b). Full tolerance will be given for RAP content even if it
exceeds the limits established in 00745.10(b). Full tolerance will be given for RAS or RAM content even if it exceeds the limits established in 00745.10(c).

Take corrective action when the RAP, RAS, or RAM content, or the moisture content at time of discharge from the mixing plant, exceeds the above tolerance. If the RAP, RAS, or RAM content, or the moisture content at time of discharge from the mixing plant, continues to be outside tolerance, stop production until a plan for corrective action is approved by the Engineer.

00745.16 Asphalt Concrete Pavement Production QC/QA - Provide ACP according to the following:

(a) Quality Control - Provide and maintain a quality control program as defined in Section 00165, the MFTP, and according to the following:

(1) Personnel Requirements - Maintain quality control by:

- Obtaining samples according to the MFTP with certified technicians.
- Having all testing, data analysis and reporting of test results performed by a CAT-I.
- Having a CAT-II available to evaluate and reconcile laboratory and field test results, submit required forms within required timeframes, and make necessary process adjustments.
- Providing at least one CAT-I full-time at each plant site when producing mixture for the Project.
- Providing access to laboratory facilities, technicians, and test results to the Engineer at all times during the production and testing process.

(2) Laboratory Requirements - Furnish and maintain an ODOT certified quality control laboratory. Furnish the laboratory with the necessary Equipment and supplies for performing Contractor quality control testing. Calibrate all testing Equipment according to the required test methods. The Engineer may inspect measuring and testing devices to confirm both calibration and condition.

The laboratory shall be operational before beginning the ACP production and be equipped with a telephone or cellular telephone, if either service is available. Provide laboratory Equipment meeting the requirements of the applicable test methods identified in these Specifications and selected for use on the Project.

(3) Production Sampling and Testing - Perform sampling and testing according to Section 00165 and the MFTP.

(4) Testing Frequency - Conduct the above testing program, once for each sublot, on randomly selected samples for each design mixture. Do not obtain the first sample of the Day in the first 25 tons of production. If the random number indicates that the sample is to be obtained in the first 25 tons, sample at 25 tons. In addition, test the asphalt content at least once during each Day of production. This requirement may be waived by the Engineer.

Provide "QC Program" sampling and testing frequencies (random numbers) to the Engineer before starting production. Provide QC test results to the Engineer by the middle of the following work shift.

Stop production when the pay factor for any constituent with a weighting factor greater than one falls below 0.75. Resume production when a plan for correction is accepted by the Engineer.
(5) **Plant Calibration** - Calibrate all meters and belt scales at the ACP mixing plant according to ODOT TM 322 before beginning production.

(b) **Mix Design Verification:**

(1) **Mix Design Verification Quality Control:**

   a. **General** - Before beginning production and placement of WMAC, perform mix design verification (MDV) tests on the HMAC as required at start-up according to 00745.16(b)(1)(d). Two consecutive MDV test results from testing of HMAC shall be within the limits of 00745.16(b)(1)(a). The Engineer may waive ODOT TM 306 for HMAC production required before WMAC production for one shift.

   Perform MDV tests on every sublot and as required at start up according to 00745.16(b)(1)(d) and the MFTP. Perform gradation and asphalt content testing with each MDV test. Calculate the following values for each MDV test:

   - Air Voids
   - Voids in Mineral Aggregate (VMA)
   - Voids Filled with Asphalt (VFA)
   - Passing No. 200/Effective Asphalt Content (Pbe) Ratio

   The running averages of four MDV results shall be within the limits given below:

<table>
<thead>
<tr>
<th>Average of</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Voids</td>
<td>JMF Target ± 1.0%</td>
</tr>
<tr>
<td>VMA</td>
<td>12.5 - 17.0 (3/4” Mix)</td>
</tr>
<tr>
<td></td>
<td>13.5 - 17.0 (1/2” Mix)</td>
</tr>
<tr>
<td></td>
<td>14.5 - 17.0 (3/8” Mix)</td>
</tr>
<tr>
<td>VFA</td>
<td>65 - 75 (3/4” and 1/2” Mix in Level 3 and 4)</td>
</tr>
<tr>
<td></td>
<td>65 - 78 (3/4” and 1/2” Mix in Level 2)</td>
</tr>
<tr>
<td></td>
<td>70 - 80 (1/2” Mix in Level 1 and 3/8” Mix in Levels 1 - 4)</td>
</tr>
<tr>
<td>Passing No. 200/Pbe</td>
<td>0.8 - 1.6</td>
</tr>
</tbody>
</table>

   b. **Laboratory Compactor Selection** - Use the equivalent laboratory compactor for MDV as used to develop the JMF.

   c. **Reconciliation of Laboratory and In-place Properties** - Have a CDT provide the results from the initial control strip to the CAT-II for evaluation and comparison with the MDV results at the completion of the control strip. If the MDV and density test results are contradictory, inform the Engineer and initiate an investigation. The CAT-II shall recommend a plan to the Engineer for resolving the discrepancy based on the results of the investigation. Submit results of investigation and plan no later than the end of two shifts after investigation has been initiated.

   d. **Mix Design Verification Requirements at Start-Up** - Perform MDV testing at the start-up of the JMF production according to the following process:

      1. Obtain a sample in the first 100 tons of production and immediately perform MDV testing.
2. If the Va and VMA mix properties of 00745.16(b)(1)(a) are within tolerance, then continue subsequent MDV testing at the established random QC sublot interval. If not, then go to step "3".

3. If the Va and VMA mix properties are out of tolerance in 00745.16(b)(1)(a), then make mix adjustments within the requirements of 00745.16(b)(1)(e) and immediately obtain another sample and perform MDV testing. Two adjustments will be given. If any of the test results for Va and VMA are not within the limits of 00745.16(b)(1)(a) after second adjustment, then stop production and go to step "4".

4. Have the CAT-II submit the revised JMF targets and production and plant adjustments to the Engineer. Obtain the approval of the Engineer before restarting production. Production will be restarted with MDV testing according to this subsection.

Use the initial MDV sample as the first random QC sublot test. Subsequent MDV samples required due to failure of start-up criteria will be used for a sublot QC test if the sample is taken within 100 tons of the scheduled random QC sample location. If not, perform the MDV testing separate from, and not included in, the random QC testing program. Complete all required MDV testing at no additional cost to the Agency.

e. Corrective Action - Take corrective action when required by the MDV start-up process of 00745.16(b)(1)(d). After the requirements of 00745.16(b)(1)(d) have been met, take corrective action if the MDV test results show that two consecutive running averages of four samples are outside the limits for air voids, VMA, VFA, or P No. 200/Pbe ratio according to 00745.16(b)(1)(a). Document the corrective action and submit to the Engineer. If the subsequent MDV test results following the corrective action are outside the limits of 00745.16(b)(1)(a), immediately stop production and make adjustments. Restart production according to 00745.16(b)(1)(d) only after the Engineer has approved the proposed adjustments. If the MDV test results are outside the limits of 00745.16(b)(1)(a), but the mixture meets the current requirements for gradation and asphalt content, an adjustment to the JMF targets is required. A new lot is not required as a result of the adjustment.

f. Field Tensile Strength Ratio Testing - Perform a Tensile Strength Ratio (TSR) test according to AASHTO T 283 on a sample obtained during the first 2 days of production after QC test results verify that ACP constituents with a weighting factor greater than one according to 00745.95 are in tolerance. Provide test results to the Engineer within 6 Calendar Days of obtaining the sample. Stop production and make adjustments if the TSR is less than 70. Restart production only after the Engineer has approved the proposed adjustments.

The Engineer may waive Field TSR testing if the Contractor provides Field TSR data dated within the prior 3 months of the first MDV sample.

g. Request for Job Mix Formula Target Adjustment - A request for an adjustment to the JMF targets may be made to the Engineer by the Contractor's CAT-II. The requested change will be reviewed and documented by the Engineer. If acceptable, a revised JMF will be allowed. Document the sublot test for which the adjusted targets are in effect. When making adjustments for gradation do not exceed the tolerances specified for the original JMF limits. Keep AC content adjustments for HMAC within 0.5 percent of the original JMF. Keep AC content adjustments for WMAC within 0.3 percent of the original JMF. The JMF asphalt content may only be adjusted if the production VMA meets the requirements of 00745.16(b)(1)(a). Keep adjustments for RAP or RAM within 5 percent of the original JMF blend percentage, but do not exceed the requirements of 00745.10(b) or 00745.10(c). Adjusting proportions of the combined RAP and RAS will not be allowed during production.
of the mixture. Keep adjustments for RAS content within 1 percent of the original JMF, but do not exceed the requirements of 00745.10(c). A gradation adjustment is required if the VMA is outside of the 00745.16(b)(1)(a) limits. Regardless of these tolerances, keep the adjusted JMF within the mixture specification control points of 00745.12. If a redesign of the mixture becomes necessary, submit a new JMF according to the requirements of these Specifications.

(2) Mix Design Verification Quality Assurance - The Engineer will observe and document the Contractor’s performing of MDV test procedures and calculations. Immediately correct any deviations from the specified test procedures. The Engineer may conduct MDV assurance testing at any time.

(3) Mix Design Verification for Warm Mix Asphalt Concrete - Perform MDV testing on WMAC according to 00745.16(b)(1)(a). Continued production and placement of WMAC will be allowed at the discretion of the Engineer.

(c) Quality Assurance and Acceptance - The Agency will provide quality assurance according to Section 00165. When QA testing is performed, the Contractor’s quality control results will be used for acceptance if they are within acceptable limits of the QA test results as defined by ODOT’s Quality Assurance Program.

00745.17 Small Quantity Acceptance - When the quantity of ACP in a lot is less than 2,500 tons, the Engineer may accept the ACP according to Section 4(B) of the MFTP or by test results according to the following:

(a) Within Specification Limits - If all sublot sample test results are within specification limits for all constituents, including compaction, the material will be accepted and the full Bid price will be paid for the material represented by that test.

(b) Outside Specification Limits - If a sublot sample test result for any constituent is outside the specification limit the Engineer will have the backup sample tested.

(1) Backup Within Specifications - If the backup sample test results for all constituents are within specification, the material will be accepted and the full Bid price will be paid for the material represented by that test.

(2) Backup Out of Specifications - If the backup sample test results are out of specification, the Contractor may choose to accept the price adjustment calculated according to 00745.95 or may choose to sample the in-place material for further testing according to 00745.17(b)(3). The price adjustments will be computed using all original test results as well as all backup test results. If there are less than three tests, average the two tests and use the average as a third test result. The maximum composite pay factor (CPF) will be 1.0.

(3) In-Place Samples - If the Contractor chooses to sample the in-place material, sample from a minimum of three random locations from the area represented by the lot in question under the observation of the Engineer. If the in-place sample test results are within specification, the material will be accepted and paid for at the full Bid price. If the in-place sample test results are not within specification, the material will be accepted and paid for at an adjusted price according to 00745.95. The maximum CPF will be 1.0. Perform sampling and testing of in-place material at no additional cost to the Agency.

Equipment

00745.20 Lime Treated Aggregate Plant - When lime treated Aggregate is specified, provide a mixing plant that includes:
• A pug mill that mixes the Aggregate and lime until the Aggregate is uniformly coated and the lime is distributed throughout the Aggregate.
• Provide a system for adding water to the pug mill if necessary to achieve Aggregate that is in SDC. This requirement may be waived by the Engineer if the stockpiled Aggregates are watered to the satisfaction of the Engineer.
• A lime metering or weighing device that determines the amount of lime incorporated within any selected time period. Provide a device that is of sufficient accuracy to supply lime within the tolerances specified in 00745.11(c).

00745.21 Mixing Plant - Provide ACP plants that comply with the following:

(a) DEQ Permits - Before producing ACP for this Contract at a new or revised plant location, provide the Engineer with copies of all permits according to 00160.70.

(b) Scales - Provide required scales to assure a uniform mixture. Check and adjust scales according to 00190.30.

(c) Vibratory Scalping Devices - Provide vibratory scalping devices ahead of the mixer to reject Aggregate, RAP, RAS, or RAM and lumps of cemented material that are detrimental to the mix.

(d) Asphalt Antistrip Additive Metering Device - When asphalt antistrip additive is added into the asphalt at the ACP mixing plant, provide a means to weigh or meter the additive at a specified rate that has an accuracy of plus or minus 0.5 percent.

(e) Thermometers - Provide the following:
  • A direct reading, full operating range thermometer in the asphalt feed line near the mixer unit.
  • A thermometric instrument that automatically registers the temperature of the materials at the discharge of the mixer.

(f) Sampling Devices - Provide and operate a device that produces a representative sample of the quantity of material required for the appropriate tests when sampling at or around crushing, screening or mixing plants.

(g) Warm Mix Asphalt Concrete Mixing Production - Modify the asphalt mixing plant as required by the manufacturer to introduce the WMAC technology. Plant modifications may include additional plant instrumentation, the installation of asphalt binder foaming systems and WMAC additive delivery systems, tuning the plant burner, and adjusting the flights in order to operate at lower production temperatures and reduced tonnage. Document the integration of plant controls and interlocks.

00745.22 Hauling Equipment - Provide hauling vehicles in good operating condition with tight, clean, smooth beds. Coat the beds with a minimum amount of an approved material to keep the ACP from sticking to the beds. Do not use diesel oil. Drain excess coating material before loading by raising the truck bed, opening belly dump gates, or operating the conveyor belt, as appropriate.

00745.23 Pavers - Provide pavers that are:
  • Self-contained, self-propelled, supported on tracks or wheels, none of which contact the mixture being placed.
  • Equipped with augers and a screed, heated when necessary, which:
Can spread and finish the ACP to a uniform texture, in the specified widths, thicknesses, lines, grades and Cross Sections.

Will not segregate, tear, shove or gouge the ACP.

Equipped with a paver control system which:
- Controls the ACP placement to specified Slope and grade.
- Maintains the paver screed in proper position.
- Provides the specified results through mechanical sensors and sensor-directed devices actuated from independent line and grade control references.

Equipped with adequate lighting to illuminate the paver and the roadway in front of and behind the paver during the period from 30 minutes after sunset to 30 minutes before sunrise, or as directed. Shield lighting from adjacent traffic as necessary. Provide a minimum light level of 10 footcandles as measured by the Engineer on the roadway surface at a distance of 16 feet from the front and back edges of the paver.

00745.24 Compactors - Provide the specified self-propelled rollers capable of reversing without backlash, as follows:

(a) Steel-Wheeled Rollers - Steel-wheeled rollers with a minimum gross static weight as follows:

<table>
<thead>
<tr>
<th></th>
<th>Level 1 and Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakdown and Intermediate</td>
<td>8 ton</td>
<td>10 ton</td>
<td>12 ton</td>
</tr>
<tr>
<td>Finish</td>
<td>6 ton</td>
<td>8 ton</td>
<td>10 ton</td>
</tr>
</tbody>
</table>

(b) Vibratory Rollers - Vibratory rollers that:
- Are equipped with amplitude and frequency controls.
- Are specifically designed to compact ACP.
- Are capable of at least 2000 vibrations per minute.
- Have a minimum gross static weight meeting the requirements of 00745.24(a).

Do not operate in vibratory mode for Lifts thinner than two times the maximum Aggregate size for the type of ACP being compacted.

If vibratory rollers are used for finish rolling, they shall:
- Have a minimum gross static weight meeting the requirements of 00745.24(a).
- Not be operated in the vibratory mode.

(c) Pneumatic-tired Rollers - Pneumatic-tired rollers shall:
- Be tandem, or multiple axle, multiple wheel type.
- Have smooth-tread, pneumatic tires of equal size.
- Have tires staggered on the axles, spaced and overlapped to provide uniform compacting pressure for the full compacting width.
- Have a minimum total load of 2,800 pounds per tire with tire inflation pressures of 45 psi to 90 psi
- Be fully skirted to reduce tire heat loss and mixture pick up.
(d) **Illumination** - Provide adequate lighting to illuminate each compactor and the roadway in front of and behind each compactor during the period 30 minutes after sunset to 30 minutes before sunrise, or as directed. Shield lighting from adjacent traffic as necessary. Provide a minimum light level of 10 footcandles as measured by the Engineer on the roadway surface at a distance of 60 feet from the front and back edges of each compactor.

**Labor**

**00745.30 Quality Control Personnel** - Provide technicians having CAgT, CAT-I, CAT-II, CDT, and CMDT technical certifications.

**Construction**

**00745.40 Season and Temperature Limitations** - Place ACP during the dates indicated, and when the temperature of the surface that is to be paved is not less than the temperature indicated:

<table>
<thead>
<tr>
<th>Nominal Compacted Thickness of Individual Lifts and Courses as shown on the typical section of the Plans</th>
<th>All Levels</th>
<th>Level 1 and Level 2</th>
<th>Level 3 and Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>All Courses</td>
<td>Travel Lane Wearing Course</td>
</tr>
<tr>
<td></td>
<td>Surface Temperature*</td>
<td>From To Inclusive</td>
<td>From To Inclusive</td>
</tr>
<tr>
<td>Less than 2 inches</td>
<td>60 °F</td>
<td>All Year**</td>
<td>3/15 9/30</td>
</tr>
<tr>
<td>2 inches - 2 1/2 inches</td>
<td>40 °F</td>
<td>All Year**</td>
<td>3/15 9/30</td>
</tr>
<tr>
<td>Greater than 2 1/2 inches</td>
<td>40 °F</td>
<td>All Year**</td>
<td>3/15 9/30</td>
</tr>
<tr>
<td>Temporary</td>
<td>40 °F</td>
<td>All Year**</td>
<td>All Year**</td>
</tr>
</tbody>
</table>

* Do not use field burners or other devices to heat the Pavement surface to the specified minimum temperature unless approved.
** If placing ACP between March 15 and September 30, temperature requirement may be lowered 5 °F.

**00745.41 Preparing Conference** - Have a preparing conference with all Contractor supervisory personnel, all Subcontractors who are to be involved in the paving Work, and the Engineer. Meet at a mutually agreed time and discuss all methods of accomplishing all phases of the paving Work. When Level 3 and Level 4 mixes quantities are greater than 5,000 tons include in the preparing conference a Contractor representative who is responsible for Project quality control.

**00745.42 Preparation of Underlying Surfaces** - All bases and foundations on which the Pavement is to be constructed shall meet the applicable Specifications and be approved before the start of paving. Recondition existing bases and foundations according to Section 00610. Trim broken or ragged edges to firm material when directed.

Treat all paved surfaces on and against which ACP is to be placed with an asphalt tack coat, according to Section 00730.

Level and compact depressed areas with ACP as specified or directed. Perform the Leveling Work as a separate operation and at the locations and to the extent as shown or directed. Spread the Leveling material with a paving machine, unless otherwise directed.

Protect all existing Structures from the overlay operation and check and clean as necessary after the overlay.
00745.43

Remove existing pavement markers, recessed markers, and pavement legends before paving. Remove pavement lines, bars, and pavement legends as shown or directed and according to 00225.43(i).

00745.43 Drying and Heating Aggregates:

(a) Burner Operation - Operate the burner used to heat the Aggregates to completely burn the fuel so the Aggregate and asphalt are not contaminated and the asphalt is suitably aged.

(b) Heating Temperatures - Establish the allowable mixing and placement temperature ranges by the JMF. Measure the mixture temperature at the discharge of the mixer. Measure the placement temperature behind the paver. The allowable production temperatures may be adjusted based on the asphalt cement Supplier’s recommendation if approved by the Engineer. The maximum mixture temperature of the ACP and the minimum placement temperature shall be as follows:

<table>
<thead>
<tr>
<th>Grading Type</th>
<th>Maximum At Mixer</th>
<th>Minimum Behind Paver</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMAC</td>
<td>350°F</td>
<td>240°F</td>
</tr>
<tr>
<td>WMAC</td>
<td>–</td>
<td>215°F</td>
</tr>
</tbody>
</table>

Within the above limits, the Contractor with approval of the Engineer, or the Engineer may adjust this temperature in 10°F increments from the JMF as follows:

- **Up** - If the Aggregate coating, moisture content, workability or compaction requirements are not attained.
- **Down** - If the Aggregate coating, moisture content, workability and compaction requirements are attained.

00745.44 Asphalt Concrete Pavement Storage - Temporary storing or holding of ACP in storage silos will be allowed if the Contractor complies with the following:

(a) Flow Diverter - Provide a device to divert the flow of ACP away from the silo when starting or stopping plant production, or at any other time necessary, so improperly proportioned mixture or incompletely mixed portions of the mixture do not enter the silo.

(b) Batcher - Equip storage silos with a batcher, rotating chute, or similar device to prevent segregation of ACP as it enters the silo.

(c) Unheated Silos - Store ACP in unheated silos only when the total elapsed time from the mixing to placing is less than 6 hours.

(d) Heated Silos - Store ACP in heated, insulated silos no more than 72 hours only if an atmosphere is maintained in the silo at all times which prevents damage to the mixture or asphalt properties.

(e) Discharging AC and Loading Trucks - Discharge the ACP and load trucks so segregation is prevented. If the ACP is segregated, dispose of segregated ACP and stop temporary storage of the ACP at no additional cost to the Agency.
00745.45 Control of Line and Grade - Use a floating beam device of adequate length and sensitivity to control the grade of the paver. Where this method is impracticable, manual control of grade will be allowed when approved.

00745.46 Hauling, Depositing, and Placing - Haul, deposit, and place ACP as follows:

(a) Hauling - Cover ACP if rain or cold air temperatures are encountered any time between loading and placement.

ACP will be rejected before placing if one or more of the following occurs:

• Below temperature limit specified in 00745.43
• Slumping or separating
• Solidifying

Dispose of rejected loads at no additional cost to the Agency.

Deliver the mixture to the paving machine at a rate that provides continuous operation of the paving machine, except for unavoidable delay or breakdown. If excessive stopping of the paving machine occurs during paving operations, the Engineer may suspend paving operations until the mixture delivery rate matches the paving machine operation.

(b) Depositing - Deposit ACP from the hauling vehicles so segregation is prevented.

When ACP is windrowed, the pick-up Equipment shall:

• Pick up substantially all of the ACP deposited on the Roadway.
• Be self-supporting, not exerting any vertical load on the paving machine, or causing vibrations or other motions which could have a harmful effect on the riding quality of the completed Pavement.

(c) Placing - Alternative equipment and means may be allowed by the Engineer if the use of a paver is impractical.

Do not place ACP during rain or other adverse weather conditions, unless allowed by the Engineer. ACP in transit at the time adverse conditions occur may be placed if:

• It has been covered during transit.
• The ACP temperature is satisfactory.
• It is placed on a foundation free from pools or flow of water.
• All other requirements are met.

When leveling irregular surfaces and raising low areas, do not exceed 2 inches actual compacted thickness of any one Lift, except the actual compacted thickness of intermittent areas of 1,000 square feet or less may exceed 2 inches, but not more than 4 inches. This may require portions of the mixture to be laid in two or more Lifts.

Place the mixture in the number of Lifts and Courses, and to the compacted thickness for each Lift and Course, as shown. Place each Course in one Lift unless otherwise specified. Do not exceed a compacted thickness of 4 inches for any Lift. Limit the minimum Lift thickness to four times the nominal maximum Aggregate size in the mix.
00745.47

Do not intermingle ACP produced from more than one JMF. Each Base Course Panel placed during a working shift shall conform to a single JMF. The wearing Course shall conform to a single JMF, except for adjustments in the JMF according to 00745.16(b)(1).

00745.47 Longitudinal Joints - At longitudinal joints, bond, compact and finish the new ACP equal to the ACP against which it is placed.

(a) Location - Place the ACP in Panel widths which hold the number of longitudinal joints to a minimum. Offset the longitudinal joints in one Panel by at least 6 inches from the longitudinal joints in the Panel immediately below.

(1) Base Course - Place Base Course longitudinal joints within 12 inches of the edge of a lane, or within 12 inches of the center of a lane, except in irregular areas, unless otherwise shown.

(2) Wearing Course - Construct longitudinal joints at either lane lines or fog lines, or as shown or directed.

(b) Drop-Offs:

- Provide warning signs and markings according to Section 00225 where abrupt or sloped edge drop-offs 1 inch or more in height occur.
- Protect edges from being broken down.

If unable to complete the Pavement without drop-offs according to 00745.47(c) do the following:

- Construct and maintain a wedge of ACP at a Slope of 1V:10H or flatter along the exposed longitudinal joint.
- Remove and dispose of the wedge before continuing paving operations.
- Construct, maintain, remove, and dispose of the temporary wedge at no additional cost to the Agency. ACP for the temporary wedge will be paid for at the Pay Item price.

(c) Placing Under Traffic - When placing ACP Pavement under traffic, schedule Work for the nominal thickness being laid as follows:

(1) More Than 2 inches - Schedule Work so at the end of each working shift the full width of the area being paved, including Shoulders, is completed to the same elevation with no longitudinal drop-offs.

(2) Less Than or Equal to 2 Inches - Schedule Work so that at the end of each working shift one Panel of new travel lane Pavement does not extend beyond the adjoining Panel of new travel lane Pavement more than the distance normally covered by each shift. At the end of each week complete the full width of the area to be paved, including Shoulders, to the same elevation with no longitudinal drop-offs.

00745.48 Transverse Joints:

(a) Travel Lanes - Construct transverse joints on the travel lane portion of all specified Pavement Courses, except Leveling Courses, as follows:

(1) Temporary End Panel - Maintain Pavement depth, line and grade at least 4 feet beyond the selected transverse joint location, and from that point, wedge down on the appropriate Slope until the top of the Course being laid meets the underlying surface (assuming a Pavement Course thickness of 2 inches) as follows:
• For wedges that will be under traffic for less than 24 hours, construct an 8 foot long wedge (1V:50H taper rate).
• For wedges that will be under traffic for 24 hours or longer, construct a 25 foot long wedge (1V:160H taper rate).
• Construct, maintain, remove, and dispose of the temporary wedge at no additional cost to the Agency. ACP for the temporary wedge will be paid for at the Pay Item price.

When the Pavement Course thickness is different than the above 2 inch example, use the appropriate taper rate to compute the length of the wedge. The wedge length plus the 4 feet or longer Panel form the temporary end Panel.

(2) Vertical Face - After the mixture has reached the required density:
• Provide a smooth, vertical face the full depth of the Course being laid at the location selected for the joint by sawing, cutting or other approved method.
• Remove the ACP material from the joint to the end of the Panel. If removed before resuming paving beyond the joint, reconstruct the temporary end Panel immediately by placing a bond-breaker of paper, dust, or other suitable material against the vertical face and on the surface to be occupied by the temporary end Panel. Construct a full-depth Panel at least 4 feet long, beginning at the sawed or cut joint, and taper it on a 1V:50H Slope to zero thickness.

(3) Excess Asphalt Concrete Pavement - After completing a temporary end Panel as specified, dispose of unused, remaining ACP as directed. Payment will be made for the entire load of ACP, but will be limited to only one load for each joint of each Panel.

(4) Resume Paving - When permanent paving resumes, remove the temporary end Panel and any bond-breakers. Clean the surface of all debris and apply a tack coat to the vertical edge and the surface to be paved.

(5) Joint Requirements - Compact both sides of the joint to the specified density. When tested with a straightedge placed across the joint, the joint surface shall conform to 00745.70.

(b) Abutting Bridge Ends - Compact the ACP abutting bridge ends and other rigid type Structures in the longitudinal direction and either transverse or diagonal direction, as directed.

(c) Bridge Deck Overlays - Saw cut the wearing Course of Pavement directly over the joints in bridge decks, bridge end joints and end Panel end joints as soon as practical but within 48 hours of paving each stage of the wearing Course, unless otherwise directed. Saw the cut 3/8 inch wide, ± 1/8 inch, by 1/2 inch less than the thickness of the Panel of Pavement depth or 1 1/2 inches deep, whichever is less.

Flush the saw cut thoroughly with a high-pressure water stream after the cut has been made. Before the cut dries out, blow it free of water and debris with compressed air. Fill the joint with a poured filler from the QPL.

00745.49 Compaction:

(a) General - After the ACP has been spread, struck off, and surface irregularities and other defects remedied, roll it uniformly until compacted as specified.

(1) Temperature - Complete breakdown and intermediate compaction before the ACP temperature drops below 180 °F, unless otherwise directed or required based on the control
strip. For WMAC, complete breakdown and intermediate compaction before the WMAC
temperature drops below 160 °F. When the rolling causes tearing, displacement, cracking or
shoving, make necessary changes in compaction temperature, type of compaction Equipment,
and rolling procedures.

(2) Rolling - Provide sufficient rollers of the types appropriate to compact the mixture while it
is still within the specified temperature. Do not use equipment which crushes the Aggregate.
Do not displace the line and grade of edges. Moisten steel roller wheels with a minimum
amount of water, or other approved material, necessary to prevent the ACP from sticking to
them and spotting or defacing the ACP.

Operate rollers at a slow, uniform speed recommended by the manufacturer. Drive rolls or
wheels shall be nearest the paver unless otherwise approved. Operate pneumatic rollers no
faster than 3 mph. Operate vibratory rollers at frequencies of at least 2,000 vibrations per
minute.

Begin rolling at the sides and proceed longitudinally, parallel to the road centerline, gradually
progressing to the center, unless otherwise directed. On superelevated curves, begin rolling at
the low side and progress to the high side. When paving in echelon, or when abutting a
previously placed lane, roll the longitudinal joint first, followed by the regular rolling pattern. Do
not make sharp turns or park rollers on hot ACP. Stop each Pass at least 5 feet longitudinally
from preceding stops.

Perform finish rolling with rollers meeting the requirements of 00745.24(a) or 00745.24(b), and
continue until all roller marks are eliminated.

(b) Normal Pavement (Nominal Thickness 2 Inches or Greater):

(1) General - Compliance with the density Specifications for ACP shall be determined by
random testing of the compacted road surface with calibrated nuclear gauges. Use the MAMD
method of compaction measurement.

Construct a control strip at the beginning of Work on each JMF on the Project according to
ODOT TM 306. The purpose of the control strip is to determine the maximum density that can
be achieved for the JMF, paving conditions, and Equipment on the Project. Additional control
strips are necessary when there is a change in compaction Equipment or when JMF targets
are adjusted according to 00745.16(b)(1)(a). The Engineer may waive the control strip for
irregular areas or areas too small to establish a reasonable roller pattern.

Stop paving if three consecutive control strips fail to achieve the specified density. Take all
actions necessary to resolve compaction problems. Do not resume paving until allowed by the
Engineer.

A pneumatic tired roller is not required for Level 1 and Level 2 ACP. Have at least one
available pneumatic tired roller conforming to 00745.24(c) on the Project and in good operating
condition for Level 3 and Level 4 ACP.

Have the CDT notify the Engineer and CAT-II when the average density for a subplot exceeds
95 percent of MAMD. Initiate an investigation to determine if the results indicate that a
problem with the mix is developing. An adjustment to the JMF will not be allowed unless MDV
testing supports a required change.

(2) Random Testing - Determine the density of each subplot by averaging five QC tests
performed at random locations with the nuclear gauge operated in the backscatter mode. Lots
and sublots shall correspond with those defined in 00745.02. In addition, perform at least one density test each Day of production. The additional testing may be waived by the Engineer.

a. Testing - After completion of the finish rolling, test according to AASHTO T 355. Do not locate the center of a density test less than 1 foot from the Panel edge. Complete density testing before traffic is allowed on the new mat.

b. Core Correlation of Nuclear Gauge Readings - Correlate each nuclear gauge on the Project for each Lift when requested or required. Perform core correlations and determine core correlation factors according to AASHTO T 355 and ODOT TM 327. Provide bulk specific gravity values to the Engineer within 24 hours of coring. If an Aggregate source or the asphalt cement source changes, new core correlations are required.

Apply correlation factors to all nuclear gauge readings for the Lift on which the core correlation was performed.

Both the Engineer and the Contractor may request additional core correlation of nuclear gauge readings. Core correlations requested by the Contractor or that are required due to a change in Aggregate or asphalt cement source will be at no additional cost to the Agency. The party requesting the core correlation pays the costs of coring and lab testing of the cores. The party performing nuclear gauge testing pays the costs of the nuclear gauge testing.

(3) Moving Average Maximum Density Method - The MAMD is the average of the current MDT and, if available, the four previous MDT’s for the JMF used. Determine each MDT using the Gmm determined according to AASHTO T 209 and calculate the MAMD according to ODOT TM 305.

When this method is used, compact the ACP to at least the percent of the MAMD applicable for the mix type and Lift as follows:

<table>
<thead>
<tr>
<th>Course of Construction</th>
<th>ACP</th>
</tr>
</thead>
<tbody>
<tr>
<td>First ACP Lift less than 3 inches placed on Aggregate Base</td>
<td>91.0 *</td>
</tr>
<tr>
<td>All other</td>
<td>92.0</td>
</tr>
</tbody>
</table>

*If any part of the width of a Lift at a station requires 91.0 percent, then the entire width of that Lift at that station shall be 91.0 percent

(4) Test Results - Provide density results for the completed sublots to the Engineer by the middle of the following working shift.

(c) Thin Pavement - Compaction to a specified density will not be required for Leveling, patches, or where the nominal compacted thickness of a Course of ACP will be less than 2 inches.

Perform breakdown and intermediate rolling until the entire surface has been compacted by at least four coverages of the rollers. Perform additional coverages, as directed, to obtain finish rolling of the ACP.

(d) Other Areas - Compaction to a specified density will not be required on temporary Surfacing, guardrail flares, mailbox turnouts, road approaches, Pavement repair, and areas less than 8 feet wide or limited length, regardless of thickness. Compact these surfaces according to 00749.45.

(e) Bridge Decks and End Panels - Compaction to a specified density will not be required for ACP placed on bridge decks and end Panels. Perform the same rolling pattern, without vibration, as established by 00745.49(b)(1). In the absence of a rolling pattern established
by 00745.49(b)(1), perform breakdown and intermediate rolling until the entire surface has been compacted by at least six coverages of the rollers. Perform additional coverages, as directed, to obtain finish rolling of the ACP.

Temporary

00745.50 Temporary Surfacing Course - Provide ACP for temporary Surfacing that is a well-graded, uniform, durable commercial mix. All new materials, or a combination of new materials and reclaimed materials, may be used, according to 00745.10(b). The Contractor is responsible for the quality of material furnished according to Section 00165 and for maintaining the surface in a condition appropriate for the facility. Mix used for temporary Surfacing will not be eligible for price adjustment under 00745.95.

Maintenance

00745.60 Correction of Defects - Correct all defects in material and Work, as directed, at no additional cost to the Agency, according to the following:

(a) Fouled Surfaces - Before the ACP cools repair, clean, and retack fouled surfaces that would prevent full bond between successive Lifts of mixture.

(b) Boils, Slicks, and Oversized Material - Before the ACP cools replace boils, slicks, and oversized material with fresh mixture.

(c) Segregation - Take corrective measures when segregation or non-uniform surface texture is occurring in the finished mat. If segregation continues to occur, stop production until a plan for providing uniform surface texture is approved.

(d) Roller Damage to Surface - Before the ACP cools correct surface damage from rollers with additional fresh mixture or by other approved means.

(e) Longitudinal Joints - Take corrective measures when open longitudinal joints are being constructed or when the elevation of the two sides of a longitudinal joint does not match. If problems with the longitudinal joint continue to occur, stop production until a plan for providing tight, equal elevation longitudinal joints is approved.

(f) Non-specification Compaction - Take corrective measures when the specified compaction density is not being achieved.

(g) Other Defects - Remove and replace any ACP that:

- Is loose, broken, or mixed with dirt.
- Shows visually too much or too little asphalt.

Finishing and Cleaning Up

00745.70 Pavement Smoothness - Furnish a 12-foot straightedge and, when required a 12-foot rolling straightedge, and test as specified. Additional testing may be required. Mark areas not meeting the surface tolerance.

(a) Level 1 and Level 2 ACP - Test with the 12-foot straightedge in travel lanes parallel to and perpendicular to the centerline, as directed. The Pavement surface shall not vary by more than 1/4 inch.
(b) Level 3 and Level 4 ACP:

(1) Single Course Construction - Test with the 12-foot straightedge in travel lanes parallel to and perpendicular to the centerline, as directed. The Pavement surface shall not vary by more than 1/4 inch.

(2) Multiple Course Construction - Test the surface of the Course on which the wearing Course is placed according to 00745.70(a).

Test the wearing surface with the rolling straightedge in the designated wheel path of a 0.1 mile strip of each travel lane per mile, where directed, and on each transverse joint throughout the Project. Operate the rolling straightedge parallel to the centerline. The surface shall not vary more than 0.015 foot.

Also test the wearing surface with a 12-foot straightedge placed perpendicular to the centerline at least once within the above-mentioned 0.1 mile strip. It shall not vary by more than 1/4 inch.

If the 0.1 mile testing strip meets the Specifications, no further testing of the mile represented by the testing strip will be required, except at the transverse joints. If any part of the testing strip does not meet the Specifications, test both wheel paths of the entire mile.

(c) Utility Appurtenances - If the Contractor constructs or adjusts Utility appurtenances, manhole covers, and valve boxes, the tolerances of 00745.70(a) and 00745.70(b) apply. If the Utility appurtenances are adjusted by others, these tolerances do not apply.

(d) Shoulders and Paved Medians - Test the Base and wearing Course with the 12-foot straightedge parallel to and perpendicular to the centerline for Shoulders and paved Medians where permanent traffic barriers will be located. The Pavement surface shall not vary by more than 1/4 inch.

00745.75 Correction of Pavement Roughness - Correct Equipment or paving operation procedures when tests show the Pavement smoothness does not comply with 00745.70. In addition, do the following:

(a) Methods - Correct surface roughness to the required tolerances, using one of the following methods as approved by the Engineer:

(1) Base Course:

- Profile to a maximum depth of 0.4 inch with Equipment meeting the requirements of 00620.20.
- Profile to a maximum depth of 0.4 inch with abrasive grinders equipped with a cutting head comprised of multiple diamond blades.
- Remove and replace the Base Lift.

(2) Wearing Course:

- Remove and replace the wearing surface Lift.
- Profile to a maximum depth of 0.3 inch with abrasive grinders equipped with a cutting head comprised of multiple diamond blades and apply an emulsion fog seal as directed.

(b) Time Limit - Complete correction of all surface roughness within 14 Calendar Days following notification, unless otherwise directed.
Measurement

**00745.80 Measurement** - The quantities of ACP will be measured on the weight basis, with separate measurement being made for the asphalt concrete mixture and the asphalt cement contained in the mixture. No deduction will be made for lime or any other additive used in the mixture.

When RAP, RAS, or RAM materials are used, measurement of the total asphalt quantity will be based on quality control tests averaged at least to the nearest 0.01 percent. For mixtures not containing RAP, RAS or RAM materials, measurement of the total asphalt quantity will be based on quality control tests averaged at least to the nearest 0.01 percent when the Engineer determines that payment by invoice and tank sticking is impracticable.

If an estimated bulk specific gravity for the Aggregates is shown in the Special Provisions, determine the actual bulk specific gravity for the Aggregates, recompute the quantities of ACP to be used, and inform the Agency in writing. The quantities of ACP will be adjusted accordingly with no adjustment in Contract unit prices. The provisions of 00140.20 and 00195.20 will apply.

When listed in the Contract Schedule of Items, extra or additional Work for approaches, driveways, walks, and other miscellaneous Structures will be measured according to 00749.80 through 00749.82.

If there is no separate item listed in the Contract Scheduled of Items for Leveling Work, the quantities will be included in the appropriate ACP items.

Payment

**00745.90 Payment** - The accepted quantities of ACP incorporated into the Project, whether or not recycled Materials are used, will be paid for at the Contract unit price, per unit of measurement, for the following items:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Unit of Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Level ____, ____ ____ ACP ____ ......................................................... Ton</td>
<td></td>
</tr>
<tr>
<td>(b) ____ Asphalt in ____ ACP ..................................................................... Ton</td>
<td></td>
</tr>
</tbody>
</table>

In item (a), the following will be inserted in the blanks:

- The level of ACP (1, 2, 3, 4) will be inserted in the first blank.
- The type of ACP (3/4 inch, 1/2 inch, 3/8 inch) will be inserted in the second blank.
- The words "Lime Treated" will be inserted in the third blank when applicable.
- The words "in Leveling", "in Temporary", or "in Leveling and Temporary" will be inserted in the fourth blank when applicable.

In item (b), the performance graded asphalt binder will be inserted in the first blank. The types of ACP will be inserted in the second blank. This item applies to all asphalt used in ACP, including residual asphalt in RAP, RAS, or combined RAP and RAS. Substituted asphalt cement described in 00745.11(a) will be paid for under the asphalt specified in the Contract Schedule of Items.

Payment will be payment in full for furnishing and placing all Materials, and for furnishing all Equipment, labor, and Incidents necessary to complete the Work as specified.

No separate or additional payment will be made for:
• reconditioning existing roadway
• Leveling Work
• lime
• QC testing
• sawing, cleaning, and filling joints on bridge deck overlays

When indicated by other Pay Items in the Contract Schedule of Items, separate payment will be made for Work described in 00745.42, 00749.91 and 00749.92.

When a Panel consists of both temporary and permanent Courses, payment for the entire Panel will be based on the permanent Course.

Anti-stripping asphalt cement additives will be paid for at the Contractor's actual documented costs with no percentage allowance or markup allowed. No additional payment will be made for anti-stripping additives or treatments that are not anti-stripping asphalt cement additives.

00745.95 Price Adjustments - The Composite Pay Factor (CPF), calculated according to 00165.40, 00745.16, and 00745.95, will be applied to the Contract unit price for Pay Items (a) and (b) of 00745.90 and to the applicable lot quantities. The CPF will be made available to the Contractor within 24 hours of receipt of the required quality control test results. If less than three samples are tested, the CPF will be computed as outlined in 00745.17 and 00745.95, the maximum CPF for material represented by less than three samples will be 1.0.

To accommodate the lot definition of 00745.02, interpret the upper specification limit (USL) and the lower specification limit (LSL) in 00165.40 to allow adjustments to a JMF according to 00745.16 without changing lots. Include all material from the original JMF and revisions of that JMF in the statistical analysis unless a change in the lot is required by 00745.02. If JMF target values are modified according to 00745.16, the CPF will be calculated in the following manner:

• The adjusted target value will be evaluated as zero with the USL and LSL representing the allowable tolerances of 00745.14. All sample test values for the changed constituents will be compared to the target for each sublot. The differences between the target values and sample test values are the adjusted sample test values for each sublot. These will be analyzed for determination of the pay factor for the constituent.

The Pay Factor (PF) for compaction will be:

<table>
<thead>
<tr>
<th>Type/Method</th>
<th>PF</th>
<th>Maximum PF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Pavement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control Strip Method</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>MAMD Method</td>
<td>1.05</td>
<td></td>
</tr>
<tr>
<td>Thin Pavement</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Other Areas</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Use the following table to determine price adjustments in the CPF for constituents of ACP.
**Gradation Constituents**

<table>
<thead>
<tr>
<th>All Aggregate Passing</th>
<th>3/4&quot;</th>
<th>1/2&quot;</th>
<th>3/8&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1/2&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&quot;</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>No. 4</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>No. 8</td>
<td>5</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>No. 30</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>No. 200</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

**Other Constituents**

- Asphalt Content: 28 28 28
- Compaction: 44 44 44

Those ACP constituents statistically evaluated will be eligible for a maximum PF of 1.05 (see 00165.50(b)(1)), unless otherwise specified.

When the CPF is greater than 1.000 for Material used in Leveling Courses for ACP, it will be reduced as follows:

Reduction in CPF = (CPF - 1) x 0.5

If these Specifications do not require measurement of a constituent, its individual PF will be considered 1.00 in calculating the CPF according to 00165.40.

A price adjustment will be determined by the following formulas:

\[(CPF - 1) \times [(JMF\% / 100 \times \text{Asphalt Unit Price}) + (ACP Unit Price)] \times (LQ) = \text{______}\]

Where:

- JMF\% is the asphalt cement % from the JMF
- LQ is the quantity of mixture in the lot