

SUPPLEMENTAL SPECIFICATIONS  
INDIANA DEPARTMENT OF TRANSPORTATION  
1999 STANDARD SPECIFICATIONS

REVISION TO 1999 STANDARD SPECIFICATIONS

SECTION 401, BEGIN LINE 31, INSERT AS FOLLOWS:

prior to use. The DMF shall state the maximum particle size in the mixture, *the calibration and test temperature to be used for the determination of binder content using the ignition oven, and the binder content as determined by ITM 571.* Approval of

SECTION 401, LINE 49, DELETE AND INSERT AS FOLLOWS:

Standard Practice for Designing Superpave HMA ..... AAASHTO PP 28

SECTION 401, BEGIN LINE 62, DELETE AND INSERT AS FOLLOWS:

The single percentage of aggregate passing each required sieve shall be within the limits of the following gradation ~~tables~~ *table*.

SECTION 401, DELETE LINES 65 THROUGH 69.

SECTION 401, BEGIN LINE 74, DELETE AND INSERT AS FOLLOWS:

Dust/Calculated Effective Binder Ratio shall be from 0.6 to ~~4.6~~ *1.2, except when the aggregate gradation passes beneath the boundaries of the restricted zone. When the aggregate gradation passes beneath the boundaries of the restricted zone, the Dust/Calculated Effective Binder Ratio shall be from 0.8 to 1.6.* The optimum binder content shall produce 4.0% air voids at  $N_{des}$ . The design shall have at least four points, including a minimum of two points above and one point below the optimum. The ~~amount of maximum specific gravity of the uncompact~~ *amount of maximum specific gravity of the uncompact* mixture shall be determined in accordance with AASHTO T 209.

The mixture shall be tested for moisture susceptibility in accordance with AASHTO T 283 except that the loose mixture curing shall be replaced by short term aging for 2 h in accordance with AASHTO PP 2. The minimum tensile strength ratio, TSR, shall be 80%. The ~~150 mm (6 in.)~~ *100 mm (4 in.)* mixture specimens shall be compacted in accordance with ~~AASHTO TP 4~~ *the Asphalt Institute publication "Mix Design Methods for Asphalt Concrete and Other Hot Mix Types", MS-2, for 75 blow Marshall specimens.* If anti-stripping additives are added to the mixture to be in accordance with the minimum TSR requirements, the dosage rate shall be submitted with the DMF.

SECTION 401, DELETE LINES 100 THROUGH 101.

SECTION 401, AFTER LINE 102, INSERT AS FOLLOWS:

<b>GYRATORY COMPACTION EFFORT</b>					
<b>ESAL</b>	<b><math>N_{ini}^*</math></b>	<b><math>N_{des}^*</math></b>	<b><math>N_{max}^*</math></b>	<b>Max. % Gmm @ <math>N_{ini}</math></b>	<b>Max. % Gmm @ <math>N_{max}</math></b>
<b>&lt; 300,000</b>	<b>6</b>	<b>50</b>	<b>75</b>	<b>91.5</b>	<b>98.0</b>
<b>300,000 to &lt; 3,000,000</b>	<b>7</b>	<b>75</b>	<b>115</b>	<b>90.5</b>	<b>98.0</b>
<b>3,000,000 to &lt; 10,000,000</b>	<b>8</b>	<b>100</b>	<b>160</b>	<b>89.0</b>	<b>98.0</b>
<b>10,000,000 to &lt; 30,000,000</b>	<b>8</b>	<b>100</b>	<b>160</b>	<b>89.0</b>	<b>98.0</b>
<b><math>\geq 30,000,000</math></b>	<b>9</b>	<b>125</b>	<b>205</b>	<b>89.0</b>	<b>98.0</b>

\*  $N_{ini}$ ,  $N_{des}$ ,  $N_{max}$  - definitions are included in AASHTO PP 28.

SECTION 401, BEGIN LINE 103a, DELETE AND INSERT AS FOLLOWS:

<b>VOIDS FILLED WITH ASPHALT (VFA) CRITERIA @ <math>N_{des}</math></b>	
<b>ESAL</b>	<b>VFA, Percent</b>
<b>&lt; 300,000</b>	<b>70 - 80</b>
<b><del>&lt; 1,000,000</del></b> <b>300,000 to &lt; 3,000,000</b>	<b>65 - 78</b>
<b><del>&lt; 3,000,000</del></b> <b>3,000,000 to &lt; 10,000,000</b>	<b><del>65 - 78</del></b> <b>65 - 75</b>
<b><del>&lt; 10,000,000</del></b> <b>10,000,000 to &lt; 30,000,000</b>	<b><del>65 - 75</del></b> <b>65 - 75</b>
<b><del><math>\geq 10,000,000</math></del></b> <b><math>\geq 30,000,000</math></b>	<b><del>65 - 75</del></b> <b>65 - 75</b>

Note 1: For 9.5 mm nominal maximum size mixtures, the specified VFA range shall be 73% to 76% for design traffic levels  $\geq 3$  million ESALS.

Note 2: For 25.0 mm nominal maximum size mixtures, the specified lower limit of the VFA shall be 67% for design traffic levels < 0.3 million ESALS.

Note:3: For 37.5 mm nominal maximum size mixtures, the specified lower limit of the VFA shall be 64% for all design traffic levels.

SECTION 401, BEGIN LINE 115, DELETE AND INSERT AS FOLLOWS:

Recycled materials may be used as a substitute for a portion of the new materials required to produce HMA mixtures. When only RAP is used in the mixture, the RAP shall not exceed ~~25%~~ 25.0% by mass (weight) of the total mixture. When only ARS is used in the mixture, the ARS shall not exceed ~~5%~~ 5.0% by mass (weight) of the total mixture. For substitution or use, ~~1%~~ 1.0% of ARS is considered equal to ~~5%~~ 5.0% RAP. The percentages of recycled materials shall be as specified on the DMF.

SECTION 401, BEGIN LINE 128, DELETE AND INSERT AS FOLLOWS:

Mixtures containing ~~15%~~ 15.0% or less RAP, shall use the same grade of binder as specified. The binder for mixtures containing greater than ~~15%~~ 15.0% and up to ~~25%~~ 25.0% RAP shall be reduced by one temperature classification, 6EC, for both the upper and lower temperature classifications.

**401.07 Lots and Sublots.** Lots will be defined as 4000 Mg (~~4164~~ 4400 t) of base or intermediate mixtures or 2400 Mg (~~2500~~ 2800 t) of surface mixture. Lots will be further sub-divided into sublots not to exceed 1000 Mg (~~1041~~ 1100 t) of base or intermediate mixtures or 600 Mg (~~624~~ 700 t) of surface mixtures. Partial sublots of 100 Mg (~~104~~ 100 t) or less will be added to the previous subplot. Partial sublots greater than 100 Mg (~~104~~ 100 t) constitute a full subplot.

140 | **401.08 Job Mix Formula.** The A job mix formula, JMF, shall be developed by a certified HMA producer in accordance with ITM 582. The JMF for each mixture shall be submitted to the Engineer.

**401.09 Acceptance of Mixtures.** Acceptance of mixtures for binder content, coarse aggregate angularity and gradation for each lot will be ~~determined on the basis of extraction, coarse aggregate angularity and gradation based on~~ tests performed by the Engineer.

The Engineer will randomly select the location(s) within each subplot for sampling in accordance with the ITM 802.

150 | ~~One random~~ Two samples from each random location shall be obtained from each subplot from the pavement in accordance with ITM 580. *The second sample shall be located from the random sample by offsetting 0.3 m (1 ft) transversely towards the center of the mat.* The test results of the sublots will be averaged and shall meet

SECTION 401, BEGIN LINE 158, DELETE AND INSERT AS FOLLOWS:

The Engineer's acceptance test results will not be made available until a lot is completed ~~and~~ after the certified HMA plant's adjustment period. *Test results during the adjustment period will be available at the completion of each test.*

SECTION 401, BEGIN LINE 161a, INSERT AS FOLLOWS:

ACCEPTANCE TOLERANCE FOR MIXTURES (")										
MIXTURE	NUMBER OF TESTS	SIEVE SIZE								
		*37.5 mm	*25.0 mm	*19.0 mm	*12.5 mm	*9.5 mm	*4.75 mm	2.36 mm	600 Fm	75 Fm
BASE	1							10.0	6.0	2.0
	2							7.0	4.2	1.4
	3							5.8	3.5	1.2
	4							5.0	3.0	1.0
INTERMEDIATE	1							10.0	6.0	2.0
	2							7.0	4.2	1.4
	3							5.8	3.5	1.2
	4							5.0	3.0	1.0
SURFACE	1							8.0	4.0	1.0**
	2							5.7	2.8	0.7**
	3							4.6	2.3	0.6**
	4							4.0	2.0	0.5**

\* The acceptance tolerance for this sieve shall be the applicable composition limits specified in 401.05.

\*\* Acceptance tolerances will be the same as the intermediate and base mixtures when the ignition oven is used

SECTION 401, BEGIN LINE 164, DELETE AND INSERT AS FOLLOWS:

Acceptance of mixtures for range will be determined using the ~~sublot test results of subplot tests~~ *the extraction and gradation tests performed by the Engineer* from each lot. If the range is not in accordance with the requirements, adjustment points will be assessed in accordance with 401.19(a).

SECTION 401, BEGIN LINE 169, INSERT AS FOLLOWS:

Acceptance tolerance for coarse aggregate angularity shall be minus 5.0% of the value as shown on the *DMF or JMF*.

SECTION 401, BEGIN LINE 180, INSERT AS FOLLOWS:

Single test values and averages will be reported to the nearest 0.1%. Rounding will be in accordance with ASTM E 29 *using the rounding method*.

SECTION 401, BEGIN LINE 206, INSERT AS FOLLOWS:

**401.11 Preparation of Surfaces to be Overlaid.** The subgrade shall be shaped to the required grade and sections, free from all ruts, corrugations, or other irregularities, and uniformly compacted and approved in accordance with 207. *Milling of an existing pavement surface shall be in accordance with 202.05.* Surfaces on which a mixture is placed shall be free from objectionable or foreign materials at the time of placement.

Compacted aggregate bases and rubblized pavements shall be primed in accordance with 405. Portland cement concrete, *milled asphalt surfaces*, and asphalt surfaces shall be tacked in accordance with 406. Contact surfaces of curbing, gutters, manholes, and other structures shall be tacked in accordance with 406.

SECTION 401, BEGIN LINE 272, DELETE AND INSERT AS FOLLOWS:

**401.16 Density.** The type of density acceptance method for all QC/QA mainline mixtures shall be determined by the number of mainline ESAL. Density of the compacted mixture ~~shall will~~ be accepted by using cores when the ESAL are equal to or greater than ~~10,000,000~~ *1,000,000* in accordance with 401.16(a). ~~Nuclear testing devices shall be used when the~~  
~~ESAL are equal to or greater than 3,000,000 and less than 10,000,000 in accordance with 401.16(b).~~ Standard rolling pattern practices shall be used when the ESAL are less than ~~3,000,000~~ *1,000,000* in accordance with 401.16(c).

SECTION 401, BEGIN LINE 296, DELETE AND INSERT AS FOLLOWS:

Sublot and lot density values will be reported to the nearest 0.1%. Rounding will be in accordance with ASTM E 29 *using the rounding method*.

**(a) Mainline ESAL Equal To or Greater Than ~~10,000,000~~ *1,000,000*.**

~~Acceptance for~~

~~density~~ *Density acceptance* for all QC/QA mixtures shall be based on cores cut from the compacted pavement and analysis of *pavement* samples obtained in accordance with ~~401.09~~ *ITM 580*. Acceptance will be based on lots and sublots in accordance with 401.07. The Engineer will randomly select two locations in accordance with ITM 802, within each sublot for ~~testing~~ *coring*. The transverse core location will be located so that the edge of the core will be no closer than 75 mm (3 in.) from a confined edge or 150 mm (6 in.) from a non-confined edge of the course being placed. *An additional plate sample for determining the maximum specific gravity shall be obtained adjacent to the location determined in accordance with 401.09. The adjacent sample will be located by offsetting 0.3 m (1 ft) transversely towards the center of the mat from the mixture sample.*

SECTION 401, DELETE LINES 324 AND 325.

SECTION 401, BEGIN LINE 336, DELETE AND INSERT AS FOLLOWS:

Within one work day of coring operations the Contractor ~~shall~~ clean, dry, and refill the core holes with ~~suitable~~ *HMA of similar or smaller size particles or other approved materials*. The Contractor's plan for refilling core holes shall be outlined in the QCP.

**(b) Mainline ESAL Equal To or Greater Than ~~3,000,000~~ and Less Than ~~10,000,000~~ *Blank*.** ~~Acceptance for density for QC/QA mixtures shall be based on nuclear testing~~

SECTION 401, DELETE LINES 342 THROUGH 364.

SECTION 401, BEGIN LINE 366, DELETE AND INSERT AS FOLLOWS:

**(c) Mainline ESAL Less Than 3,000,000 1,000,000.** Density requirements for the compacted mixture shall be controlled in accordance with 402.10 and 402.13.

SECTION 401, BEGIN LINE 498, DELETE AND INSERT AS FOLLOWS:

3. The coarse aggregate angularity is ~~in accordance with the minimum within the tolerance~~ requirements of ~~904.02(c) 401.09~~.

SECTION 401, BEGIN LINE 510, DELETE AND INSERT AS FOLLOWS:

**1. Mainline ESAL Equal To or Greater Than 10,000,000 1,000,000.**

Pay Adjustments - Percent	For Thickness of Base & Intermediate $\geq$ 37.5 mm (1.5 in.) and all Surfaces Mixes	For Thickness of Intermediate Mixes < 37.5 mm (1.5 in.)
	Percentages are based on % MSG	
submitted to the Materials and Tests Division for disposition	$\geq$ 97.0	$\geq$ 97.0
1.0 points for each 0.1 % above 96.0	96.0 - 96.9	96.0 - 96.9
100	92.0 - 95.9	91.0 - 95.9
<del>0.05</del> 0.2 points for each 0.1 % below 92.0/91.0	91.0 - 91.9	90.0 - 90.9
<del>0.5</del> 2.0 + 0.4 points for each 0.1 % below 91.0/90.0	90.0 - 90.9	89.0 - 89.9
<del>4.5</del> 6.0 + 1.0 points for each 0.1 % below 90.0/89.0	88.0 - 89.9 See Note 1	87.0 - 88.9 See Note 1
submitted to the Materials and Tests Division for disposition	$\leq$ 87.9 See Note 1	$\leq$ 86.9 See Note 1

Note 1: If two consecutive lots fall within this range, the Contractor shall stop production of the mix, identify an action plan to address the deficiencies, and submit an addendum to the QCP.

SECTION 401, BEGIN LINE 514, DELETE AND INSERT AS FOLLOWS:

**2. Mainline ESAL Equal To or Greater Than 3,000,000 and Less Than 10,000,000 Blank.** If the average density of a subplot is less than 95.0% of the target density,

SECTION 401, DELETE LINES 516 THROUGH 521d.

SECTION 401, LINE 532, DELETE AND INSERT AS FOLLOWS:

$$q_s = \frac{P}{100} \sum_{i=1}^n A \times \frac{S}{1000-T} \times U$$

SECTION 401, AFTER LINE 539, INSERT AS FOLLOWS:

$T = \text{conversion factor: } 1000 \text{ kg/m}^2 \text{ (2000 lb/ton)}$

SECTION 401, LINE 553, INSERT AS FOLLOWS:

take cores in accordance with ITM 580. *The core location will be within 0.3 m (1.0 ft) longitudinally of the sample tested using the same transverse offset.*

SECTION 401, BEGIN LINE 557, DELETE AND INSERT AS FOLLOWS:

**1. Mainline ESAL Equal To or Greater Than 10,000,000 1,000,000.** If an appeal is granted, additional cores shall be taken within five calendar days unless otherwise directed. Additional core locations will be ~~within~~ *determined by adding* 0.3 m (1.0 ft) longitudinally of the cores tested using the same transverse offset. Each subplot density will be calculated using the average bulk specific gravity of the cores obtained for that subplot and the average MSG of the lot.

SECTION 401, BEGIN LINE 567, DELETE AND INSERT AS FOLLOWS:

**~~2. Mainline ESAL Equal To or Greater Than 3,000,000 and Less Than 10,000,000 Blank.~~** ~~Sublots below 95% density may be appealed. Upon approval of the appeal~~

SECTION 401, DELETE LINES 569 THROUGH 581.

SECTION 401, LINE 598, INSERT AS FOLLOWS:

Payment for furnishing, calibrating, and operating the profilograph, and furnishing profile information will be made at the contract lump sum price for profilograph, *HMA*.

SECTION 401, LINE 624, INSERT AS FOLLOWS:

Profilograph, *HMA* ..... LS

SECTION 401, BEGIN LINE 643, INSERT AS FOLLOWS:

The price for profilograph, *HMA* will be full compensation regardless of how often the profilograph is used or how many profilograms are produced.

SECTION 402, LINE 26, INSERT THE FOLLOWING:

a format acceptable to the Engineer. The JMF shall state the maximum particle size in the mixture *and the calibration factor and test temperature to be used for the determination of binder content using the ignition oven. The binder content specified for the JMF shall be that shown on the tables plus the difference between the actual binder content and the binder content determined by ITM 571.* Approval of the JMF will be based on the ESAL and mixture designation. A

SECTION 402, BEGIN LINE 72, DELETE AND INSERT AS FOLLOWS:

Recycled materials may be used as a substitute for a portion of the new materials required to produce HMA mixtures. When only RAP is used in the mixture, the RAP shall not exceed ~~25%~~ 25.0% by mass (weight) of the total mixture. When only ARS is used in the mixture, the ARS shall not exceed ~~5%~~ 5.0% by mass (weight) of the total mixture. For substitution or use, ~~1%~~ 1.0% ARS is considered equal to ~~5%~~ 5.0% RAP. The percentages of recycled materials shall be as specified on the JMF.

SECTION 402, BEGIN LINE 85, DELETE AND INSERT AS FOLLOWS:

Mixtures containing ~~15%~~ 15.0% or less RAP, the asphalt materials shall be PG 64-22 or AE-60. Mixtures containing greater than ~~15%~~ 15.0% and up to ~~25%~~ 25.0% RAP, the grade of asphalt material shall be PG 58-28 or AE-90.

SECTION 402, DELETE LINES 89 THROUGH 106.

SECTION 402, AFTER LINE 107, INSERT AS FOLLOWS:

**402.06 Acceptance of Mixtures.**

**(a) Mainline and Shoulders.** Sampling of the HMA mixture will be in accordance with ITM 580 except that two samples shall be obtained at each sample location and performed where deemed necessary. Acceptance of the mixtures for binder content and gradations will be based on tests performed by the Engineer. Sampling and testing will be performed by the Engineer in accordance with the Frequency Manual.

When mixtures in accordance with 401.08 are supplied as allowed in 402.03, gradation acceptances will be based on the following:

ACCEPTANCE TOLERANCE FOR MIXTURES (")									
MIXTURE	SIEVE SIZE								
	*37.5 mm	*25.0 mm	*19.0 mm	*12.5 mm	*9.5 mm	*4.75 mm	2.36 mm	600 Fm	75 Fm
Base							10.0	6.0	2.0
Intermediate							10.0	6.0	2.0
Surface							8.0	4.0	2.0

\* The acceptance tolerance for this sieve shall be the applicable composition limits specified in 401.05.

Gradation test results which are outside the composition limits will be considered and adjudicated as a failed material in accordance with normal Department practice as listed in 105.03.

Asphalt test results which are more than " 0.5% from the JMF will be considered as a failed material and adjudicated in accordance with normal Department practice as listed in 105.03.

**(b) Wedge and Leveling and Rumble Strips.** Sampling, testing, and acceptance of the material will be in accordance with 402.06(a) unless mixtures in accordance with 401.08 are supplied as allowed in 402.03. When mixtures in accordance with 401.08 are supplied, all applicable requirements of 401.02 shall be met.

Acceptance of mixtures in accordance with 401.08 will be on the basis of a type D certification in accordance with 916.02(d). The test results shown on the certification shall be the quality control tests representing the material supplied. The testing frequency for the 401.08 mixtures shall be in accordance with ITM 582.

SECTION 402, BEGIN LINE 127, DELETE AND INSERT AS FOLLOWS:

Binder draindown shall not exceed 0.5% for Base C50.0 mm, Base C25.0 mm, and Intermediate ~~C190.0 mm~~ C19.0 mm mixtures.



SECTION 402, BEGIN LINE 151, INSERT AS FOLLOWS:

and uniformly compacted and approved in accordance with 207. *Milling of an existing surface shall be in accordance with 202.05.* Surfaces on which a mixture is placed shall be free from objectionable or foreign materials at the time of placement.

Compacted aggregate bases and rubblized ~~pavements~~ *bases* shall be primed in accordance with 405. Portland cement concrete, *milled asphalt surfaces* and asphalt surfaces shall be tacked in accordance with 406. Contact surfaces of curbing, gutters, manholes, and other structures

SECTION 402, BEGIN LINE 254, DELETE AND INSERT AS FOLLOWS:

Option 4: For courses  $\leq 180$  270 kg/m<sup>2</sup> (~~330~~ 495 lb/sq yd), compaction may be completed utilizing vibratory rollers in accordance with the Department's Approved Equipment List - Vibratory Rollers.

SECTION 402, DELETE LINES 269 THROUGH 273.

SECTION 402, AFTER LINE 274, INSERT AS FOLLOWS:

*Longitudinal joints shall be compacted in accordance with the following:*

- (a) *For confined edges, the compaction equipment shall be on the hot mat and extend 150 mm (6 in.) along the longitudinal joint for all passes except when compacting the shoulders along a confined edge or where conditions only allow the compaction equipment to be entirely on the hot mat. When compacting shoulders along a confined edge, the compaction equipment shall be entirely on the hot mat.*
- (b) *For unconfined edges, the compaction equipment shall extend 150 mm (6 in.) beyond the edge of the hot mat for all passes.*

SECTION 402, BEGIN LINE 297, INSERT AS FOLLOWS:

**402.14 Low Temperature Density Requirements.** Compaction for mixtures, except C50.0 mm, C25.0 mm, C19.0 mm, and 4.75 mm mixes, placed below the temperatures listed in 402.10 shall be controlled by air voids determined from cores cut from the compacted pavement placed during a low temperature period. Acceptance will be based on a minimum of two cores per section. Sections are defined as a maximum of 1000 Mg (~~1041~~ 1100 t) of HMA base or intermediate or 600 Mg (~~624~~ 700 t) of HMA surface. The Engineer will randomly select locations in accordance with

SECTION 402, BEGIN LINE 339, DELETE AND INSERT AS FOLLOWS:

with AASHTO T 209 from the first mixture sample of the day. Air voids shall not be greater than ~~8%~~ 8.0%. Within one work day of coring operations, the Contractor shall clean, dry, refill, and compact the core holes with ~~suitable~~ *HMA of similar or smaller size particles or other approved materials.*

SECTION 405, LINE 12, DELETE AS FOLLOWS:

Asphalt Emulsion, AE-P ~~or AE-PL~~ ..... 902.01(b)

SECTION 408, LINE 185, DELETE AND INSERT AS FOLLOWS:

**1. Profilograph.** *The profilograph shall be in accordance with ITM 901.*  
~~A profilograph is an instrument that very precisely~~

SECTION 408, DELETE LINES 186 THROUGH 193.