400-R-610 PROVISIONS FOR HMA MIXTURES

(Revised 05-15-14)

The Standard Specifications are revised as follows:

SECTION 401, BEGIN LINE 68, DELETE AND INSERT AS FOLLOWS:

Dense Graded, Mixture Designation – Control Point (Percent Passing)					
	25.0 mm	19.0 mm	12.5 mm	9.5 mm	4.75 mm**
Sieve Size					
50.0 mm					
37.5 mm	100.0				
25.0 mm	90.0 - 100.0	100.0			
19.0 mm	< 90.0	90.0 - 100.0	100.0		
12.5 mm		< 90.0	90.0 - 100.0	100.0	100.0
9.5 mm			< 90.0	90.0 - 100.0	95.0 - 100.0
4.75 mm				< 90.0	90.0 - 100.0
2.36 mm	19.0 - 45.0	23.0 - 49.0	28.0 - 58.0	32.0 - 67.0*	
1.18 mm					30.0 - ~~60.0~~*55.0*
600 µm					
300 µm					
75 µm	1.0 - 7.0	2.0 - 8.0	2.0 - 10.0	2.0 - 10.0	~~6.0 - 12.0~~*3.0 - 8.0*
* The mix design gradation shall be less than or equal to the PCS control point for 9.5 mm category 3, 4 and 5 surface mixtures. ** *The total blended aggregate gradation for the 4.75 mm mixture shall have a fineness modulus greater than or equal to 3.30 as determined in accordance with AASHTO T 27.*					

PCS Control Point for Mixture Designation (Percent Passing)					
Mixture Designation	25.0 mm	19.0 mm	12.5 mm	9.5 mm	4.75 mm
Primary Control Sieve	4.75 mm	4.75 mm	2.36 mm	2.36 mm	NA
PCS Control Point	40	47	39	47	NA

Open Graded, Mixture Designation – Control Point (Percent Passing)			
	OG9.5	OG19.0	OG25.0
Sieve Size			
37.5 mm			100.0
25.0 mm		100.0	70.0 – 98.0
19.0 mm		70.0 – 98.0	50.0 – 85.0
12.5 mm	*100.0*	40.0 – 68.0	28.0 – 62.0
9.5 mm	*75.0-100.0*	20.0 – 52.0	15.0 – 50.0
4.75 mm	*10.0-35.0*	10.0 – 30.0	6.0 – 30.0
2.36 mm	*0.0-15.0*	7.0 – 23.0	7.0 – 23.0
1.18 mm		2.0 – 18.0	2.0 – 18.0
600 µm		1.0 – 13.0	1.0 – 13.0
300 µm		0.0 – 10.0	0.0 – 10.0
150 µm		0.0 – 9.0	0.0 – 9.0
75 µm	*0-6.0*	0.0 – 8.0	0.0 – 8.0
% of Binder	*> 3.0*	> 3.0	> 3.0

Dust/Calculated Effective Binder Ratio shall be taken from 0.6 to 1.2, when the aggregate gradation passes above the primary control sieve, PCS, control point and 0.8 to 1.6 when the aggregate gradation is less than or equal to the PCS. The Dust/Calculated Effective Binder Ratio for 4.75 mm mixtures shall be ~~0.9~~ *0.8* to 2.0.

The optimum binder content shall produce the following air voids at N_{des}:

Air Voids at Optimum Binder Content								
	Dense Graded					*Open Graded*		
Mixture Designation	*25.0 mm*	*19.0 mm*	*12.5 mm*	*9.5 mm*	*4.75 mm*	*25.0 mm*	*19.0 mm*	*9.5 mm*
Air Voids	*4.0%*	*4.0%*	*4.0%*	*4.0%*	*5.0%*	*15.0% - 20.0%*		*10.0% - 15.0%*

~~The optimum binder content for dense graded mixtures shall produce 4.0% air voids at N_{des} and for open graded mixtures shall produce 15.0% – 20.0% air voids at N_{des}.~~ The design for dense graded mixtures shall have at least four points, including a minimum of two points above and one point below the optimum. A one point design may be used for open graded mixtures. The maximum specific gravity shall be mass determined in water in accordance with AASHTO T 209. The bulk specific gravity of the gyratory specimens shall be determined in accordance with AASHTO T 166, Method A or AASHTO T 275, if required, for dense graded mixtures and AASHTO T 331 for open graded mixtures.

SECTION 401, BEGIN LINE 127, DELETE AND INSERT AS FOLLOWS:

VOIDS FILLED WITH ASPHALT, VFA, CRITERIA @ N_{des}	
ESAL	VFA, %
< 300,000	70 – 80
300,000 to < 3,000,000	65 – 78
3,000,000 to < 10,000,000	65 – 75
10,000,000 to < 30,000,000	65 – 75
≥ 30,000,000	65 – 75

Notes:
1. For 9.5 mm mixtures, the specified VFA range shall be 73% to 76% for design traffic levels ≥ 3 million ESALs.
2. For 25.0 mm mixtures, the specified lower limit of the VFA shall be 67% for design traffic levels < 0.3 million ESALs.
3. For 4.75 mm mixtures, the specified VFA range shall be ~~75% to 78%~~*66% to 79%*. ~~for design traffic levels ≥ 3 million ESALs.~~
4. For *OG 9.5 mm*, OG19.0 mm, ~~and~~ OG25.0 mm mixtures, VFA is not applicable.

SECTION 401, BEGIN LINE 152, DELETE AS FOLLOWS:

RAS may be obtained from either pre-consumer or post-consumer asphalt shingles. Post-consumer asphalt shingles shall be in accordance with AASHTO MP 15 and prepared by a processing company with an IDEM Legitimate Use Approval letter. A copy of this letter shall be submitted to the Engineer. Deleterious material present in post-consumer asphalt shingles shall be limited to the percentages stated in AASHTO MP 15. Pre-consumer and post-consumer asphalt shingles shall not be blended for use in HMA mixtures ~~and shall be stockpiled separately from other materials~~.

SECTION 401, BEGIN LINE 193, INSERT AS FOLLOWS:

401.08 Job Mix Formula

A job mix formula, JMF, shall be developed by a certified HMA producer. A JMF used in the current or previous calendar year that was developed to N_{des} will be allowed. The mixture compaction temperature shall be 300 ± 9°F for dense graded mixtures and 260 ± 9°F for open graded mixtures. The JMF shall list the minimum and maximum plant discharge temperatures as applicable to the mixture. The JMF for each mixture shall be submitted to the Engineer and shall use the same MAF as the DMF. *A JMF of the same*

gyratory compactive effort ESAL category or higher approved in the current calendar year may be submitted for use.

401.09 Acceptance of Mixtures

Acceptance of mixtures for binder content, VMA at N_{des}, and air voids at N_{des} for each lot will be based on tests performed by the Engineer for dense graded *9.5 mm, 12.5 mm, 19.0 mm and 25.0 mm* mixtures with original contract pay item quantities greater than or equal to 300 t. Acceptance of mixtures for binder content and air voids at N_{des} will be based on a type D certification in accordance with 402.09 for dense graded mixtures with original contract pay item quantities less than 300 t. *Acceptance of mixtures for binder content and air voids at N_{des} for each lot will be based on a type D certification in accordance with 402.09 for dense graded 4.75 mm mixtures.*

Acceptance of mixtures for binder content and air voids at N_{des} for each lot will be based on tests performed by the Engineer for open graded mixtures *with original contract pay item quantities greater than or equal to 300 t. Acceptance of mixtures for binder content and air voids at N_{des} will be based on a type D certification in accordance with 402.09 for open graded mixtures with original pay item quantities less than 300 t, except the air voids tolerance shall be ±3.5% from the DMF or JMF.*

SECTION 401, AFTER LINE 265, INSERT AS FOLLOWS:

Samples shall not be obtained from areas placed with paving equipment in accordance with 409.03(c)2 or 409.03(c)3. If a random location falls within this area, the Engineer will randomly select another location within the sublot for sampling. If an entire sublot falls within this area, test results from the previous sublot will be used for acceptance. If the previous sublot is not available, the subsequent sublot will be used for acceptance.

SECTION 401, BEGIN LINE 377, INSERT AS FOLLOWS:

The finished thickness of any course shall be at least two times but not more than four times the maximum particle size as shown on the DMF, *except 4.75 mm mixtures shall be at least 1.5 times but not more than 3 times the maximum particle size shown on the DMF.*

A safety edge shall be constructed at locations where a dense graded intermediate mixture or a surface mixture is constructed adjacent to an aggregate or earth shoulder.

Vibratory rollers in accordance with 409.03(d)4 shall not be operated in the vibratory mode at locations indicated on the plans. Oscillatory rollers in accordance with 409.03(d)5 will be permitted for use but the vertical impact force capability shall not be used. Density acceptance shall be in accordance with 401.16.

SECTION 401, AFTER LINE 414, INSERT AS FOLLOWS:

Compaction of 4.75 mm mixtures shall be in accordance with 402.15, except vibratory rollers shall be operated in static mode and the vertical impact force capability of oscillatory rollers shall not be used.

Compaction of mixtures with original contract pay item quantities less than 300 t shall be in accordance with 402.15.

SECTION 401, AFTER LINE 437, INSERT AS FOLLOWS:

Cores shall not be obtained from areas placed with paving equipment in accordance with 409.03(c)2 or 409.03(c)3. If a random location falls within this area, the Engineer will randomly select another location within the sublot for coring. If an entire sublot falls within this area, test results from the previous sublot will be used for acceptance. If the previous sublot is not available, the subsequent sublot will be used for acceptance.

SECTION 402, AFTER LINE 285, INSERT AS FOLLOWS:

Vibratory rollers in accordance with 409.03(d)4 shall not be operated in vibratory mode at locations indicated on the plans. Oscillatory rollers in accordance with 409.03(d)5 will be permitted for use but the vertical impact force capability shall not be used. Density acceptance shall be in accordance with 402.15.

SECTION 406, BEGIN LINE 25, INSERT AS FOLLOWS:

406.05 Application of Asphalt Material

The asphalt material shall be uniformly applied at the rate of from ~~0.03~~*0.05* to ~~0.08~~*0.10* gal./sq yd, or as otherwise specified or directed.

SECTION 410, AFTER LINE 231, INSERT AS FOLLOWS:

Samples shall not be obtained from areas placed with paving equipment in accordance with 409.03(c)2 or 409.03(c)3. If a random location falls within this area, the Engineer will randomly select another location within the sublot for sampling. If an entire sublot falls within this area, test results from the previous sublot will be used for acceptance. If the previous sublot is not available, the subsequent sublot will be used for acceptance.

SECTION 410, BEGIN LINE 298, DELETE AS FOLLOWS:

The rollers shall be operated to avoid shoving of the SMA and at speeds not to exceed 3 mph. Rollers shall be in accordance with 409.03(d)1, 2, or 7. Vibratory rollers meeting the requirements of 409.03(d)4 may be used but shall not be operated in vibratory mode, ~~except the vibratory mode may be used on the first pass to the paver.~~

SECTION 410, AFTER LINE 348, INSERT AS FOLLOWS:

Cores shall not be obtained from areas placed with paving equipment in accordance with 409.03(c)2 or 409.03(c)3. If a random location falls within this area, the Engineer will randomly select another location within the sublot for coring. If an entire sublot falls within this area, test results from the previous sublot will be used for acceptance. If the previous sublot is not available, the subsequent sublot will be used for acceptance.

SECTION 904, BEGIN LINE 128, INSERT AS FOLLOWS:

FINE AGGREGATE ANGULARITY		
TRAFFIC ESAL	DEPTH FROM SURFACE	
	≤ 4 in.	> 4 in.
< 300,000	*(Note 1)*	
300,000 to < 3,000,000	40 *(Note 1)*	40
3,000,000 to < 10,000,000	45	40
10,000,000 to < 30,000,000	45	40
≥ 30,000,000	45	45

Note 1: For 4.75 mm mixtures, the fine aggregate angularity shall be 40 for <300,000 ESAL and 45 for 300,000 to <3,000,000 ESAL.