Asphalt Mix Design General Checklist

An asphalt mix design cover sheet shall be submitted prior to use on a project. This document is intended to provide general guidance for local agencies to review asphalt mix designs in accordance with INDOT Specification Section 401.05. Changes to the source or type of aggregates shall require a new DMF. Any supporting asphalt mix design information shall be made available upon request.

Project _____

Mix Code _____

☐ The Asphalt Mixture Producer is listed on INDOT's Qualified Product List for Certified Hot Mix Asphalt Producer _____

☐ The mix design laboratory is listed on the DMF and can be found on the INDOT Qualified Hot Mix Asphalt Design Labs list _____

☐ The Type of mixture is identified and correlates to the pay item(s) Choose One

☐ The size of mixture is identified and correlates to the pay item(s) 25.0 mm

☐ If the DMF has been already reviewed and assigned a number by INDOT, no further review is necessary. INDOT DMF number is _____.

If the DMF does not have an INDOT assigned number, the following values shall be reported on the DMF:

☐ The total asphalt binder content.

☐ The liquid asphalt binder grade(s) and source(s) are listed. A change in source of liquid asphalt binder does not require a new DMF. SMA requires PG 58E-28 liquid asphalt binder.

☐ If a stabilizing additive is used, report the source, type, and dosage rate. A stabilizer is required to have virgin cellulose or virgin mineral fiber.

☐ The minimum TSR value shall be 80% for dense graded and open graded mixtures and 70% for SMA mixtures. 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. If the upper temperature classification of the PG binder is lower than the original PG grade, a new TSR value is required.

☐ Gradation of the mixture meets 401.05 for dense graded and open graded mixtures and 410.05 for SMA mixtures. The Primary Control Sieve for dense-graded mixtures meets the requirements of 401.05. Percentages of each component material along with their G_{sb} and absorption values are listed and match INDOT's G_{sb} list . A list of the G_{sb} instructions for what specific gravity and absorption values to use can be found here. A combined aggregate blend G_{sb} and absorption shall be reported on the DMF.

☐ Coarse aggregates shall consist of the following per 904.03 d:

- Type B surface mixtures may include ACBF slag, SF slag, sandstone, crushed dolomite, polish resistant aggregate, crushed stone and gravel.
- Type C surface mixtures may include ACBF slag, SF slag, crushed dolomite, polish resistant aggregate or any combination

thereof. Crushed stone or gravel shall not be used unless the aggregate is classified as a crushed dolomite or polish resistant aggregate.

- Type D surface mixtures shall include high friction aggregates like ACBF slag, SF slag, sandstone, or aggregates in accordance with ITM 221 and at a minimum comprise 50% by volume of the coarse aggregate. Crushed dolomite and polish resistant aggregates may be used up to a maximum of50% by volume of the coarse aggregate material retained on the No. 4 (4.75 mm) sieve when blended with a high friction aggregate. Crushed stone and gravel may be used up to a maximum of 20% by volume of the coarse aggregate material retained on the No. 4 (4.75 mm) sieve when blended with a high friction aggregate.
- SMA coarse aggregates may include SF slag, sandstone, crushed dolomite, and polish resistant aggregates in accordance with 904.03 (a) and ITM 220 (AS Aggregates). The Qualified Product Lists for dolomite aggregates can be found here, polish resistant aggregates here, and AS aggregates here. (904.03d)

☐ Fine aggregates for HMA shall be natural sand or crushed limestone, dolomite, gravel, sandstone, SF, or ACBF. SF sand may be used in HMA surfaces. SF sand may only be used in HMA base and intermediate mixtures if SF in accordance with 904.01 is used to produce the SF sand. Fine aggregate for SMA shall be limestone, dolomite, crushed gravel, SF, or ACBF.

☐ Aggregate Angularity minimum values shall be as follows:

Traffic ESAL	Coarse Aggregate Angularity		Fine Aggregate Angularity	
	Depth From Surface		Depth From Surface	
	≤ 4 in	> 4in	≤ 4 in	> 4in
< 3,000,000	75	50	40**	40
3,000,000 to < 10,000,000	85/80*	60	45	40
≥ 10,000,000	95/90*	95/90*	45	40
* Denotes two faced crush requirements ** For 4.75 mm mixtures, the fine aggregate angularity shall be 45 for < 3,000,000.				

Fine aggregate angularity does not apply to open graded mixtures. Crushed gravels shall have a minimum fine aggregate angularity of 45 for SMA and be non-plastic.

☐ Mineral filler for SMA shall consist of dust by producing crushed stone, portland cement, or other inert material having similar characteristics. The gradation shall be for No. 16 stone in accordance with 904.02(h). Mineral filler shall be in accordance with ITM 203 or from an ACBF slag source.

☐ The dust/calculated effective binder ration shall be 0.6 to 1.4. The dust/calculated effective binder ratio for 4.75 mm mixtures shall be 1.0 to 2.0.

☐ The optimum binder content shall produce a $\Delta P_b \leq 0.20$ is reported and calculated as determined in accordance with ITM 591.

☐ The air voids at optimum binder content are 5.0% for all dense graded mixtures and 4.0% for all SMA mixtures. Open graded 9.5 mm mixtures shall have 12.0% - 17.0% air voids at optimum binder content and open graded 19.0 mm and 25.0 mm mixtures shall have 15.0% - 20.0% air voids. The MSG and BSG shall be listed on the mix design.

☐ The Mix Adjustment Factor in accordance with 401.05. The MAF equals the Gmm from the mix design divided by 2.465 for 9.5 mm mixtures and 2.500 for 12.5 mm, 19.0 mm, and 25.0 mm mixtures. If the MAF calculation is 0.980 ≤ MAF ≤ 1.020 then the MAF shall be considered 1.000. If the MAF is > 1.020, the MAF shall have 0.020 subtracted from the calculated value. If the MAF is < 0.980, the MAF shall have 0.020 added to the value. MAF does not apply to OG mixtures.

☐ The percent draindown of open graded and SMA mixtures shall not exceed 0.30%. If fibers are incorporated into the mixture or if 3.0% reclaimed asphalt shingles by weight of the total mixture is used, the upper temperature classification should be reduced by 6°C.

☐ The mixture compaction temperature for specimens shall be 300±9°F for dense graded and SMA mixtures and 260°F for open graded mixtures.

☐ The following criteria shall be met:

GYRATORY COMPACTION EFFORT					
ESAL	**N_{ini}**	**N_{des}**	**N_{max}**	**Max % G_{mm} @ N_{ini}**	**Max % G_{mm} @ N_{max}**
Dense Graded 4.75 mm					
< 3,000,000	7	75	115	90.5	98.0
3,000,000 to < 10,000,000	8	100	160	89.0	98.0
≥ 10,000,000	8	100	160	89.0	98.0
Dense Graded 9.5 mm, 12.5 mm, 19.0 mm, and 25.0 mm					
< 3,000,000	5	30	40	91.5	97.0
3,000,000 to < 10,000,000	6	50	75	91.5	97.0
≥ 10,000,000	6	50	75	91.5	97.0
Open Graded					
All ESAL	n/a	20	n/a	n/a	n/a
*N_{ini}, N_{des}, and N_{max} are defined in AASHTO R 35					

Mixture Designation	**Minimum Voids in Mineral Aggregate @ N_{des}, VMA**	**Minimum Volume of Effective Binder @ N_{des}, V_{be}**
4.75 mm	17.0	12.0
9.5 mm	16.0	11.0
9.5 mm SMA	17.0	
12.5 mm	15.0	10.0
12.5 mm SMA	16.0	
19.0 mm	14.0	9.0
19.0 mm SMA	15.0	
25.0 mm	13.0	8.0
OG	n/a	n/a

Voids Filled with Asphalt, VFA, Criteria @ N_{des}	
ESAL	VFA, %
< 3,000,000	60 – 73
3,000,000 to < 10,000,000	60 – 70
≥ 10,000,000	60 - 70

Notes:

1. For 4.75 mm mixtures, the specified VFA range shall be 67% to 79%
2. For 9.5 mm mixtures, the specified VFA range shall be 69% to 72% for design traffic levels ≥ 3,000,000 ESALs.
3. For 25.0 mm mixtures, the specified lower limit of the VFA shall be 62% for design traffic levels < 300,000 ESALs.
4. For OG mixtures, VFA is not applicable

☐ The recycled material percentages shall be specified on the DMF as well as the percent binder content by mass of each material. The use of recycled materials is limited by the amount of binder replacement:

$$Binder\ Replacement, \% = \frac{(A\ x\ B) + (C\ x\ D)}{E}$$

A = RAP, % Binder Content by Mass of RAP
B = RAP, % by Total Mass of Mixture
C = RAS, % Binder Content by Mass of RAS
D = RAS, % by Total Mass of Mixture
E = Total, % Binder Content by Total Mass of Mixture

The percent binder replacement of any dense graded or open graded mixtures shall be ≤ 25.0%. The contribution of RAS to any HMA mixture shall be ≤ 3.0% by total mass of mixture and ≤ 15.0% binder replacement.

Additional Comments:

Reviewed by: _____