PRACTICE FOR SUPERPAVE MIX DESIGN

1. SCOPE

1.1 This document outlines the mix design procedures for Superpave hot mix asphalt.

1.2 This procedure may be used for mix designed with a content of Reclaimed Asphalt Pavement or Roof Shingle Tabs or both.

2. REFERENCES

2.1 MTO Test Methods

LS-306 Bulk Relative Density of Compacted Bituminous Mixtures Using Paraffin Coated Specimens

LS-307 Recycled Hot Mix Asphalt

LS-313 Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor

LS-604 Relative Density and Absorption of Coarse Aggregate

LS-605 Relative Density and Absorption of Fine Aggregate

2.2 AASHTO Standards

M 320-10 Performance-Graded Asphalt Binder

M 323-12 Superpave Volumetric Mix Design

R 35-12 Practice for Designing Superpave Volumetric Design for HMA

T 84-10 Specific Gravity and Absorption of Fine Aggregates

T 85-10 Specific Gravity and Absorption of Coarse Aggregates

T 166-12 Bulk Specific Gravity of Compacted Asphalt Mixtures Using Saturated Surface-Dry Specimens

T 275-07 Bulk Specific Gravity of Compacted Asphalt Mixtures Using Paraffin-Coated Specimens

T 283-07 Resistance of Compacted Asphalt Mixture to Moisture-Induced Damage

T 312-12 Preparing and Determining the Density of Hot-Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor

2.3 ASTM Standards

D6752-11 Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method

3. TERMINOLOGY

Job Mix Formula (JMF): The percentage passing on each designated sieve of the total mass of aggregate and the amount of asphalt cement as a percentage by mass of the mixture that are based on specified mix design procedures.

Performance Graded Asphalt Cement (PGAC): An asphalt binder that is produced from petroleum residue, either with or without the addition of non-particulate modifiers, according to AASHTO M 320.

Reclaimed Asphalt Pavement (RAP): The processed hot mix asphalt material that is recovered by partial or full depth removal.

Roof Shingle Tabs (RST): Ground roof shingle scrap generated when new shingles are trimmed during production.

4. PROCEDURE

Mix design procedures and tests shall be in accordance with AASHTO R 35 except as noted below.

5.0 EXCEPTIONS

5.1 Superpave mix designed with a content of Reclaimed Asphalt Pavement or Roof Shingle Tabs or both shall be designed in conjunction with LS-307.

5.2 All references to AASHTO M 323, with the exception of Appendix, are deleted and replaced by “the Owner”. The PGAC grade shall be provided by the owner. The aggregate selection shall be based on the traffic category provided by the owner. The mix shall be designed based on the number of gyrations determined from Table 1 based on the traffic category provided by the owner. The design aggregate structure and asphalt cement content shall be selected to conform to the requirements provided by the owner. The design shall meet the owner’s moisture sensitivity requirements.

5.3 References to AASHTO T 84 and AASHTO T 85 are deleted and replaced with LS-605 and LS-604, respectively. Additionally, determine the bulk specific gravity of the blended coarse aggregate and the blended fine aggregate using LS-604 and LS-605, respectively.

5.4 The calculation of the voids in mineral aggregate shall be based on the densities of the blended coarse and blended fine aggregate.

5.5 References to AASHTO T 275 are deleted and replaced with LS-306 or ASTM D6752.

5.6 References to AASHTO T 312 are deleted and replaced with LS-313.

6 REPORTING

6.1 Information shall be provided in a legible manner. The documentation required with the mix design submission is covered by AASHTO R 35. The documents shall include, but are not limited to, the following information:

6.1.1 Mix design and JMF documents that are signed, dated, and certified correct by the person accountable for the engineering and management responsibility for the laboratory that conducted the work.

6.1.2 Contract number, item number, and mix type for which the mix design and JMF were completed and a description of the usage of the mix on the Contract.

6.1.3 All material proportions and sources for aggregates, including the owner's Mineral Aggregate Inventory for the aggregate sources, asphalt cement, mineral fillers, fibres, and the name of each product, its manufacturer, and the manufacturer's data sheet. Information provided for fibres shall include test results for all the owner's fibre requirements. The amount of RAP or RST or both in per cent by mass and volumetric data shall also be included.

6.1.4 PGAC and source and per cent by mass of the required new asphalt cement. Information on asphalt cement modifiers or any other additives, including name, source, type, manufacturer, its manufacturer's data sheet, and per cent by mass of asphalt cement.

A graph of the temperature-viscosity relationship for the PGAC that is to be used in the mix. The graph will show the viscosity over a temperature range of at least 135-165 ^{o}C, and will indicate the recommended mixing and compaction temperatures. Mixing and compaction temperature used in the mix design and the compaction temperature of the reheated mixture to be employed in the testing of the production mix.

6.1.5 AASHTO T 283 test results and AASHTO T 283's completed Moisture Damage Laboratory Data Sheet. If more than 0.5% liquid anti-stripping additive is required, test results indicating 0.5% liquid anti-stripping additive are not adequate. All visual observations made during the design process with particular attention and comments regarding stripping and coating for both the coarse and fine aggregates.

6.1.6 Information regarding fines that are returned to the mix, aggregate breakdown during production, and the resultant change in the aggregate gradations.

6.1.7 Complete gradations for all coarse and fine aggregates, aggregate absorptions, and bulk specific gravity and saturated surface dry density for each aggregate, the blended coarse aggregate, the blended fine aggregate, and the combined aggregate density along with information on the test method used.

6.1.8 Volumetric properties for the mixture selected. The per cent air voids, voids in mineral aggregate, compared with the requirements for air voids and voids in mineral aggregate. Graphs shall be reported for the air voids, voids in mineral aggregate, voids filled with asphalt, dust-to-asphalt ratio, bulk relative density (G_{mb} @ N_{ini}), maximum relative density (G_{mm}), and the gyratory curves of the mixture plotted against asphalt cement content.

Using a four-point mix design, graphs of air voids, voids in mineral aggregate plotted against asphalt cement content at N_{des}. Mix bulk specific gravity and percentage absorption by volume and the method used to determine it shall be clearly identified. Theoretical maximum specific gravity.

6.1.9 Extracted bulk relative density, percentage asphalt cement, and gradation for the RAP or RST or both if included in the mix.

6.1.10 Typical mix weight to produce a gyratory specimen with a height of 115 ± 5 mm.

Table 1 - Superpave Compactive Effort

Ontario Traffic Category (see Note 1)	Number of Gyrations (see Note 2)		
	N_{ini}	N_{des}	N_{max}
A	6	50	75
B and C	7	75	115
D	8	100	160
E	9	125	205

Note:

1. The Traffic Category shall be provided by the owner.
2. Where:
   - N_{ini} means initial number of gyrations.
   - N_{des} means design number of gyrations.
   - N_{max} means maximum number of gyrations.