SECTION 337

WARM MIX ASPHALT

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337.01 SCOPE

This section covers the requirements for the use of Warm Mix Asphalt in lieu of Hot Mix Asphalt per Section 330, 332 and 333, as appropriate, Hot Mix Asphalt Concrete of the Department's Specification Book. If there are any direct conflicts, this specification will govern. All other requirements of Section 330, 332 and 333, as appropriate, of the specification are applicable.

337.02 REFERENCES

Reference standards shall be the latest revision at the date of Tender closing. This specification refers to the following standards, specifications or publication:

- Asphalt Institute – Asphalt Mix Design Methods - MS-2.

337.03 DEFINITIONS

Warm Mix Asphalt (WMA): Means warm mixed, warm laid asphaltic concrete produced using technologies that allow for the mixing, handling and compaction of the asphaltic concrete mixture at a temperature 20ºC to 50ºC lower than conventional hot mix asphalt.

Hot Mix Asphalt (HMA): Means hot mixed, hot laid asphaltic concrete and includes mixes produced using WMA technologies. The terms are used interchangeably. HMA may include recycled or specialty mixes.

Design Mix Formula (DMF): The DMF is defined as the laboratory determination of the precise proportions of asphalt binder, additives and aggregates to be blended together to meet the specified properties for a given asphalt concrete mix.

Job Mix Formula (JMF): The JMF is the resultant establishment of the single definite percentage for each sieve fraction of aggregate and asphalt binder content that will produce the desired asphalt concrete mix properties under field conditions.

337.04 MATERIALS

337.04.01 Anti-Strip Additive

Section 330.04.05 is amended by the addition of the following:

An Anti-Strip additive is to be incorporated into the WMA, the Contractor shall consult with the WMA technology supplier to determine whether or not the proposed additive is compatible with the WMA. In those cases where the supplier deems the anti-stripping additive incompatible, the anti-stripping additive shall not be used and another shall be chosen and identified to the WMA technology supplier until a compatible additive is agreed upon. The Contractor shall provide a copy of the correspondence with the WMA technology supplier to the Materials Engineering Division detailing the compatibility with the proposed anti-stripping additive at least 21 days prior to paving.

337.05 WARM MIX ASPHALT

337.05.01 Mix Design Requirements

The Contractor shall be responsible for the following:

1. Obtaining all materials, production of WMA, transportation, storage, and use of all materials.
2. Identifying and using a facility capable of producing the mix in accordance with the WMA technology supplier’s instructions for the use of their WMA technology.
3. Obtaining from the WMA technology supplier any and all information required for the proper preparation, handling, storage and use of the WMA material, including Safety Data Sheets.
4. Ensuring the WMA technology is produced in accordance with the WMA technology supplier’s recommendations to prevent any deleterious effects to the finished product.

5. Notifying the Owner's Representative and Materials Engineering Division in writing, identifying the WMA technology (complete name and address of the supplier) that will be used.

Below is a list of WMA technologies that are permitted for use:

- Advera®
- Astec-Double Barrel Green
- Cecabase RT
- Evotherm M1
- Evotherm P25
- Evotherm DAT
- Gencor Ultrafoam
- Rediset TM
- WarmGrip N1

If preparation and submission of the WMA mix design at the anticipated WMA production temperature is the responsibility of the Contractor than the following additional items are required.

The Contractor shall use professional engineering services and a CCIL or AASHTO certified testing laboratory to assess and carry out the design of the WMA mix design. During the development and verification of the WMA mix design the laboratory must ensure that WMA technology does not adversely affect the asphalt cement performance grade and WMA mixture performance. The submitted documentation shall be signed and sealed by a Professional Engineer registered to practice in Newfoundland and Labrador attesting to the validity of the material test data.

The asphalt mix design shall follow the Marshall method as outlined in the latest edition of the Asphalt Institute – Asphalt Mix Design Method - MS-2. The WMA materials and mix design shall meet the requirements of Section 330.04. Mix designs shall be based on asphalt cement content as a percentage of the mixture. As a minimum, each mix design shall have five points of asphalt cement content increasing by 0.5% increments

The mix design must also include:

- Pit/quarry identification (Name, location, route and reference distance).
- The specific gravities and the percentage of aggregate by mass of each aggregate to be used in the mix.
- The mix design gradation of the combined aggregate.
- Fine Aggregate Angularity (FAA) tests shall be conducted on a representative sample of the total fine aggregate inclusive of all fine aggregate materials as indicated in the mix design including blending sand. The test will be conducted in accordance with ASTM C1252 Standard Graded Sample Method A.

- All Marshall mix design characteristic, including summary table, graphs, bulk relative densities of the combined aggregates and asphalt absorption of the combined aggregates.
- Dosage rate of WMA additive and how it will be incorporated to produce the WMA.
- WMA mixing and compaction temperatures as recommended by the manufacturer and used during the mix design process.
- The most current version of the Safety Date Sheet (SDS) for the WMA technology used.
- Identification of the anti-strip additive used in the WMA and current SDS.
- Modified Lottman and boiling water test results as per Section 330.04.05. Both tests must be completed on neat asphalt samples as well as samples including WMA additive with anti-strip.

The Materials Engineering Division will require up to ten (10) working days from the time of receipt of the WMA mix design for evaluation by the Department and/or the Department Representative's laboratory. The Materials Engineer will advise the Contractor of receipt of the required documentation. If the WMA mix design does not meet the requirements of Section 330.04, it shall be rejected. The Materials Engineer shall provide a written explanation to the Contractor that details why the DMF failed. The Contractor shall then provide another complete WMA mix design and re-submit it to the Materials Engineering Division for evaluation. Each time a WMA mix design is re-submitted, an additional five (5) working days, from the time of receipt of the revised WMA mix design, shall be required for evaluation by the Department and/or the Department's representative's laboratory. The Owner's Representative will not accept any asphalt concrete mix produced prior to the Contractor receiving written acknowledgement of receipt of all required documentation for the WMA mix design from the Materials Engineer.

337.05.02 WMA Cement Mixing

The WMA shall be produced within the temperature range recommended by the WMA technology supplier to achieve target compaction in the field and to meet the requirements specified in the Contract Documents. The maximum recommended mixing temperature of the WMA mix shall be 130ºC unless otherwise approved by the Owner's Representative. The Contractor shall maintain the mixing temperature of the WMA within ± 5ºC of the recommended temperature and shall provide the plant production temperatures obtained once per hour during production to the Owner's Representative and Materials Engineering Division no later than 7 days from the date of measurement.

337.05.03 Placing WMA Concrete

The Contractor shall provide notice of their intent to pave in writing to the Owner's Representative and Materials Engineering Division, a minimum of 7 days prior to placing WMA.

The WMA Technology supplier's recommendations for placing the WMA mix shall be followed. The temperature of the WMA immediately after spreading shall be within the limits identified in Table A below:

Table A
Allowable limits for WMA Paving Temperature

Minimum Allowable WMA Paving Temperatures	Maximum Allowable WMA Paving Temperatures
The higher of 60ºC and the minimum temperature recommended by the WMA technology supplier	The lower of 125ºC and the maximum temperature recommended by the WMA technology supplier

The Contractor shall measure and record the temperature of the WMA immediately after spreading using an infrared thermometer gun at wheel paths and midlane, once every 250 lane-metres during the WMA paving. The Contractor shall submit WMA temperature records to the Owner's Representative for compliance verification no later than 7 days from the date of measurement.

The Contractor shall utilize appropriate paving and compaction equipment to avoid mix segregation, roller pickup and/or any other surface defects.

No traffic shall be permitted on the newly placed surface mat until finish rolling is completed and the finished mat has been allowed to cool, as recommended by the WMA additive supplier. A transverse construction joint in the asphalt mat shall be constructed at the end of each day's work, and at other times when paving is halted for a period of time to permit the asphalt concrete to cool as recommended by the WMA technology supplier.