

## Appendix A: Technology Transfer Materials

### Appendix A1: Test Method

#### Proposed Procedure to Determine Constructibility and Mechanical Stability of Asphaltic Mixtures Using the Superpave Gyratory Compactor.

##### 1. Scope

- 1.1. This procedure covers mixtures used in the Superpave Gyratory Compactor. The mixtures are to be prepared according to the Superpave procedure including selection of materials, and mixing and compaction temperatures.

##### 2. Referenced Documents

###### *AASHTO Standards:*

- T312 Method for Preparing and Determining the Density of Hot Mix Asphalt Specimens by Means of the Superpave Gyratory Compactor
- T209 Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
- T166 Bulk Specific Gravity of Compacted Mixtures Using Saturated Surface-Dry Specimens
- PP-28 Standard Practice for Superpave Volumetric Design for Hot Mix Asphalt
- PP-35 Standard Practice for Evaluation of Superpave Gyratory Compactors

##### 3. Important Note

- 3.1. The raw data should be available in spreadsheet format with one column for the gyration number and another for the corresponding height.
- 3.2. Samples should be compacted as close to 98% Gmm as possible, however a threshold of 600 Gyration should not be exceeded.
- 3.3. Sample volumetric properties shall be obtained using AASHTO standards mentioned above
- 3.4. The traffic level should be either one of (E0.3, E1, E3, E10, E30)

##### 4. General Description

This document is intended to determine the densification indices to evaluate the quality of hot mix asphalt (HMA) specimens created using the Superpave gyratory compactor (SGC). The densification indices are defined as:

- 4.1. Construction Densification Index (CDI): Represents the work required to compact the mixture from its density after being placed by the paver to the required density of the mix after roller compaction. This index is calculated by estimating the area from 8 gyrations (representing the paver screed compaction) to 92% Gmm, which represent 8 % air voids as required for HMA acceptance in Wisconsin. Lower values of CDI are desired because they represent a mix that is more workable and easier to compact to achieve 92% Gmm.
- 4.2. Traffic Densification Index (TDI): Represents the ability of the mixture to resist densification under traffic loading over its service life. The index is calculated by estimating the area under the curve from 92%Gmm (initial in-place density) to 98% Gmm, the theoretical terminal density of the pavement. High values of TDI are desirable. They represent a mix that is better able to maintain its stability and resist permanent deformation/damage.

## **5. Significance of Use**

- 5.1. This method is designed to evaluate the ease of compaction of hot mix asphalt when prepared using the Superpave gyratory compactor. Ease of compaction is represented by the CDI. In addition, this method is designed to evaluate the ability of the hot mix asphalt to resist traffic load. The resistance of the mixture to compaction beyond 92% Gmm is used to calculate the value of TDI, which is an indicator of the mixture mechanical stability.

## **6. Procedure**

- 6.1. Copy and paste the raw height data in the "raw data" sheet in the appropriate columns.
- 6.2. Go to "Analyzed data" sheet and input the sample title in cell B1 and volumetric properties in cells B2 to B5, and the traffic level in cell D5.
- 6.3. The template will calculate the densification energy indices automatically (CDI and TDI).
- 6.4. The densification curve will be created in the "Densification Curve" sheet showing the cut off points for the each densification energy.
- 6.5. The tab titled: "Summary and Print" will include all the necessary information of the compacted sample.

## **7. Calculations**

- 7.1. Using the height data of compacted samples in the SGC, the increase in density of HMA can be calculated using AASHTO PP-28.
- 7.2. The %Gmm verses number of gyrations plot is generated based on calculations determine above. This plot is called the densification curve.
- 7.3. The CDI is calculated as:  
$$\text{CDI} = \text{sum of change in \% Gmm from the eighth gyration to the gyration corresponding to 92\% Gmm}$$
- 7.4. The TDI is calculated as:  
$$\text{TDI} = \text{Sum of change of \%Gmm from gyration corresponding to 92\% Gmm to gyration corresponding to 98\% Gmm.}$$

## **8. Report**

- 8.1. Report the following information
  - 8.1.1. Construction densification index (CDI)
  - 8.1.2. Traffic densification index (TDI)

## **9. Precision and Bias**

- 9.1. Since this is a practice, precision and bias statement are not needed.