1.0 SCOPE

This Standard Test Method describes the procedure to determine the achievable maximum dry density (MDD) or achievable maximum density (MD) of material in-place using the control strip method.

2.0 DEFINITIONS

Achievable Maximum Density (MD): The MD of the placed bituminous material that can be achieved with the use of specified or approved compaction equipment and methods.

Achievable Maximum Dry Density (MDD): The MDD of the placed granular material that can be achieved at the desired moisture content with the use of specified or approved compaction equipment and methods.

Control Strip: A minimum 250 m section of placed material where the specified or approved compaction equipment and methods are used to establish the achievable MDD or MD.

Pass: One complete coverage of the Control Strip with all the specified or approved compaction equipment.

Number of Passes: The total number of passes at which the control strip section achieved the achievable MDD or MD.

2.0 REFERENCE STANDARDS

ASTM Standards

D698 Laboratory Compaction Characteristics of Soil Using Standard Effort

MEB Standards

P049 Nuclear Density Gauge Standard Count Calibration
P050 Density of Bituminous Pavement in Place by Nuclear Method
P051 Density of Aggregate Base Course in Place by Nuclear Method

3.0 APPARATUS AND MATERIALS

Nuclear Density Gauge: Electronic counting instrument equipped with a gamma and neutron source, which is licensed in accordance with applicable federal regulations.

Water: Water shall be free of contaminants that could adversely affect fill material or the environment.
Compaction Equipment: Specified or approved equipment to meet the degree of compaction required and space available.

4.0 GENERAL

The achievable MDD or MD is determined by taking nuclear density and moisture readings during compaction of a control strip.

The achievable MDD or MD and the number of passes established from the control strip compaction are used to determine the percent compaction and the required compaction effort for that particular material in subsequent sections.

A new achievable MDD or MD and number of passes are to be established:

- For each lift
- If there is a change in material type or source
- Whenever there is a significant change in gradation
- If a different nuclear density gauge is used

5.0 PROCEDURE

5.1 Achievable MD for Bituminous Pavement

Spread the material, meeting the specified lift thickness requirement, on the full length of the control strip and shape uniformly.

Complete a minimum of two (2) passes with the specified or approved compaction equipment over the entire control strip area.

Determine average wet density as per *MEB P050 Density of Bituminous Pavement in Place by Nuclear Method* on 5 evenly spaced locations within the control strip.

Compact the control strip with an additional 2 passes and take density measurements again.

Continue the above mentioned process until the average wet density increases by less than 0.5% or decreases.

Plot the average wet density against the number of passes and connect the points with a curvilinear trend line. Determine the achievable MD and the corresponding number of passes of the compaction equipment from the curve.

5.2 Achievable MDD for Granular Base Course, Pulverized Surface or Cold in Place Recycled (CIR) Layer

Spread the material, meeting the specified lift thickness requirement, on the full length of the control strip.

Maintain the average field moisture content of the material within the range ±1.0% of the desired moisture content.

Complete a minimum of two (2) passes with the compaction equipment over the entire control strip area.

Determine density and moisture measurements as per *MEB P051 Density of Aggregate Base Course in Place by Nuclear Method* on 5 evenly spaced locations within the control strip.

Compact the control strip with an additional two (2) passes and take density and moisture measurements again.

Continue the above mentioned process until the density increases by less than 0.5% or decreases.

Plot the average dry density against the number of passes and connect the points with a curvilinear trend line. Determine the achievable MDD and the corresponding number of passes of the compaction equipment from the curve.

6.0 CALCULATION

6.1 Test Location Density

6.1.1 Bituminous Pavement

Test Location Density shall be determined in accordance with *MEB P050 Density of Bituminous Pavement in Place by Nuclear Method.*

6.1.2 Aggregate Base Course, Pulverized Surface or Cold in Place Recycled (CIR) Layer

Test Location Density shall be determined in accordance with *MEB P051 Density of Aggregate Base Course in Place by Nuclear Method*

6.2 Percent Compaction Calculation

Calculate the percent compaction of each test location as follows:

$$\%\ \textbf{Compaction} = \frac{\textbf{Test Location Density}}{\textbf{Achievable MDD or MD}} * \textbf{100}$$

7.0 REPORT

Report on the forms provided by the Contract Administrator.