



DETERMINING THE MAXIMUM DENSITY OF BITUMINOUS CONCRETE UTILIZING THE CONTROL STRIP PROCEDURE

1. SCOPE

- 1.1 The control strip method of compaction control can be used on any material that is uniform and has a relatively smooth surface, such as bituminous concrete.
- 1.2 The control strip method establishes the maximum attainable density or Target Density in the field using nuclear test methods and replaces the laboratory maximum density value.

2. REFERENCED DOCUMENTS

- 2.1 AASHTO Standards
 - T310, In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

3. APPARATUS

- 3.1 The apparatus requirements shall be the same as specified for AASHTO T310, Method A – Backscatter.

4. PROCEDURE

- 4.1 Prior to testing, steps must be made to ensure that all requirements are met for this method.
 - 4.1.1 The control strip shall be approximately 400 square yards (335 square meters) and of the same depth as called for in the plans.
 - 4.1.2 The material used in the construction of the control strip shall conform to the requirements of the specifications or approved job-mix formula. The materials shall be furnished from the same sources and shall be of the same type used in the remainder of the pavement course represented by the control strip.
 - 4.1.3 The subgrade or pavement course upon which a control strip is to be constructed shall be of the same type underlying the remainder of the pavement course represented by the control strip.
- 4.2 The test should be performed according to the steps outlined in this section.
 - 4.2.1 Place material in the control strip area at the proper depth and in the same manner as will be used for the remainder of the area represented by the control strip.

- 4.2.2 Start the compaction of the material and after each pass of a roller take nuclear tests for density at 3 randomly selected points.
 - 4.2.3 Make sure the previous roller pass has been completed over the entire control strip area before the next pass is started.
 - 4.2.4 Choose points with good surface conditions and try to spread the 3 tests over the length of the control strip section. When testing open graded bases having numerous surface voids or depressions, it may be necessary to fill these voids with clean, fine sand.
 - 4.2.5 Mark the exact spot the gauge is placed. After each pass of the roller, the density tests are to be taken in the same exact spots with the gauge sitting in the same position as the first tests. *All equipment used to spread and compact the bituminous concrete shall be of the same type and weight and in the same sequence as used on the remainder of the area represented by the control strip.*
 - 4.2.6 Average the results of the 3 tests taken after each roller pass and plot the average density versus number of roller passes on graph paper to establish a roller pattern curve.
 - 4.2.7 Continue the rolling and testing of the section until a pass of the roller makes no appreciable increase in the density. To be certain this density value represents a sufficient degree of compaction make one additional roll over the entire section and test again.
 - 4.2.8 Once it is determined that additional rolling does not increase the density, rolling shall be stopped. Seven additional density tests shall be made at randomly selected spots spread over the entire control strip area. The results of these seven tests and the three tests made after the final roller pass shall be added and averaged. The resulting average density of the ten tests shall be the Target Density for the remainder of the pavement course represented by the control strip.
 - 4.2.9 The sequence of rollers and the number of passes required to obtain the Target Density as determined from the control strip shall remain the same for the remainder of the pavement course represented by the control strip.
- 4.3 A new control strip shall be constructed whenever there is:
- 4.3.1 A change in the job-mix formula
 - 4.3.2 An appreciable change in the grading of the material
 - 4.3.3 A change in the material source

- 4.3.4 A change in the material upon which the bituminous concrete is being placed
- 4.3.5 A change in the paving and compacting equipment
- 4.3.6 A change in the thickness of the pavement course
- 4.3.7 Any reason to doubt the Target Density presently in use.