ATT-58A/93 DENSITY TEST, Control Strip Method, Granular Fill

1.0 SCOPE

This test procedure describes the method used to determine the minimum number of passes needed to obtain an apparent maximum density of granular fill material (culvert fill, etc.), utilizing a nuclear moisture-density gauge in the backscatter position, for density determination.

2.0 EQUIPMENT

Refer to Section 2.0 of test method ATT-58.

3.0 PROCEDURE

3.1 Definitions

A "Control Strip" is a typical section of a lift of granular fill under construction, where the contractor's compaction equipment is used to establish the minimum number of passes necessary to obtain an apparent maximum density. The minimum number of passes can then be used as a guideline for future lifts using similar material and lift thickness. To determine the minimum number of passes, nuclear moisture and density readings are taken during the compaction passes until an apparent maximum dry density is reached.

A "Pass" is defined as one complete coverage of a Control Strip with the compaction equipment. An increment in number of passes at which the granular fill is tested is referred to as a "Series of Passes". The number of passes per series is dependent upon the compaction equipment and area used for the Control Strip. Each site of a Control Strip is usually tested after every second pass.

The "number of passes" established for the Control Strip can be used as a guide for the compaction of the subsequent sections, if the same equipment, similar material and lift thickness is used. Each lift of the granular fill shall not exceed the specified maximum compacted thickness given in the contract.

The "Control Moisture Content" is the percent moisture at which the Control Strip must be kept during construction and is recommended by the Project Manager.

3.2 Equipment and Site Preparation

1. Refer to Sections 3.2 and 3.3 of test method ATT-58.

3.3 General

The purpose of a Control Strip is to find the minimum number of passes required to achieve a maximum density. The number of passes can then be used as a guide for the compaction of subsequent test sections.

Once the aggregate for the lift has been completely spread, the measurements for the Control Strip should commence. Compaction and density measurements continue until an apparent maximum dry density is achieved.

A new control strip is required when the contractor elects to use more or different compaction equipment.

3.4 Backscatter Testing

1. Repeat Section 3.5 of ATT-58.

3.4.1 Control Strip Rolling Pattern

1. Once the standard counts have been taken, select up to 5 evenly spaced sites within the Control Strip. A minimum of 2 sites per control strip is required, 1 site every 20 m or more. The test sites should be representative, with minimum segregation, no ravelling and the surface must be moist.

2. Repeat steps 2 to 8 of Section 3.5.1 of ATT-58.

3. Repeat steps 4 to 8 of Section 3.5.1 of ATT-58 for each of the remaining sites.

4. Calculate the average density and moisture reading for that pass.

5. Repeat steps 11 to 17 of section 3.5.1 of ATT-58.

6. The Rolling Pattern is complete when after the completion of three consecutive series of passes, the average dry density between each series of passes:

    a) Increases by less than 10 kg/m^3,
    b) Continually decreases, or
    c) Remains constant.

3.4.2 Test Section

1. Ensure the same equipment used for the Control Strip is used on the Test Section.

2. Monitor the number of passes made by the equipment and ensure the minimum number of passes have been performed.

3. A new Control Strip may be required when the compaction effort and minimum number of passes does not appear to be obtaining an adequate compaction. Verify as follows:

    a) Have the contractor compact the test section with at least three additional series of passes.

    b) After each series of passes, test the material in at least two locations, to determine if the material has reached its apparent maximum density.

    c) If additional passes are required, add these passes to the previous "minimum number of passes". **Use this newly established minimum number of passes as a guide for subsequent lifts.**

4.0 HINTS AND PRECAUTIONS

1. This test method can be used on all granular fills including pit-run as long as it is well graded. If the pit-run is too rocky, this method will be inaccurate.