IS : 10379 - 1982
(Reaffirmed 1995)

Indian Standard

CODE OF PRACTICE FOR FIELD CONTROL OF MOISTURE AND COMPACTION OF SOILS FOR EMBANKMENT AND SUBGRADE

(First Reprint MARCH 1999)

UDC 624.131.431.3 : 624.136

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 2 *February* 1983

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Indian Standard

CODE OF PRACTICE FOR FIELD CONTROL OF MOISTURE AND COMPACTION OF SOILS FOR EMBANKMENT AND SUBGRADE

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 24 December 1982, after the draft finalized by the Soil Engineering and Rock Mechanics Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 The earthwork involved in embankments and subgrades has to be controlled so that the average properties of the soil are equal in quality as adopted in design. A number of field control methods have been evolved. This standard covers such methods and also gives guidance for use in various situations. It is suggested that the tests mentioned in this standard are conducted at regular intervals so that the results are available for every 1 000 m^2 of earth file.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

SCOPE

1.1 This standard covers various methods of field control of compaction and moisture contents of soil for embankment and subgrade.

*Rules for rounding off numerical values (*revised*).

2. METHODS APPLICABLE TO NON-GRAVELY SOILS

2.1 Method 1 — In this method, compaction parameters, that is, optimum moisture content and maximum dry density are determined according to the procedure described in IS : 2720 (Part VII)-1980* and IS : 2720 (Part VIII)-1974†. The *in-situ* moisture content of compacted soil is determined by one of the procedures given in IS : 2720 (Part II)-1973‡. The field dry density is determined by any one of the methods given in IS : 2720 (Part XXVIII)-1974§, IS : 2720 (Part XXIX)-1975‖ or IS : 2720 (Part XXXIV)-1972¶. The test shall be performed after removing the top 5 cm layer of earth.

The compaction efficiency is then obtained by expression of field density-laboratory maximum dry density.

2.2 Method 2 — This method allows the determination of the relationship between the embankment moisture content, dry density and the laboratory optimum conditions without the necessity of measurement of water content and the results can be obtained in less than one hour. This method, as given in IS : 2720 (Part XXXVIII)-1976** can be used directly for both moisture and density controls or only density control.

2.3 Method 3 — In certain weathered soils, field moisture content and dry density differ from the laboratory compaction values. In such soils, a test embankment under nearly identical operating conditions for thickness of soil, watering, mixing and compacting is used to determine field moisture content and dry density attainable. The specified layer of soil should be spread on a test strip 3 × 10 m, watered and left for 5 to 30 minutes depending upon type before rolling. The water content is varied in layers within + 6 percent of laboratory values. Each strip is rolled by the roller and the density of soil is measured by either of the methods mentioned in **2.1** after every two passes. A graph of the number of passes against dry density is drawn for each water content. A graph of maximum dry density attained when plotted against water content gives field moisture content and attainable field dry density. The trial gives a minimum number of passes of compaction roller which at field moisture content will give maximum dry density.

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*Methods of test for soils : Part VII Determination of water content-dry density relation using light compaction (*second revision*).

†Methods of test for soils : Part VIII Determination of water content-dry density relation using heavy compaction (*first revision*).

‡Methods of test for soils : Part II Determination of water content (*second revision*).

§Methods of test for soils : Part XXVIII Determination of dry density of soils in-place by the sand replacement method (*first revision*).

‖Methods of test for soils : Part XXIX Determination of dry-density of soils in-place by the core-cutter method (*first revision*).

¶Methods of test for soils : Part XXXIV Determination of density of soil in-place by rubber balloon method.

**Methods of test for soils : Part XXXVIII Compaction control test (HILF method).

Based on this test embankment, indirect control of number of passes with controlled water using any one of the methods for determining the moisture content [IS : 2720 (Part II)-1973*] can be used for the earthwork.

3. METHOD APPLICABLE TO SOIL CONTAINING GRAVELS AND ROCKFILLS

3.1 In addition to the methods given for non-gravelly soils, the following provisions shall be applicable.

3.2 The total density of soil increases and moisture content decreases with increasing percentage of gravel size fraction up to 60 to 75 percent and above this value density again decreases.

3.3 For the soils with gravels up to 30 percent, recommended method is to establish moisture density relationship [*see* IS : 2720 (Part VII)-1980† and IS : 2720 (Part VIII)-1974‡] in the laboratory on soil fraction passing 40 mm IS Sieve. The embankment density may be compared with the laboratory density so obtained. The field density and the moisture content of the embankment may be determined by the method preferably given in IS : 2720 (Part XXXIII)-1971§ or alternatively as given in IS : 2720 (Part XXVIII)-1974‖.

3.4 As shear strength of compacted gravel and rockfill does not vary much with small changes in the density and higher precise densities can be attained without precise control of water content as in the case of fine grained soil, controlled testing may not be necessary.

*Methods of test for soils : Part II Determination of water content (*second revision*).

†Methods of test for soils : Part VII Determination of water content-dry density relation using light compaction (*second revision*).

‡Methods of test for soils : Part VIII Determination of water content-dry density relation using heavy compaction (*first revision*).

§Methods of test for soils : Part XXXIII Determination of the density in-place by the ring and water replacement method.

‖Methods of test for soils : Part XXVIII Determination of dry density of soils in-place by the sand replacement method (*first revision*).

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Printed at Simco Printing Press, Delhi