NEW ZEALAND STANDARD

METHODS OF TESTING SOILS FOR CIVIL ENGINEERING PURPOSES

Part 4
Soil compaction tests

4.2
DETERMINATION OF THE MINIMUM AND MAXIMUM DRY DENSITIES AND RELATIVE DENSITY OF A COHESIONLESS SOIL

TEST 4.2.3
Relative density

4.2.3.1
Scope
This method determines the relative density of a soil with respect to the loosest and densest states at which it can be placed by the laboratory procedures specified in this Standard.

4.2.3.2
Related documents
The provisions of Part 1 of this Standard are applicable to and shall be read in conjunction with this method of test. Reference is also made to tests 4.2.1, 4.2.2, and section 5.1 of this Standard.

4.2.3.3
Procedure

(a) Determine the minimum dry density ($\varrho_{d\,min}$) and the maximum dry density ($\varrho_{d\,max}$) by the procedures given in tests 4.2.1 and 4.2.2 respectively. Perform both tests on the same sub-sample with the minimum dry density being determined first because of possible degradation in the maximum dry density test.

(b) Determine the dry density of soil in place (ϱ_d) by one of the procedures specified in section 5.1 of this Standard where relevant. Where none of the procedures in this Standard are relevant, another procedure may be used and shall be fully defined in the test report.

4.2.3.4
Calculations
Calculate the relative density (*RD*) as a percentage, from the formula:

$$RD = \frac{\varrho_{d\,max}(\varrho_d - \varrho_{dmin})}{\varrho_d(\varrho_{d\,max} - \varrho_{d\,min})} \times 100 \quad \text{.....\%}$$

where ϱ_d = dry density of the soil in place (t/m^3)
$\varrho_{d\,max}$ = maximum dry density of the soil (t/m^3)
$\varrho_{d\,min}$ = minimum dry density of the soil (t/m^3)

4.2.3.5
Reporting of results

4.2.3.5.1
Report the following:

(a) The date of test

(b) The relative density to the nearest 5 %

(c) The minimum dry density (t/m^3) to the nearest 0.02

(d) The maximum dry density (t/m^3) to the nearest 0.02

(e) Percentage of oversize material discarded

(f) The *in situ* density (t/m^3) to the nearest 0.02 and the test method used to determine it

(g) The maximum size of particle used in the tests for minimum and maximum dry density (mm)

(h) Whether the optimum double amplitude of vibration was measured or assumed in the test for maximum dry density

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(j) Whether the screeding or depth indicator method was used to establish the densified material volume in the test for maximum dry density

(k) The nominal volume of the mould used in the tests for minimum and maximum dry density (ml)

(m) The condition of the soil used in the test for maximum dry density e.g. saturated, as received or dry.

4.2.3.5.2
State that the result was obtained in accordance with this Standard Test Method.