

203-R-685 METHOD OF MAKING STRENGTH, STIFFNESS AND DENSITY TESTS

(Revised 02-20-20)

The Standard Specifications are revised as follows:

SECTION 203, BEGIN LINE 1125, DELETE AND INSERT AS FOLLOWS:

203.24 Method of Making Strength, Stiffness and Density Tests

The strength of *chemically modified or* compacted soils will be determined by DCP in accordance with ITM 509. ~~and~~ The stiffness of *chemically modified soils or* aggregates will be determined by the ~~Light Weight Deflectometer, LWD~~; in accordance with ITM 508. The *density of soils and aggregates, as a percent of compaction, shall* will be based on the maximum dry densities unless otherwise specified or directed. ~~DCP~~ field compaction tests will be performed in accordance with 203.23. *LWD and density field compaction tests will be performed in accordance with this section.* ~~and~~ The required compaction *shall be* obtained before additional material is placed.

(a) Laboratory

The DCP criteria will be established on representative soils by performing ASTM D 1140, AASHTO T 88, AASHTO T 89, AASHTO T 90, and AASHTO T 99 using Method A for soils and Method C for granular materials.

The optimum moisture content, maximum dry density, and gradation of aggregates will be determined by performing AASHTO T 99 Method C, AASHTO T 11, and AASHTO T 27 on representative samples of the aggregates.

(b) Field

The soil strength of compacted soils or compacted chemically modified soils will be determined by DCP in accordance with ITM 509 and the stiffness of chemically modified soils or aggregates will be determined by LWD in accordance with ITM 508. The moisture content will be determined in accordance with ITM 506 *or AASHTO T 255.*

~~The~~ *As an alternative, in situ field density determination shall be made* may be determined in accordance with AASHTO T 191, ~~or~~ *except as listed below. The maximum dry density of the soil will be determined by ITM 512* ~~except as follows:~~

1. If AASHTO T 191 is used, the sand used for the test shall be silica sand in accordance with the gradation as follows:

Passing the No. 20 (850 µm) sieve - 98 to 100%
 Passing the No. 40 (425 µm) sieve - 0 to 35%
 Passing the No. 70 (212 µm) sieve - 0 to 2%

Sand such as Wedron Silica Sand No. 4075 or Ottawa 2.8 Blasting Sand has been found to be acceptable.

2. If particles larger than those that can pass through a No. 4 (4.75 mm) sieve for soil and a 3/4 in. (19 mm) sieve for granular material are encountered, corrections shall be made so that the density obtained is for the minus No. 4 (4.75 mm) or 3/4 in.

(19 mm) only. After the densities are determined, the degree of compaction shall be computed by the following formula:

$$\text{Percent Compaction} = \frac{\text{In Place Density, pcf}}{\text{Maximum Density, pcf}} \times 100$$

3. Other approved types of field density tests may be used for control purposes after density values corresponding to those obtained by either of the methods set out above have been established.
4. All references to soils in these methods of tests shall be interpreted to mean either or both soil and granular materials.

~~The compaction. Acceptance testing of chemically modified soils and coarse aggregates will be determined by LWD testing in accordance with ITM 508. The moisture content will be determined in accordance with AASHTO T 255 or ITM 506. The allowable deflection will be determined from a test section or will be specified. Test sections shall be constructed in accordance with ITM 514 in the presence of a representative of the Office of Geotechnical Services for other materials not included in the Tables to determine the maximum allowable deflection. The compaction procedures shall be in accordance with 203.23, 215, 301, 302, and 303. Compaction of aggregate shall not occur if the moisture content of the aggregate is greater than 6.0%. Proofrolling of compacted aggregate shall be performed in accordance with 203.26.~~

~~The maximum allowable deflection will be determined from a test section or will be specified. Acceptance testing with a LWD will be in accordance with ITM 508. The optimum moisture content and gradation will be determined by performing AASHTO T 99 Method C, AASHTO T 11, and AASHTO T 27 on representative samples of the aggregates.~~

~~The moisture content of the aggregate shall be between 4% and the optimum moisture content when the aggregate is delivered to the project. Water shall not be added to the aggregate on the grade. Samples for moisture content testing will be taken on the grade from the first truck of the day. The frequency of the moisture content test for aggregates will be a minimum of one test for each day of aggregate placement.~~

The ~~maximum~~ allowable average deflection and maximum deflection for chemically modified soils and aggregate over chemically modified and untreated soils shall be in accordance with the following:

Table 1. Allowable Average Deflection and Maximum Deflection for Chemically Modified Soils and Aggregate over Chemically Modified Soils

Material Type	Maximum Allowable Average Deflection (mm)	Maximum Deflection at a Single Test Location (mm)
Lime Modified Soil	≤ 0.30	0.35
Cement Modified Soil	≤ 0.27	0.31

Aggregate over Lime Modified Soil	≤ 0.30	0.35
Aggregate over Cement Modified Soil	≤ 0.27	0.31

Table 1

Table 2. Aggregate over Untreated Soils:
Where Proofrolling Can Be Performed

Material Thickness	Allowable Average Deflection (mm)	Maximum Deflection at a Single Test Location (mm)
6 in. Thick Coarse Aggregate No. 53	≤ 0.51	0.57*
12 in. Thick Coarse Aggregate No. 53	≤ 0.34	0.40**
18 in. Thick Coarse Aggregate No. 53	≤ 0.31	0.35**
* When deflection exceeds this value, the area shall be recompact or undercut as directed. The failed area will be delineated prior to excavation. Deflection will be measured based on the top 6 in. thick coarse aggregate No. 53 material placed for undercut.		
** The Contractor shall recompact the coarse aggregate No. 53 in accordance with 301.06.		

Table 3. Aggregate over Untreated Soils:
Where Proofrolling Cannot be Performed

Material Thickness	Allowable Average Deflection (mm)	Maximum Deflection at a Single Test Location (mm)
6 in. Thick Coarse Aggregate No. 53	≤ 0.60	0.65*
12 in. Thick Coarse Aggregate No. 53	≤ 0.47	0.52**
18 in. Thick Coarse Aggregate No. 53	≤ 0.44	0.49**
* When deflection exceeds this value, the area shall be recompact or undercut as directed. The failed area will be delineated prior to excavation. Deflection will be measured based on the top 6 in. thick coarse aggregate No 53 material placed for undercut.		
** The Contractor shall recompact the coarse aggregate No. 53 in accordance with 301.06.		
<u>Note:</u> The Engineer will perform the moisture test on in-situ soils prior to placement of coarse aggregate. If the result of the moisture test is >13%, the Engineer will contact the Geotechnical Section.		

~~Test sections shall be constructed in accordance with ITM 514 in the presence of a representative of the Office of Geotechnical Services for other materials not included in Table 1 to determine the maximum allowable deflection.~~

Acceptance of the compaction of chemically modified soils or aggregate will be determined by averaging three LWD tests obtained at a random station determined in accordance with ITM 802, for each ~~1,500 ft length~~ 1,400 cu yds of chemically modified soil ~~for each two-lane pavement section~~, or for each 800 t of compacted aggregate. Where the construction area is 8 ft wide or more, the location of the three tests will be at 2 ft from each edge of the construction area and at 1/2 of the width of the construction area. Where the construction area is less than 8 ft wide, the location of the three LWD tests will be spaced at 1/2 of the width of the construction area and spaced 5 ft apart in the longitudinal direction. The average deflection shall be equal to or less than the maximum allowable deflection allowed in the Tables ~~above~~ or determined by the test section.

~~If the average deflection is not equal to or less than the maximum deflection for aggregates, a sample of the aggregate shall be obtained in accordance with AASHTO T 2 and a moisture content test shall be performed in accordance with AASHTO T 255 to determine if the moisture content is within the acceptable limits. If the moisture content is not within the acceptable limits, additional LWD tests may be taken at the same locations after 24 h if the moisture content is within the acceptable limits at the time of testing. The aggregate will be accepted if the LWD tests are equal to or less than the maximum deflection.~~
