NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

MATERIALS AND TESTS UNIT

SOILS LABORATORY

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MODIFICATION OF AASHTO TESTING PROCEDURES

July 30, 2004

AASHTO T87----------See Attached Sheet
AASHTO T88----------See Attached Sheet
AASHTO T89----------See Attached Sheet
AASHTO T90----------See Attached Sheet
AASHTO T99----------See "Density Procedures"
Revised: June 4, 2003
AASHTO T134----------See Modifications to AASHTO
T-99 in "Density Procedures"
AASHTO T180----------See Attached Sheet

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Modification of AASHTO T 87-86 (2000)

3.4 Delete this section and substitute the following:

The aggregations shall be thoroughly broken up by rubbing with a wooden mallet in such a way as to avoid reducing the natural size of individual particles.

4.1.1 Mechanical Analysis (AASHTO T 88) – Delete the first sentence and substitute the following:

For the mechanical analysis material passing a 2.00 mm (No. 10) sieve is required in amounts equal to 100g of sandy soils and 50g of silty or clayey soils.

5.1 Delete the second sentence in this section and substitute the following:

A representative test sample weighing approximately 1,000 grams (or as otherwise established) is selected as the amount required to perform the desired test (Section 3)

6.2 Delete “approximately 110g” and substitute “100g”.
Delete “approximately 60g” and substitute “50g”.

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Modification of AASHTO T 88 – 00 (2003)

APPARATUS:

3.1.3.1 (Alternate b) – Dispersing Device – Delete in entirety.

DISPERSING AGENT:

4.1 Use a stock solution of sodium hexametaphosphate with a 6.0 hydrometer reading at 68° F.
NOTE: Correction factor of 6.0 will be deducted from all hydrometer reading when using this stock solution.

SAMPLES:

6.1 Delete use of AASHTO T146 - Wet Preparation of Disturbed Soil Samples for test unless directed otherwise.

6.1.2 (a) Delete “approximately 100g” and substitute “100g” ; delete “approximately 50g” and substitute “50g”

Hydrometer and Sieve Analysis of Fraction Passing the No. 10 (2.0mm) Sieve.

DISPERSION OF SOIL SAMPLES:

10.1 Delete in entirety and substitute the following:

The 100g sample for sandy soils or 50g sample for silty or clayey soils which is to be used for hydrometer analysis shall be weighed, placed in a 250 ml evaporating dish or beaker, covered with 125-ml of stock solution of the selected dispersing agent and stirred thoroughly with a glass rod before placing in a dispersing cup. Distilled, demineralized, or pure tap water shall be added until the dispersing cup is more that half-full, and the contents dispersed for a minimum of 1 minute in the mechanical stirring apparatus.

ALTERNATE METHOD FOR DISPERSION:

11.1~11.4 Delete in entirety

HYDROMETETER TEST:

12.1~12.3 Delete in entirety and substitute the following:

After dispersion, the mixture shall be transferred to a glass graduate and distilled, demineralized or pure tap water having the same temperature as the constant temperature bath added until the mixture attains a volume of 1000 ml. The graduate containing the soil suspension attains the temperature of the bath, the graduate shall be removed and its contents thoroughly shaken for 1 minute, the palm of the hand being used as a stopper over the mouth of the graduate. At the conclusion of this shaking, a reading to determine the diameter of soil particles in suspension is taken, after approximately 35 seconds, with the hydrometer at the top of the meniscus formed by the suspension around its stem. The exact time is determined by use of a time-versus particle size-diameter chart. This is the initial silt-clay reading. Then the sample shall be replaced in the constant temperature bath. After the sedimentation time of 60 minutes, a second hydrometer reading (clay) shall be taken in the soil suspension with care being taken not to disturb the sedimentation of the material.

NOTE 1: The initial and 2nd hydrometer reading must be corrected for the dispersing agent solution (minus 6.0) and for temperature, if other than 68° F.

At the conclusion of the final reading of the hydrometer, the suspension shall be washed on a No. 270 sieve. The fraction retained on the No. 270 sieve shall be placed in a 250 ml. evaporating dish, the surface water poured off and the material dried in an oven at 100 $\pm$ 5° C and a sieve analysis made using the No. 40, No. 200 and such other sieves as may be required.

The weights of that part of the air-dried sample retained on each sieve shall be corrected for hygroscopic moisture and converted to percent passing.

$$\text{Percentage of hygroscopic moisture} = \frac{W - W1}{W1} \times 100$$

Where:

W = mass of air-dried soil
W1 = mass of oven-dried soil

16.1~20.1 Delete in entirety unless directed otherwise.

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Modifications of AASHTO T 89-02

3.7 Balance – A balance sensitive to 0.1g unless directed otherwise.

6.2 Tap water may be used in this test unless directed otherwise.

6.3 NOTE 6 – Delete the last sentence and substitute the following:

If the soil continues to slide on the cup at a lesser number of blows that 25, the test is not applicable and the following method will be used: Modification of Liquid Limit Test of Non-Plastic Material. When the liquid limit test cannot be performed on non-plastic soils with the device and in the manner prescribed in AASHTO Method T 89 due to slippage of the divided soil mass in the cup, the liquid limit shall be determined as directed below.

A soil sample shall be taken as directed in Article 4.1 and mixed with water as described in Article 6.1.

When sufficient water has been thoroughly mixed with soil to form a uniform mass of stiff consistency, the mass shall be spread in a 250 ml evaporating dish in a manner similar to the operation of placing the mass in the cup of the liquid device as described in Article 6.2 of AASHTO Method T 89, except that the soil mass shall not be divided with the grooving tool.

A clean, dry spatula shall be pressed firmly on the surface of the soil mass and then lifted without dragging, and the spatula surface observed for water. When sufficient water has been thoroughly mixed with the soil to just cause water to adhere to the spatula in the form of beads, the consistency of the liquid limit has been reached, and the percentage of moisture in the soil is its value.

Modification of Liquid Limit Test of Plastic Materials (May be used in lieu of "flow curve" unless directed otherwise).
The cup containing the sample prepared as described in 6.2 shall be lifted and dropped by turning the crank F at the rate of two revolutions per second until the two sides of the sample come in contact at the bottom of the groove along a distance of about ½ inch (12.7 mm) in 25 shocks. When it is ascertained that the flow of the material has closed the groove in exactly 25 blows at approximately ½ inch; a sample shall be taken as described in 6.4, and the liquid limit shall be determined by calculation as described in 8.1.

Sections 11.1 through 14.3 – Delete in entirety.

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Modification of AASHTO T 90-00

3. 7 Balance – A balance sensitive to 0.1g unless otherwise directed.

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Modification of AASHTO T 180-01

Scope:

1. 1 Method D (For Aggregate Base Course Only) – All material used in the determination will pass a 1 ½ in. sieve and the mold will be a CBR mold specified in AASHTO T193 – 99 (Sect. 4.1) and each layer compacted by 86 blows of the rammer.

METHOD D

Delete in entirety and substitute the following (For Aggregate Base Course Only):

SAMPLE:

10. 1 Select a representative sample weighing approximately 200 lb.

PROCEDURE:

11. 1 Drying of the sample may be in air or by drying apparatus at a temperature not exceeding 140 ^{o}F. The material shall be tested for gradation in accordance with AASHTO T88 as modified by the Division of Highways and separated on the 1 in., ½ in. and No. 4 sieves. Four specimens weighing 8,000g each shall be prepared by using the approximate center of the specifications and as the percent passing on the 1 in., ½ in., and No. 4 sieves (as shown in Table 1010 – 1, Col. B) of the 2002 Standard Specifications for roads and structures.

Example: In preparing the specimen, the following weights will be used:

Ret. 1 in.	8%	x	8,000g =	640g
Ret. ½ in.	25%	x	8,000g =	2000g
Ret. No. 4	22%	x	8,000g =	1760g
Minus No. 4	45%	x	8,000g =	3600g
			TOTAL =	8000g

Each of the four 8,000g specimens will be compacted in the CBR mold in five equal layers at 86 blows per layer using the 10 lb. rammer having an 18 in. drop.

The first specimen shall be compacted using 4 percent moisture and each succeeding specimen using an additional 1 percent moisture. After compaction, each of the wet specimens shall be weighed and the total sample dried in an oven at a temperature of 110° ± 5 °C for determining the dry weight and percent moisture.

At the completion of compaction of each specimen, the collar is removed from the specimen, and the excess material is struck off level with the top of the 6 in. x 7 in. mold. Voids may occur in the surface of the material during the “strike off” which should be filled with wet, excess minus No. 4 material.