

State of Nevada
Department of Highways
Materials and Testing Division

METHOD FOR DETERMINATION OF THE CEMENT CONTENT OF
CEMENT TREATED BASE AND CEMENT TREATED SUBGRADE

SCOPE

This method describes the procedure for determining the cement content of cement treated materials by a rapid chemical analysis.

A. PRINCIPLE:

A 10% ammonium chloride solution is used as the solvent system for the calcium compounds present in Cement Treated Base Materials. The solution is titrated with the disodium salt of EDTA (ethylenedinitrilotetra-acetic acid) after adjustment of pH, using Hydroxynaphthol Blue as indicator. Cement content is determined from a standard graph after subtracting the aggregate blank.

B. EQUIPMENT: (For field use).

- 6 - 10 ml volumetric pipettes
- 2 - 25 ml burettes
- 1 - Magnetic Stirrer and Stirring Bar
- 1 - Burette Stand
- 6 - 250 ml Erlenmeyer flasks
- 6 - 2qt. Polyethylene Jugs (Fruit juice containers from any Variety Store have proven satisfactory and economical).
- 6 - Stainless Steel stirring rods (12 to 14 in.)
- 1 - Harvard Trip Balance with tared pan.
- 1 - 25 ml graduated cylinder
- 1 - 1,000 ml graduated cylinder
- 1 - Plastic funnel (12 in. diam.)
- 2 - 5 gal Polyethylene jugs for distilled water
- 1 - 5 gal Polyethylene jug for ammonium chloride
- 6 - Medicine droppers
- 1 - Pkg. pH indicator paper range 10 to 14.

C. REAGENTS:

1. EDTA, 0.1 M. Weigh 116.88 gms of EDTA (acid), A.C.S. Reagent grade, into a 3 L beaker. Add approximately 1.5 L of distilled water and place on stirrer. Add sodium hydroxide pellet by pellet until the acid is completely dissolved. Make up to exactly 4 L and transfer to a 1 gal. polyethylene bottle. This solution must be stored in plastic. (For field use this solution will be made up and distributed by Headquarters Laboratory.)
2. Ammonium chloride solution, 10%. Transfer 1893 gms of U.S.P. Granular Ammonium Chloride to a 5 gallon plastic bottle. Make up to 5 gallons with distilled water with thorough mixing.

3. Sodium Hydroxide, 50%. Dissolve 500 gms of sodium hydroxide pellets in distilled water and dilute to 1 L. Use caution, store in plastic when cool. Dilute 1 to 1 with distilled water for use. (For field use this solution will be made up and distributed by Headquarters Laboratory.)
4. Triethanolamine, 20%. Dilute 100 ml of triethanolamine to 500 ml with distilled water. (For field use this solution will be made up and distributed by Headquarters Laboratory.)
5. Hydroxynaphthol Blue. Obtain from Headquarters.

CAUTION: All equipment must be kept scrupulously clean and thoroughly rinsed with distilled water. All reagents must be stored in polyethylene containers.

D. PROCEDURE: Preparation of Curve:

Prepare three duplicate sets of samples as follows:

- Set 1. Transfer two 300 gm samples of aggregate at the planned moisture content for the job, to separate plastic containers. (Note: The water used in bringing up the moisture to the correct amount should be the same as that used at the job site.)
- Set 2. Prepare two samples as above containing 2.0 percent cement of the type to be used on the job.
- Set 3. Repeat Set 1, preparing two samples containing 3.0 percent cement.

Proceed with each sample as with production samples described in Section E. Then construct a graph showing net mls.* EDTA vs. percent cement, using the average figures from Sets 1, 2, and 3. This should yield a straight line. Set 1 corresponds to the blank for the aggregate being used.

*Net mls. EDTA = Total mls. minus mls. for blank. Thence a new curve need not be prepared if only the blank changes.

E. PRODUCTION SAMPLES:

Make up a sample of exactly 300 grams, and place the sample into a 2 qt. plastic container, and add 600 mls of ammonium chloride solution. Stir EXACTLY 2 minutes with a stainless steel stirring rod, allow to settle EXACTLY 4 minutes and then pipette a 10 ml aliquot of the supernatant solution into a 250 ml Erlenmeyer flask. Add approximately 75 ml of distilled water and with thorough mixing add the diluted sodium hydroxide (NaOH) dropwise until a pH between 13.0 and 13.5 is obtained, using the pH indicator paper as a control. Add 4 drops of 20% Triethanolamine solution and then add the Hydroxynaphthol Blue indicator. Titrate with EDTA to a pure blue endpoint.

Subtract the blank from your final reading and determine the cement content from the previously prepared graph.