Test Method

Cementitious Binder and Granular Additive Content for the Stabilisation of Pavement Materials

RC 330.01

1. Scope

This Method covers the laboratory procedure for the design of an optimum mixture of granular material and cementitious binder for use as a pavement base or subbase.

2. Definitions

(a) Cementitious Binder

A cementing agent which binds the particles of a granular pavement material together to increase its strength. Cementitious binders include Portland cement Type GP or blended cement Type GB, hydrated lime, quicklime, or a blend of ground granulated blast furnace slag (GGBFS), hydrated lime, fly ash, alkali activated slag or other pozzolanic material.

(b) Maximum Allowable Working Time

The time available, to the nearest hour, for a crushed rock base material stabilised with a cementitious binder to reach a value of 90% of the Unconfined Compressive Strength (UCS) determined for the stabilised material after storage for one hour at the specified temperature.

The specified temperature is:
May to September 10° to 15°C
October to April 20° to 25°C.

(c) Working Time

The time that is required to mix, trim and fully compact, the stabilised material after addition of the cementitious binder in the road bed.

3. Apparatus

(a) For grading - as detailed in AS 1289.3.6.1.

(b) For plasticity index - as detailed in AS 1289.3.1.1, AS 1289.3.2.1 and AS 1289.3.3.1.

(c) For unconfined compressive strength - as detailed in AS 1141.51.

(d) For maximum dry density and optimum moisture content- as detailed in AS 1289.5.2.1.

4. Sampling

4.1. General

(a) Divide the road into lots representing not more than 10 000 m^2 of the pavement to be stabilised.

(b) Select the boundaries of the lot based on uniformity of material type, apparent grading and plasticity of the material to be stabilised.

(c) Determine the number of sampling sites within the lot so that each does not represent more than 2000 m^2 of the existing pavement. Select the sampling sites within the lot in accordance with AS 1289.1.4.2.

(d) Obtain a sample of at least 50 kg from each site within a lot in accordance with Clause 6.4 of AS 1289.1.2.1. Include the bituminous surfacing if it is to be pulverized and added to the mixture. Ensure that the proposed maximum depth of stabilisation is reached.

4.2. Preparation

(a) Combine all the samples taken from the lot into a combined sample for the lot.

(b) Prepare the combined sample in accordance with Clause 5.1 of AS 1289.1.1. Ensure that all asphalt and surfacing seal material is broken up. Take care not to crush individual particles.

5. Particle Size Distribution

(a) Obtain a representative test portion from the combined sample prepared in step 4.2(b).

(b) Determine the particle size distribution of the representative test portion in accordance with AS 1289.3.6.1.

(c) If the particle distribution does not meet the job specification requirements, adjust the particle distribution by addition of natural or crushed material meeting the job specification requirements (see Note 1).

(d) Determine the particle distribution of the granular additive.

(e) Record the percentage of granular additive required to correct the particle size distribution.

6. Plasticity Index

(a) Obtain a representative test portion from the combined sample prepared in step 4.2(b).

(b) Thoroughly mix in any granular additives in the proportions determined in Clause 5.

(c) Determine the Plasticity Index (PI) of the test portion prepared in step 6(b) in accordance with AS 1289.3.1.1, 3.2.1, and 3.3.1.

(d) If the Plasticity Index is outside the specification limits,

EITHER

(i) Pretreat the material with the type of lime that would be used on the job at a rate of not less that 1.5% by mass using the following procedure:

A add additional water to hydrate the lime and maintain a moisture content at or near optimum moisture content;

B allow the material to stand for 24 hours and retest for Plasticity Index by repeating steps 6(b) & (c);

C repeat this procedure, with increasing increments of lime, until the Plasticity Index falls below the specified maximum limit;

OR

(ii) Add a low plasticity or non plastic granular material to lower the Plasticity Index using the following procedure:

A determine the particle size distribution of the additive;

B add the granular additive material to the mixture prepared in Step 6(b);

C repeat step 6(c) above until it is found that the Plasticity Index falls below the specified limit.

D repeat step 5 above to check the combined grading of the modified material and, if required, adjust the combinations to comply with specified requirements.

(e) Record the percentage by mass of lime to be added or the description, source and percentage of low plasticity granular additive required to be added to satisfy the maximum specified PI requirement.

7. Unconfined Compressive Strength (Ucs)

(a) Obtain a representative test portion from the combined sample prepared in step 4.2(b).

(b) Thoroughly mix in any granular or lime additives in the proportions determined in steps 5 and 6. Screen out any oversize material retained on the 19 mm sieve. Add sufficient water to achieve a moisture content, close to optimum moisture content. Allow the mixed material to stand and cure for at least 8 hours.

(c) Select the cementitious binder to match the maximum allowable working time of the binder with the expected working time in the field.

(d) Add binder to the material prepared in step 7(b) and thoroughly mix into the test portion.

(e) Determine the UCS of the stabilised material prepared in step 7 (d) in accordance with AS 1141.51 with the following provisions:

(i) allow the material to stand for a minimum of 2 hours before commencing compaction;

(ii) complete compaction of both specimens within 3 hours ofmixing using modified compactive effort;

(iii) cure the compacted test specimens for 7 days at an ambient temperature of between 20°C and 25°C;

(iv) On completion of curing, immediately perform the procedure for compression testing as described in AS 11411.51 Clause 9.

(f) If the UCS is below the specified minimum, repeat steps 7(a) to (e) above with increasing increments of cementitious binder until the minimum UCS as specified is obtained or exceeded.

(g) If the quantity of cementitious binder required exceeds the specified upper limit, modify the grading as determined in step 5. Repeat step 6 to check that plasticity index requirements are met. Repeat, steps 7(a) to (e) until the minimum UCS requirement is satisfied and the quantity of cementitious binder meets the specification requirements.

(h) Record the percentages by mass of cementitious binder added, the UCS values obtained and, if applicable, the percentage of material added to modify the grading.

8. Maximum Dry Density (Mdd) and Optimum Moisture Content (Omc)

(a) Obtain a representative test portion from the combined sample prepared in step 4.2(b).

(b) Thoroughly mix in any granular additives in the proportions determined in steps 5 and 6. Screen out any oversize material retained on the 19 mm sieve. Add water and allow the mixed material to stand and cure for a minimum of 8 hours.

(c) Add the same quantity and type of cementitious binder as determined in step 7.

(d) Store the sample in a sealable container at a temperature of 20°-25°C for 2 hours.

(e) Break any lumps of the material over a 10 mm screen and recombine as described in AS 1289.1.1.

(f) Determine the Maximum Dry Density (MDD) and Optimum Moisture Content (OMC) of the material prepared in step 8 (e) as detailed in AS 1289.5.2.1.

9. REPORT

Report the following information to the levels of accuracy detailed in the relevant test methods, where appropriate:

(a) the particle size distribution of the combined sample obtained.

(b) the particle size distribution of the modified combined sample after the addition the granular additive(s), the particle size distribution and the percentage by mass of any granular additive added to correct the particle size distribution and/or plasticity index.

(c) as required:

  (i) the Plasticity Index (PI) of the sample prior to addition of lime or granular additive;

  (ii) the PI after addition of lime or granular additive;

  (iii) the percentage by mass of lime and/or granular additive to the nearest 0.1%, as recorded in step6 (d);

  (iv) the particle size distribution of the additive used, see step 6(d)(ii)A.

(d) the type and percentage of cementitious binder added, to the nearest 0.1%, as recorded in step 7(f);

(e) the mean Unconfined Compressive Strength of the combined materials, including cementitous binder as recorded in step 7(h);

(f) the maximum dry density and the optimum moisture content of the stabilised material;

(g) the location of the lot.

10. Note

Note 1:

Crushed material is required to meet the durability requirements for Class 3 crushed rock as detailed in Section 812 of VicRoads Standard Specification.

If the material is too fine, add a suitable no fines or gap graded Class 3 crushed rock or no fines natural material additive (e.g. material with the 7 mm minus fraction removed) to the mixture, so that the material meets the specified grading limits. Repeat steps 5 (a) and (b).

If the material is too coarse, add a suitable fine natural gravel or crusher fines additive to the mixture, so that the material meets the specified grading limits, repeat steps 5 (a) and (b).

Test Method - Revision Summary

RC 330.01 Cementitious Binder and Granular Additive Content for the Stabilisation of Pavement Materials

Date	Clause Number	Description of Revision	Authorised by
June 2012	Full document	Re-styled with minor corrections made	Principal Advisor – Pavements & Materials