ASSEGAI CONCRETE TECHNOLOGIES

"Quality Through Harmony"

PO Box 471, Kalamunda
Western Australia 6076
Mobile 0439 995 447
Email (current): gandjacton @ westnet. com. au

John T.C. Acton CPEng. MIE Aust.
Proprietor

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CEMENTED SOILS FOR FLOOR SLAB ON GROUND CONSTRUCTION

Cemented Soils have been used to construct hardstanding areas including floors, using soil materials in the vicinity of the construction site in a cement stabilisation process.

The prime consideration is that of the capability of the soil being compatible with the cementing action of the addition of cement and / or hydrated lime. The capability of the soil depends primarily of the absence or minimal quantities of organic materials, which inhibit the hydration process.

The secondary consideration is the dosage of cement required to form a material of sufficient strength to satisfy the floor performance. The range of soils which can be stabilised ranges from fine sands to clays, with the optimum being a well graded gravel, such as would be selected to construct an unsealed road pavement.

The requirement for the use of hydrated lime in the stabilisation of wet, cohesive clays is for the pre-treatment of the clay to allow the addition of cement into the clay. Most clay types will be compatible to lime stabilisation, passing from a wet, cohesive clay into a friable 'gravel' material. Cement can be used to complete the cementation process. Testing of soils before site works commence is required.

Testing for organic contamination, which will interrupt the setting and hardening process, can be carried out using a 3% Caustic Soda test as per the attached sheet. Alternatively a small sample of approximately half a litre volume can be checked for various cement contents for setting and hardening characteristics.

The performance of Cemented Soils is dependant on the adjustment of the moisture content of the soil to the optimum for compaction, that is the condition when the effort required for maximum compaction by a particular method is a minimum. For practical purposes, this is measured by the 'Hand Clasp Test' which has been used as a test by people in the road making industry for centuries. A handful of the soil is squeezed and should form a lump which is not crumbly, nor wet, clearly shows the imprint of the fingers which have squeezed it and will break open if pushed by a finger of the other hand.

This test will also show if the selected soil requires blending with another soil for optimum results, for example a coarse gravel may require blending with a clayey sand. Each soil type is individual and only general guidelines can be given.

Soil types and cement dosage requirements can be classified as follows:

NUMBER OF SQUARE METRES COVERED BY ONE BAG (40 KG) CEMENT				
	Degree of Wear Resistance Required		Dosage of cement as % by weight soil Note#1	
Soil Type	Normal	High	Normal	High
Sandy Gravel, Gravels with low to medium clay content	3	2	3 x 150 kg = 450 kg 40/450 = **9%**	2 x 150 kg = 300 kg 40/300 = **13.5%**
Very sandy gravels, grits & course sands, gravels with medium to high clay contents	2	1½	2 x 150 kg = 300 kg 40/300 = **13.5%**	1.5 x 150 = 225 kg 40/225 = **18%**
Fine sands, gravels with high clay content.	1½	1	1.5 x 150 = 225 kg 40/225 = **18%**	1 x 150 = 150 kg 40/150 = **27%**

Note #1. The calculation is made assuming that the compacted material has a bulk density of 1,500 kg per cubic metre and the bag coverage is related to a mixing depth of 100 mm as available with a walk – behind rotary hoe.

Weight of 1 square metre by 100 mm thick = 0.1 cubic metre x 1,500 kg
= 150 kg

Clay and Fine Silt Test

Prepare a nominal 1 per cent solution of common salt in water. This may be done by adding one teaspoonful (5 ml) of common or table salt to 500 ml of water.

Place about 50 ml of the salt solution in a 250 ml stoppered bottle. Pour sand into the bottle until its measured volume is 100 ml. Make the volume up to 150 ml by the addition of more salt solution.

Shake the mixture vigorously and allow to stand for three hours. At the end of that time note the volume of the sand and the volume of the settled silt. The depth of the clay and silt layer should not be more than 10% of the total depth of sand.

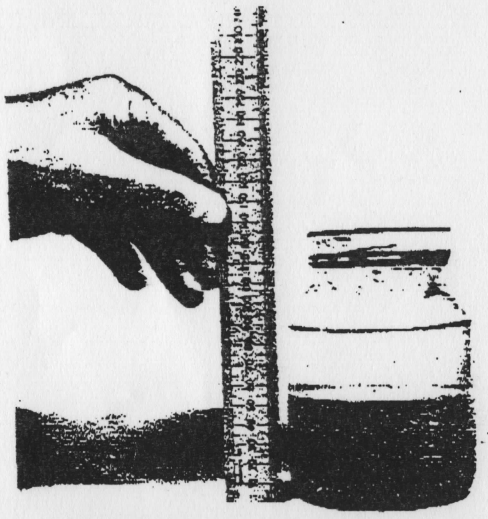

Fig. 5. The Silt Test. Measure the amount of silt on top of sand and total depth of sand.

Organic Impurities Test

Organic impurities in aggregate, that is humus, vegetable matter or other impurities of this kind can seriously affect the setting time and strength of concrete.

A simple test for organic matter other than sugar may be carried out with the aid of a bottle and a three per cent solution of caustic soda. This solution can be obtained at a chemist shop or alternatively dissolve 30 g of sodium hydroxide in 970 ml of water.

Pour about 50 ml of 3 per cent sodium hydroxide into a calibrated bottle. Add the sand to the 125 ml mark and adjust the sodium hydroxide level to the 200 ml mark with more solution. Vigorously shake the mixture and allow to stand for approximately 24 hours.

Examine the colour of the solution above the sand. (See Figure 6). If it is still clear the sand is free from organic impurities. If, however, it has darkened, there could be organic material present and further tests may be required. A slight amount of darkening may be permissible, no darker than the colour of light straw say, but any signs of darkening must be reported.

Fig. 6. Organic Impurities Test. Solution above sand should remain clear — as in bottle at left. Darkening of solution (bottle at right) indicates impurities.