SINGAPORE STANDARD

SS 73 : Part 21 : 1992

(ICS 91.100.20)

SPECIFICATION FOR

Methods for sampling and testing of mineral aggregates, sand and fillers

Part 21 : Methods for determination of soundness

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METHODS FOR SAMPLING AND TESTING OF MINERAL AGGREGATES, SAND AND FILLERS - PART 21 : METHODS FOR DETERMINATION OF SOUNDNESS

FOREWORD

This Part of SS 73 has been prepared under the direction of the Building Materials and Products Standards Committee.

This Part of SS 73 contains the test procedures for the determination of the 'soundness' of aggregates. Soundness test were not included in the previous edition of SS 73 but have now been included because there is a need, in some circumstances, for a test to identify certain aggregates which are apparently suitable for use, when tested by the test procedures described in other Parts of this standard (e.g. the mechanical strength tests described in BS 812 Parts 110*, 111*, 112* and 113*), but which fail in service. This standard is based on BS 812 : Part 121 : 1989 and reproduced by permission of BSI, 2 Park Street, London, WIA 2BS, England.

The definitive method is based on finding the degree of degradation that occurs when test portions of an aggregate in the size range 10.0 mm to 14.0 mm are subjected to cycles of immersion in saturated magnesium sulphate solution followed by oven-drying. The degree of degradation is expressed as the magnesium sulphate soundness value. Appendix A recommends procedures for carrying out the test on test portions of aggregate in size ranges other than the one used in the definitive method.

The sulphate soundness test has a long history. It is reported that it first appeared in France around 1818 as a test for classifying the resistance of building stone to deterioration under freeze-thaw conditions. In North America it has been incorporated in the ASTM book of standards, designation C88, since 1931. It did not come into widespread use in the United Kingdom until the late 1970s.

Current experience of the use of the test in the UK relates mainly to aggregates in materials forming the surfacing of airfields/airports and of highway pavements.

It is intended that advice on the applicability of this test for given situations and on the selection of limits will be included in future Parts of this standard. Similarly it is intended that advice on calibration will be included under SS 73 series standard.

It is intended that other Singapore Standards should call up SS 73 test methods as the basis for compliance. Nevertheless it is not intended that all aggregates should be subjected regularly to all the listed tests. Specifications in other standards should call up only relevant test methods.

Reference should be made to SS 73 : Part 1 for general guidance on testing aggregates, precision of test methods and variance arising from sampling errors.

* Titles are given at the end of the standard.

NOTE

1. Singapore Standards are subject to periodical review to keep abreast of technological changes and new technical developments. The revisions of Singapore Standards are announced through the issue of either amendment slips or revised editions.

2. Compliance with a Singapore Standard does not exempt users from legal obligations.

1. SCOPE

This Part of SS 73 describes the method for determining the soundness of aggregates by subjecting the aggregate to cycles of immersion in a saturated solution of magnesium sulphate followed by oven-drying. The method is applicable to aggregate passing a 14.0 mm test sieve but is retained on a 10.0 mm test sieve.

NOTE 1. The majority of aggregates can be tested for soundness using this method. Precision has been established for the rock types listed in Table 1. The test may not be suitable for all rock types and reservations have been expressed elsewhere in respect of some carbonate aggregates and some aggregates having a high proportion of magnesium bearing minerals or of cryptocrystalline quartz.

For other size fractions, a recommended method is described in Appendix A.

NOTE 2. The titles of the publications referred to in this standard are listed at the end of the standard.

2. DEFINITIONS

For the purposes of this Part of SS 73 the definitions given in SS 73 : Part 1 and BS 812 : Part 102 or equivalent Singapore Standards apply.

3. PRINCIPLE

A sample of aggregate in the size range 10.0 mm to 14.0 mm is subjected to five cycles of : immersion in a saturated solution of magnesium sulphate; followed by oven-drying at 105°C to 110°C. This subjects the sample of aggregate to the disruptive effects of the repeated crystallization and rehydration of magnesium sulphate within the pores of the aggregate. The extent of the disruption is dependent upon the soundness of the aggregate. The degree of degradation arising from the disruptive effects is measured by the extent to which material finer than 10.0 mm in particle size is produced.

4. SAMPLING

The sample to be used for the test (the laboratory sample) shall be taken in accordance with the procedure described in Clause 5 of BS 812 : Part 102 or equivalent Singapore Standards.

5. APPARATUS

5.1 Test sieves, with square hole perforated plate of sizes 14.0 mm, 10.00 mm and 6.3 mm, and a woven wire 3.35 mm test sieve. The test sieves shall comply with SS 74.

5.2 **A Balance,** of at least 10 kg capacity, accurate to 5 g.

5.3 **A Balance,** of at least 500 g capacity, accurate to 0.05 g.

5.4 **At Least Two Brass Or Stainless Steel Mesh Baskets** for immersing aggregate specimens in the solution (see 6.3), which permit free access to the solution and drainage of the solution from the aggregate under test. A suitable design is shown in Figure 1.

5.5 **Containers,** of diameter such that the baskets listed in 5.4 can be readily placed in and out, and with a volume at least five times the volume of the immersed aggregate (see note).

NOTE. Polypropylene beakers of 2 L capacity make suitable containers.