

**SINGAPORE STANDARD**

# **Testing concrete**

– Part A24 : Methods for analysis of hardened concrete

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## SS 78 : Part A24 : 1991

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**TESTING CONCRETE  
PART A24 : METHODS FOR ANALYSIS OF HARDENED CONCRETE**

**FOREWORD**

This part of SS 78 has been prepared under the direction of the Building Materials Product Standards Committee. It supersedes SS 78 : Part 6 : 1972, which is withdrawn.

The publication as SS 78 : Part 6 of the first Singapore Standard methods for analysing hardened concrete enabled analysts to use the same methods and to make the same assumptions. After 18 years' use some modifications and extensions to the methods and interpretation of results are necessary.

The publication in 1980 of the revision of BS 4551 also made it desirable that the methods for analysing hardened concrete should be in harmony with the methods for analysing hardened mortars and screeds.

The most important technical changes made in this revision as a result of experience gained with the methods in these two standards are as follows:

- (a) Deletion of the sodium succinate step for removing silica, iron and alumina prior to measuring calcium; on occasion this led to low results probably caused by co-precipitation of calcium with the silica.
- (b) A change in the method for extracting soluble silica; the new method has been shown to give reduced attack on siliceous aggregate while still giving full extraction of the soluble silica. This change in the extraction procedure renders the new method unsuitable for analysing concretes made with high alumina cement.
- (c) Deletion of the method of cement content determination associated with the procedure for measuring aggregate grading since it was considered that few (if any) workers still used this procedure.
- (d) Inclusion of a method for determining sulphide as an essential step in analysing concretes containing ground granulated blastfurnace slag as a reactive addition.
- (e) Inclusion in the test for original water content of a sanction for assuming the combined water content of hydrated Portland cement in hardened concrete when samples of the aggregates are not available. It is recognized that making the assumption is usually more accurate than attempting to measure the combined water content of the sample and of the aggregate recovered from the concrete, and making the appropriate corrections.
- (f) Simplification of the equations for calculating cement and aggregate contents based on an assumed value for the combined water content of hydrated Portland cement in hardened concrete.
- (g) Deletion of the method for the determination of sulphoaluminate on account of doubts about its reliability and utility.
- (h) Deletion of the method for the determination of cement content by calculation from the acid soluble calcium and carbon dioxide contents; the method frequently gave difficulties caused by uncertainty in the assumed value for carbonation of the concrete and was therefore considered unsuitable for regular use. However, in certain cases it allows an estimate of the cement content to be made when no other method seems possible.

In addition some major changes have been made, among which is a new recommended indicator, calcein, for calcium determination because the indicator previously recommended. HSN\*, does not always give clear end-points, however, when clear unambiguous end-points are given, HSN may be preferred. Trichlorethane is now used for resaturation when measuring capillary porosity as the toxic nature of carbon tetrachloride has been recognized.

A universally applicable method of analysis does not exist owing to the wide variety of materials from which concrete can be made and the conditions to which it may have been subjected. Many different approaches are therefore necessary in varying circumstances and in this part of SS 78 A series standards all possible circumstances have not been included. Nevertheless the methods given are considered to present the best approach in the majority of cases.

The increasing use of reactive additions in concrete will complicate the analysis of concretes. The content of blast-furnace slag from known sources can still be determined, but at present no simple method exists for determining the content of pozzolanas, eg. pulverised-fuel ash.

Sampling hardened concrete to provide sufficient data to give meaningful information about the composition of a batch of concrete remains a problem. No statistical statement about the results of analysis can be made with less than two independent samples, and this should be regarded as the minimum number.

It should not be necessary to stress that the results for one batch of concrete cannot be applied to any other batch.

Poor results are often caused by incorrect sample preparation and the requirements given in Subclause 4.5 should be followed closely. Precise and accurate results can be achieved using the methods described. This does not imply that all analysts will regularly achieve such results.

This standard is based on BS 1881 : Part 124 : 1988 "Methods for Analysis of Hardened Concrete" and is reproduced by permission of BSI, 2 Park Street, London W1A 2BS, England.

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\* The HSN indicator is prepared by grinding 1 g 2-hydroxy-1-(2-hydroxy-4-sulpho-1-naphthylazo) -3-naphthoic acid with 10 g MgSO<sub>4</sub> 7H<sub>2</sub>O and 100 g NaCl.

**1. SCOPE**

This Singapore Standard describes the sampling procedures, treatment of samples, and analytical methods to be used on a sample of concrete to determine the cement content, aggregate content, aggregate grading, original water content, type of cement, type of aggregate, chloride content, sulphate content, and alkali content.

The procedures apply to concretes made with Portland cements and, in favourable circumstances, containing ground granulated blastfurnace slag.

The analysis of concretes made with other cements and the determination of pulverized-fuel ash content are outside the scope of this standard.

**2. DEFINITIONS**

For the purposes of this part of SS 78 A-series standards, the definitions in BS 5328 and BS 6100 : Part 6 apply.