

Concrete admixtures —

Part 1: Specification for accelerating and retarding water-reducing admixtures

ICS 91.100.10; 91.100.30

Cooperating organizations

The Cement, Gypsum, Aggregates and Quarry Products Standards Committee, under whose direction this British Standard was prepared, consists of representatives from the following:

Association of Consulting Engineers	Department of Transport*
Association of County Councils	Federation of Civil Engineering Contractors*
Association of District Councils	Gypsum Products Development Association
Association of Metropolitan Authorities	Institute of Quarrying
Autoclaved Aerated Concrete Products Association	Institution of Civil Engineers*
British Precast Concrete Federation Ltd.*	Institution of Highway Engineers
British Quarrying and Slag Federation	Institution of Municipal Engineers
British Railways Board	Institution of Public Health Engineers
British Ready Mixed Concrete Association*	Institution of Structural Engineers*
British Steel Industry	Institution of Water Engineers and Scientists
Cement Admixtures Association*	National Federation of Building Trades Employers*
Cement and Concrete Association*	Natural Environment Research Council (Institute of Geological Sciences)
Cement Makers' Federation*	Royal Institute of British Architects
Chemical Industries Association	Royal Institution of Chartered Surveyors
Concrete Society Limited*	Sand and Ballast Hauliers and Allied Trades Alliance
County Surveyors Society*	Sand and Gravel Association Limited
Department of the Environment (Building Research Establishment)*	Society of Chemical Industry*
Department of the Environment (PSA)*	Stone Federation
Department of the Environment (Transport and Road Research Laboratory)	

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the Technical Committee entrusted with the preparation of this British Standard:

Brick Development Association	Mortar Producers' Association Ltd.
British Ceramic Research Association	Plasterers' Craft Guild
Electricity Supply Industry in England and Wales	

This British Standard, having been prepared under the direction of the Cement, Gypsum, Aggregates and Quarry Products Standards Committee, was published under the authority of the Board of BSI and comes into effect on 26 February 1982

© BSI 10-2000

First published July 1974
First revision

The following BSI references relate to the work on this standard:
Committee reference CAB/3
Draft for comment 79/11802 DC

Amendments issued since publication

Amd. No.	Date of issue	Comments
4183	February 1983	
4910	October 1985	
11057	October 2000	Indicated by a sideline in the margin

Contents

	Page
Cooperating organizations	Inside front cover
Foreword	ii
1 Scope	1
2 References	1
3 Definitions	1
4 Sampling	1
5 Performance requirements	1
6 Admixture uniformity tests and requirements	1
7 Information to be provided by the manufacturer	3
8 Manufacturer's compliance certificate	4
9 Manufacturer's storage certificate	4
10 Marking	4
Appendix A Methods of sampling admixtures	5
Appendix B Preparation of concrete for admixture acceptance tests	5
Appendix C Admixture acceptance tests on the control mix and test mix concretes	7
Appendix D Admixture uniformity tests	8
Appendix E Determination of the chloride ion content of admixtures	10
Appendix F Notes on the use of accelerating and retarding water-reducing admixtures	12
Figure 1 — Example of potentiometric titration of chloride with silver nitrate solution using silver and calomel electrodes	12
Figure 2 — Typical relationship between compacting factor, penetration resistance (stiffening time) and time, indicating temperature effects (cement content: 300 kg/m ³)	15
Table 1(a) — Performance requirements and tests for test mix concrete A	2
Table 1(b) — Performance requirements and tests for test mix concrete B	2
Table 2 — Admixture uniformity test requirements	3
Table 3 — Fine aggregate grading limits	6
Table 4 — Approximate quantities of concrete required for each admixture acceptance test on a batch	6
Table 5 — Example of experimental data for the determination of the chloride ion content of an admixture	12
Bibliography	16

Foreword

This Part of this British Standard has been prepared under the direction of the Cement, Gypsum, Aggregates and Quarry Products Standards Committee and is based on an initial draft provided by the Cement Admixtures Association. This Part of this standard incorporates such recommendations of other organizations as the Technical Committee felt were appropriate, and is based on the results of cooperative tests carried out in accordance with earlier drafts of this Part. Particular attention has been given to the use of test methods already covered in BS 1881 and BS 4551.

This Part of the standard is concerned only with accelerating water-reducing admixtures and retarding water-reducing admixtures. Mortar plasticizers are covered in BS 4887. The requirements for accelerating admixtures, retarding admixtures and water-reducing admixtures which were previously covered by BS 5075-1 have been superseded by the issue of BS EN 934-2 and BS EN 934-6.

Where existing British Standards and specifications call up accelerating admixtures, retarding admixtures and water-reducing admixtures meeting the requirements of BS 5075-1, products with an existing certificate showing compliance with that standard can still be accepted. Products which have been tested to the requirements of BS EN 934-2 should also be accepted as showing technically equivalent performance.

Where standards and specifications call up BS EN 934, it is recommended that for an interim period, BS 5075 certification should continue to be accepted as technically equivalent.

Retarding superplasticizing admixtures are covered by BS 5075-3 and admixtures for mortar are covered by BS 4887. All other types of admixture for concrete are now covered by BS EN 934-2.

BS 5075-1:1974 is superseded by this Part and is therefore now withdrawn.

Major changes are made to this Part of this British Standard by Amendment No. 3 subsequent to the publication of BS EN 934-2.

This Part of this standard deals primarily with the water content, the strength and the rate of stiffening and hardening of normal concretes. The effects of admixtures on other properties or on special concretes are not covered and should be the subject of assurances from the vendor.

This Part of this standard requires that the chloride ion content of all admixtures be declared so that the user will be fully aware of the chloride ion content that will be introduced into the concrete by any particular admixture.

Some guidance on the use of admixtures was considered to be important and has been included as Appendix F, which also indicates the desirability of the purchaser carrying out trials of the admixture with the specific materials and conditions of the given concrete work before actually introducing the admixture into a functional concrete mix at the site.

Certification. Attention is drawn to the certification facilities described on the inside back cover of this standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 16, an inside back cover and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

Sidelining in this document indicates the most recent changes by amendment.

1 Scope

This Part of this British Standard specifies the requirements and methods of test for accelerating and retarding water-reducing admixtures, which may be used to modify one or more properties of hydraulic cement concrete: the workability, the rate of stiffening and hardening, and the strength.

2 References

The titles of the standards publications referred to in this standard are listed on the in the Bibliography.

3 Definitions

For the purposes of this Part of this British Standard the definitions given in BS 2787 and the following apply.

3.4

accelerating water-reducing admixture

a material that combines the functions of an accelerating admixture and a normal water-reducing admixture

3.5

retarding water-reducing admixture

a material that combines the functions of a retarding admixture and a normal water-reducing admixture

NOTE 3.4 and 3.5. The performance requirements for these categories are defined according to their specified test requirements in Table 1.

4 Sampling

An admixture to be tested in accordance with the requirements of this Part of this standard shall be sampled by the appropriate method described in Appendix A.

5 Performance requirements

Admixtures shall comply with the performance requirements, appropriate to the type of admixture, detailed in Table 1.

For the purpose of acceptance testing, a representative sample of admixture, as defined in the appropriate subclause in Appendix A, shall be subjected to the tests detailed in Table 1 and shall comply with the relevant requirements specified therein.

Concrete mixes for these tests shall be prepared and tested in accordance with Appendix B and Appendix C.

Each pair of test mixes A and B containing the admixture shall be compared with a control mix made on the same day under the same conditions and the average result obtained from two such comparisons shall be taken to assess compliance with the specified test requirements.

Consignments of this admixture which have the same description, given as in 7.3 a) and b), need not be tested individually for acceptance. If any characteristic of the admixture given in 7.3 a) and b) is changed new acceptance tests shall be carried out and the designation as given in clause 10 b) shall be changed.

NOTE 1 Although the purpose of the tests is to verify compliance with the specified requirements, the results will also serve to demonstrate the effect of the admixture on certain properties of the concrete; it will be seen that, for some types of admixture, certain tests are not applicable.

NOTE 2 For the purposes of acceptance testing, the manufacturer¹⁾ or his agent may be required by the purchaser to demonstrate compliance with the test requirements. The manufacturer is responsible thereafter for ensuring, by his control of production, that consignments of admixture maintain, on delivery, the performance of the sample originally tested for acceptance.

6 Admixture uniformity tests and requirements

Any batch of admixture shall have the same composition, given as in 7.3 b), as that of the admixture tested for acceptance. To check this uniformity of composition, a sample of the batch taken in accordance with Appendix A shall be tested in accordance with Appendix D and Appendix E and it shall satisfy the requirements given in Table 2.

¹⁾ The term “manufacturer” throughout this standard includes the supplier where appropriate.

Table 1(a) — Performance requirements and tests for test mix concrete A

Property	Type of admixture	
	Accelerating water-reducing	Retarding water-reducing
Compacting factor (see C.3) relative to control mix concrete	At least 0.03 above	At least 0.03 above
Stiffening times (see C.4) for 0.5 N/mm ² for 3.5 N/mm ²	—	—
Minimum compressive strength as % of control mix concrete (see C.5) at 24 h at 7 days at 28 days	125 — 90	— 90 90

Table 1(b) — Performance requirements and tests for test mix concrete B

Property	Type of admixture	
	Accelerating water-reducing	Retarding water-reducing
Compacting factor (see C.3) relative to control mix concrete	Not more than 0.02 below	Not more than 0.02 below
Stiffening time (see C.4) for 0.5 N/mm ² for 3.5 N/mm ²	More than 1 h At least 1 h less than control mix	At least 1 h longer than control mix —
Minimum compressive strength as % of control mix concrete (see C.5) at 24 h at 7 days at 28 days	125 — 110	— 110 110

NOTE The strength requirements take into account the usual variations in cube testing and the limited increase in air content allowed with the test mix concretes.

Table 2 — Admixture uniformity test requirements

Characteristic	Test reference	Requirement
Dry material content	D.1	(a) For liquid admixtures: to be within 3 % (<i>m/m</i>) of the value stated by the manufacturer. (b) For solid admixtures: to be within 5 % (<i>m/m</i>) of the value stated by the manufacturer.
Ash content ^a	D.2	To be within 1.0 % (<i>m/m</i>) of the value stated by the manufacturer.
Relative density	D.3	For liquid admixtures: to be within 0.02 of the value stated by the manufacturer.
Chloride ion content	Appendix E	To be within 5 % of the value stated by the manufacturer or within 0.2 % (<i>m/m</i>), whichever is the greater.
^a As admixtures containing chloride give very variable results for ash content this test and requirement may be waived for admixtures which contain more than 1.0 % (<i>m/m</i>) of chloride ion.		

7 Information to be provided by the manufacturer

7.1 Information concerning the admixture.

The following information shall be provided by the manufacturer in a printed form.

- The name, trade mark or other means of identification of the manufacturer.
- The trade designation of the product, i.e. brand name, reference number and/or letter.
- The description of the material, i.e. accelerating or retarding water-reducing admixture.

7.2 Information concerning the admixture acceptance tests. The following information shall be provided by the manufacturer in a printed form if requested.

- The name and location of the test laboratory where admixture acceptance and uniformity tests were made and the date of testing.
- The sources of the cement (works of manufacture) and aggregates (quarry or pit, or for material dredged from seas, estuaries or rivers, the locality).
- The quantity of admixture used in the test mix concretes.
- The values of compacting factor, water/cement ratio and cement content for each batch of the control and test mix concretes.
- The percentage water reduction for test mix concrete B.
- The stiffening times to reach resistances to penetration of 0.5 N/mm² and 3.5 N/mm² for mortars sieved from each control and test mix concrete.
- The air content of each batch of the control and test mix concretes.

h) The ratio of the average compressive strength of the cubes from each of the test mix concretes A and B to the average compressive strength of the cubes from the control mix concrete at each appropriate age. This ratio is to be expressed as a percentage for each set of control and two test mix concretes at the appropriate ages required by this standard for the different types of admixtures.

7.3 Additional information. The following information shall be provided by the manufacturer in a printed form.

- Physical state (i.e. liquid or solid) and colour.
- Composition.

- Generic type of main active constituent(s), e.g. lignosulphonate, organic hydroxy-carboxylic acid or carbohydrate.
- Dry material content.
- Ash content.
- Relative density of liquid admixtures.
- Chloride ion content, expressed as a percentage by mass of total admixture.

c) Chloride content relative to the cement mass contributed by the recommended dosage or dosages expressed as a percentage by mass of chloride ion.

d) Packaging, recommended storage conditions, maximum storage time before use, and special precautions at extremes of temperature, including instructions regarding liquids which have become frozen. Where any special requirements on storage life apply, they shall be stated in the words:

“This admixture shall not be taken to comply with the requirements of BS 5075-1:1982 after (date).”

e) instructions for use and any necessary safety precautions, e.g. if caustic, toxic or corrosive.