

Screeds, bases and in situ floorings —

Part 3: Code of practice for polymer modified cementitious wearing surfaces

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Committees responsible for this British Standard

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- Association of Lightweight Aggregate Manufacturers
- British Aggregate Construction Materials Industries
- British Resin Manufacturers Association
- Building Employers Confederation
- Chartered Institute of Building
- Concrete Society
- Contract Flooring Association
- Department of the Environment (Building Research Establishment)
- Department of the Environment (Property Services Agency)
- Federation of Associations of Specialists and Subcontractors
- Federation of Plastering and Drywall Contractors
- Federation of Resin Formulators and Applicators (FeRFA)
- Mastic Asphalt Council and Employers Federation
- Mortar Producers Association Limited
- National Federation of Terrazzo-Marble and Mosaic Specialists
- Scottish Master Plasterers Association
- Society of Chemical Industry

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Foreword

This Part of BS 8204 has been prepared under the direction of Technical Committee B/544 Plastering, rendering, dry lining, screeds and in-situ flooring. It gives recommendations for floorings prepared from mixtures of cement, aggregate and polymer dispersion applied to a direct finished concrete slab or fine concrete screed and finished to the required level. Annex A, Annex B and Annex C give relevant test methods.

Traditional industrial floorings are sometimes not satisfactory for the more stringent requirements of some industrial situations. The main advantages of polymer modified cementitious in-situ flooring when compared with unmodified concrete wearing surfaces can be summarized as follows:

- a) more reliable bond to the base concrete;
- b) reduced permeability giving improved resistance to many chemicals;
- c) increased toughness, durability, flexural and tensile strength and resistance to abrasion and dusting;
- d) greater resistance to cracking;
- e) can be thinner and still give adequate performance.

The ISO standard for the measurement of the surface regularity of floors is in the course of preparation. The flatness requirements for flooring in this Part of BS 8204 will be amended to align with the ISO standard when it is published.

BS 8204-3 is one of a series dealing with in-situ floorings; the other Parts of BS 8204 are as follows.

- *Part 1:1987, Code of practice for concrete bases and screeds to receive in-situ floorings;*
- *Part 2:1987, Code of practice for concrete wearing surfaces;*
- *Part 4¹⁾, Code of practice for terrazzo wearing surfaces.*

Additional Parts of BS 8204 dealing with mastic asphalt and cold setting resin wearing surfaces are to be prepared.

As a code of practice, this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

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 to iv, pages 1 to 20, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

¹⁾ In preparation.

1 Scope

This Part of BS 8204 gives recommendations for the design and installation of trowel finished polymer modified cementitious wearing surfaces bonded to direct finished concrete slabs, fine concrete screeds and to existing concrete floors.

This standard does not include unbonded wearing surfaces or those laid monolithically, neither does it include two-component aqueous thermosetting polymer dispersions.

2 Normative references

This Part of BS 8204 incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on the inside back cover. Subsequent amendments to, or revisions of, any of these publications apply to this Part of BS 8204 only when incorporated in it by updating or revision.

3 Definitions

For the purposes of this Part of BS 8204, the definitions given in BS 6100-6.1:1984, BS 6100-6.2:1986, BS 6100-6.3:1984 and BS 6100-6.4:1986 apply together with the following.

3.1

direct finished base slab

base slab that is suitably finished to receive the flooring to be applied directly without need for a screed

3.2

concrete screed

concrete layer applied to a base and suitably finished at a designated level to receive the flooring

3.3

flooring

uppermost fixed layer of a floor that is designed to provide a wearing surface

3.4

fine concrete screed

screed consisting of concrete containing coarse aggregate of maximum size 10 mm

3.5

polymer modified cementitious flooring

mixture of cement, aggregates, polymer dispersion or re-dispersible powder polymer and water that hardens on curing

4 Exchange of information and time schedule

4.1 General

Consultations and exchange of information between all parties concerned with the building operations should be arranged at an early date, so that each may have full knowledge of the particulars of the flooring work and be able to cooperate in producing the conditions required to complete a satisfactory job.

4.2 Exchange of information

The designer should provide in good time all relevant information to those responsible for laying the flooring and to others whose work could be affected, including whichever of the following are applicable:

- a) description, situation and address of site and means of access;
- b) those conditions of contract which could practically affect this particular work;
- c) location and area of flooring to be laid;
- d) age and nature of the base, including information about the previous use of the floor which could impair adhesion, and any preparatory treatment required;
- e) type of polymer modified cementitious flooring to be laid related to intended use, the type of loading and time before trafficking;
- f) number of layers;
- g) thickness of flooring;
- h) finished floor level, falls and maximum permissible departure from datum in each location;
- i) class of surface regularity of base or fine concrete screed;
- j) type of damp-proofing and insulation;
- k) type and thickness of concrete screed;
- l) category of soundness of fine concrete screed required;
- m) any work consequent upon services passing through the floor;
- n) treatment of joints;
- o) treatment of channels;
- p) treatment of skirtings;
- q) treatment of junctions with adjacent floorings;
- r) type of finish of base or fine concrete screed;
- s) any special requirements related to underfloor heating;
- t) minimum time intervals between stages of work and the application of heat in the building;
- u) date for the completion of the base or concrete screed to receive the flooring;

- v) dates for the start and completion of various sections of the floor;
- w) details of any conformity testing required.

4.3 Time schedule

Allowances should be made for the following:

- a) curing and drying of the base concrete and/or fine concrete screed, when applicable (see 7.2);
- b) time between commencement and completion of work;
- c) period of curing (see 8.6.3) and protection of the completed flooring from damage by other trades, including restriction of access.

5 Materials

5.1 Polymers

5.1.1 Polymers for flooring

Polymers should be in the form of dispersions, or re-dispersible powders incorporated in one-pack systems of a type recommended by the manufacturer of the flooring.

The polymer dispersion should be a stable aqueous dispersion of alkali-resistant polymer particles of up to 3.0 µm in size, which on drying, under conditions of use, form a coherent film.

Styrene butadiene (SBR), acrylics and styrene acrylics are examples of suitable polymers.

Re-dispersible powder polymers should be able to re-disperse during the wet mixing process to form a stable polymer dispersion.

Vinyl acetate/ethylene and vinyl acetate/versatate are examples of re-dispersible powder polymers.

The label of the container holding the polymer dispersion should state the proportion of polymer solid content of the dispersion and the minimum film-forming temperature of the dispersion.

Pre-packed materials are available as follows.

- a) *Two-pack* in which one pack, consisting mainly of cement, graded aggregates and additives, is mixed with the second pack containing the corresponding dose of polymer dispersion. In some cases the second pack contains sufficient liquid to mix with the dry component, otherwise a recommended additional quantity of water has to be added.
- b) *One-pack* consisting mainly of a blend of cement, dried fine and coarse aggregates and powdered polymer which is mixed with water on site.

Each type of pre-packed material should be used in accordance with the manufacturer's instructions. Where the re-dispersible powder polymer is incorporated in a pre-packed dry mix, the label of the container or bag should state: the proportion of the polymer solids in the dry mix (excluding any filler used in the re-dispersible powder polymer) and the minimum film-forming temperature of the powder after re-dispersion.

5.1.2 Bonding agents

Any of the polymer dispersions given in 5.1.1 may be used in a bonding agent system. Other suitable bonding agents are epoxide dispersions and solvent-free epoxides. The use of bonding agents is discussed in 6.5.

Under laboratory conditions bonding agents should be capable of achieving a slant shear bond strength of not less than 20 N/mm² when tested by the method given in BS 6319-4:1984 (after 28 days, air curing at (20 ± 3) °C, (55 ± 10) % r.h., and a tensile bond strength of not less than 1 N/mm² after 3 days and not less than 2 N/mm² after 14 days, when tested by the adhesion test method given in B.3 of this Part of BS 8204.

The open time of the bonding agent after application should be compatible with the technique used on the site to lay the flooring.

Cement or cement and sand bonding coats without polymer modification are not recommended as they may not achieve the required tensile bond strength.

5.2 Cement

Cement should conform to class 42.5 N in BS 12:1991, BS 915-2:1972 or class 42.5 N in BS 4027:1991.

NOTE There is insufficient practical experience to include advice on other classes of cement in BS 12 or BS 4027, or the use of cement replacements: pulverized fuel ash, ground granulated blast-furnace slag and microsilica.

5.3 Aggregates

Aggregate should conform to the following grading limits:

- a) *sand*, grades C or M in Table 4 of BS 882:1992 with the additional requirement that not more than 1 % by mass should pass the 75 µm sieve;
- b) 3 mm *nominal single-sized aggregate*, Table 2 of BS 63-1:1987;
- c) 6 mm *nominal single-sized aggregate*, Table 2 of BS 63-1:1987;
- d) 10 mm *nominal single-sized aggregate*, Table 2 of BS 63-1:1987 or Table 3 of BS 882:1992.
- e) *fine aggregate (sand)*, type A or B in Table 1 of BS 1199:1976 (for making good imperfections in stair risers as described in 6.11).

Single-sized aggregates for heavy duty flooring should also conform to the mechanical properties given in 4.4 of BS 882:1992.

Aggregates should not contain any deleterious material in sufficient quantity to affect adversely the durability or appearance of the flooring; for example, lignite, coal, iron pyrites and any soft particles.

5.4 Pigments

Pigments should conform to BS 1014:1975.

5.5 Admixtures

Admixtures should conform to BS 5075-1:1982 and should be compatible with the polymer modified cement. Other types of admixture should only be used with the agreement of the polymer supplier.

5.6 Water

Water fit for drinking is suitable for mixes for polymer modified cement flooring but, where the water is of doubtful quality, reference should be made to BS 3148:1980.

Table 1 — Recommended thicknesses and mix designs

Class	Thickness mm	Total cement : aggregate	Mix proportions by weight of dry material					Polymer content
			Cement (see 5.2)	Sand (see 5.3 a)	3 mm aggregate (see 5.3 b)	6 mm aggregate (see 5.3 c)	10 mm aggregate (see 5.3 d)	
Light duty	8 to 15	1 : 3 to 1 : 4.5	1 1	3 to 4.5 ^a 3 to 4 ^b	—	—	—	See Table 2
Medium duty	10 to 15	1 : 3 to 1 : 4.5	1	1.5 to 2.25	1.5 to 2.25	—	—	
	15 to 30	1 : 3.5 to 1 : 4.5	1	2.0 to 2.25	—	1.5 to 2.25	—	
	25 to 40	1 : 4 to 1 : 5	1	2.25 to 2.50	—	—	1.75 to 2.50	
Heavy duty	As for medium duty	As for medium duty except that very hard single-sized aggregates should be used, as given in 5.3.						

^a Grade C in Table 4 of BS 882:1992.

^b Grade M in Table 4 of BS 882:1992.

Table 2 — Examples of mix proportions based on 50 kg of cement

Class	Thickness mm	Total cement : dry aggregate proportions	Dry Sand kg	Dry aggregate		Assumed water ^a in damp aggregates kg	Polymer dispersion content	Polymer dispersion ^b kg or l	Maximum ^c extra water kg or l
				Size mm	Weight kg				
Light duty	8 to 15	1 : 4	200	—	—	10	Min.	10	5
							Typical	12	4
							Max.	20	0
Medium and heavy ^d duty	10 to 15	1 : 4	100	3	100	6	Min.	10	9
							Typical	12	8
							Max.	20	4
Medium and heavy ^d duty	15 to 30	1 : 4	112.5	6	87.5	6.5	Min.	6.5	10.3
							Typical	10.0	8.5
							Max.	13.0	7
Medium and heavy ^d duty	25 to 40	1 : 4.5	125	10	100	7.3	Min.	7.0	9.3
							Typical	11.0	7.3
							Max.	14.0	5.8

^a 5 % water in sand, 1 % water in single-sized aggregates.

^b Weight or volume based on 50 % polymer solids.

^c For the maximum water : cement ratio of 0.40 assuming damp aggregates.

^d Coarse aggregate for heavy duty flooring should be as given in 5.3.