

Screeds, bases and in situ floorings —

Part 1: Concrete bases and cement sand levelling screeds to receive floorings — Code of practice

ICS 91.060.30

Committees responsible for this British Standard

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- Association of Concrete Industrial Flooring Contractors
- Association of Lightweight Aggregate Manufacturers
- Concrete Society
- Contract Flooring Association
- Federation of Plastering and Drywall Contractors
- Federation of Resin Flooring Formulators and Applicators
- Mastic Asphalt Council
- Mortar Industries Association
- National Federation of Terrazzo-Marble and Mosaic Specialists
- National Specialist Contractors Council
- Quarry Products Association
- Society of Chemical Industry
- Co-opted members

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Foreword

This part of BS 8204 has been prepared by Subcommittee B/544/6. This new edition of BS 8204-1 incorporates technical changes only. It does not reflect a full review or revision of the standard, which will be undertaken in due course. It supersedes BS 8204-1:1999 and DD 230:1996, which are withdrawn. This part gives recommendations for the design and laying of concrete bases and cement sand levelling screeds to receive in situ floorings.

The main changes from the 1999 edition are the following.

- a) The terminology reflects designations for screeds that agree with those developed in the European standardization work.
- b) The specifications for materials have been updated. In particular European Standard specifications for cements now include a number of cement types and standard strength classes.
- c) The use of higher slag content cements (>35 %) and the equivalent combinations have been excluded from levelling screeds due to limited experience of their use.
- d) Recommendations for curing when using cement lower than strength class 42.5 N are given in Annex E.
- e) Simplification of Table 4 — Choice of in situ crushing resistance category for levelling screeds.
- f) Incorporation of DD 230:1996, *Determination of in situ crushing resistance of floating levelling screeds*, as Annex D.

The other parts of BS 8204 are as follows:

- *Part 2:2002, Concrete wearing surfaces — Code of practice.*
- *Part 3:1993, Code of practice for polymer modified cementitious wearing surfaces.*
- *Part 4:1993, Code of practice for terrazzo wearing surfaces.*
- *Part 5:1994, Code of practice for mastic asphalt underlays and wearing surfaces.*
- *Part 6:2001, Code of practice for synthetic resin floorings.*

An additional Part 7 of BS 8204 dealing with pumpable and self-smoothing screeds is awaiting publication.

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.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its 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 37 and a back cover.

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1 Scope

This part of BS 8204 gives recommendations for constituent materials, design, work on site, inspection and testing of concrete bases that are to receive in situ wearing screeds of the following types:

- a) concrete (see BS 8204-2);
- b) polymer modified cement (see BS 8204-3);
- c) terrazzo (see BS 8204-4);
- d) mastic asphalt (see BS 8204-5);
- e) synthetic resin (see BS 8204-6);
- f) magnesium oxychloride;

and for bases and levelling screeds that are to receive flexible floor coverings such as:

- g) textiles;
- h) linoleum;
- i) polyvinyl chloride;
- j) rubber;
- k) cork;

and rigid floorings such as:

- l) wood block and strip;
- m) ceramic tiles;
- n) natural stone.

It applies to ground-supported and suspended concrete floor bases.

This part of BS 8204 includes the use of concrete and levelling screeds made with lightweight aggregates conforming to BS 3797. Where the recommendations differ from those for normal weight aggregates, these are given in Annex A.

Recommended methods for the assessment of levels and surface regularity and for the determination of in situ crushing resistance (soundness) are given in Annex B, Annex C and Annex D.

This part of BS 8204 is not intended to provide guidance on the structural design or related construction of concrete ground-supported floors or suspended slabs. Information on these aspects is given in BS 8110-1 and reference [4]. The specification of concrete for base slabs is given in BS 5328 and BS 8500-2. The recommendations in this code relate to those other aspects of design and construction of concrete slabs that affect the performance of the overlying levelling or wearing screed.

This part does not include polymer modified cementitious levelling screeds: it is intended to include them in a future revision of BS 8204-3.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 146:2002, *Specification for blastfurnace cements with strength properties outside the scope of BS EN 197-1*.

BS 882:1992, *Specification for aggregates from natural sources for concrete*.

BS 915-2, *Specification for high alumina cement — Part 2: Metric units*.

BS 1370, *Specification for low heat Portland cement*.

BS 3797:1990, *Specification for lightweight aggregates for masonry units and structural concrete*.

BS 3892-1, *Pulverized-fuel ash — Part 1: Specification for pulverized-fuel ash for use with Portland cement*.

BS 4027, *Specification for sulfate-resisting Portland cement*.

BS 4483:1998, *Steel fabric for the reinforcement of concrete*.

BS 4551-2:1998, *Methods of testing mortars, screeds and plasters — Part 2: Chemical analysis and aggregate grading*.

BS 4721:1981, *Specification for ready-mixed building mortars*.

BS 4887-1, *Mortar admixtures — Part 1: Specification for air-entraining (plasticizing) admixtures*.

BS 4887-2, *Mortar admixtures — Part 2: Specification for set retarding admixtures*.

BS 5328-1:1997, *Concrete — Part 1: Guide to specifying concrete*.

BS 5328-3:1990, *Concrete — Part 3: Specification for the procedures to be used in producing and transporting concrete*.

BS 6100-1 (all parts), *Glossary of building and civil engineering terms — Part 1: General and miscellaneous*.

BS 6100-6 (all parts), *Glossary of building and civil engineering terms — Part 6: Concrete and plaster*.

BS 6699, *Specification for ground granulated blastfurnace slag for use with Portland cement*.

BS 7979, *Specification for limestone fines for use with Portland cement*.

BS 8102, *Code of practice for protection of structures against water from the ground*.

BS 8110-1:1997, *Structural use of concrete — Part 1: Code of practice for design and construction*.

BS EN 197-1:2000, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*.

BS EN 934-2, *Admixtures for concrete, mortar and grout — Part 2: Concrete admixtures — Definitions, requirements, conformity, marking and labelling*.

BS EN 10223-2, *Steel wire and wire products for fences — Part 2: Hexagonal steel wire netting for agricultural, insulation and fencing purposes*.

BS EN 13318, *Screed material and floor screeds — Definitions*.

CP 102:1973, *Code of practice for protection of buildings against water from the ground*.

3 Terms and definitions

For the purposes of this part of BS 8204, the terms and definitions given in BS 6100-1, BS 6100-6 and BS EN 13318 and the following apply.

3.1

base

flooring element that provides the support for a screed and floor finishes

3.2

flooring

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

NOTE Layers in a ground-supported concrete floor and a suspended concrete floor are illustrated in Figure 1 and Figure 2 respectively.

3.3

direct finished base slab

concrete flooring element that is suitably finished to provide a wearing surface or to receive directly the flooring to be applied without the need for a levelling screed

3.4

screed material

mixture comprising cement, aggregates, water and, in some cases, admixtures and/or additives

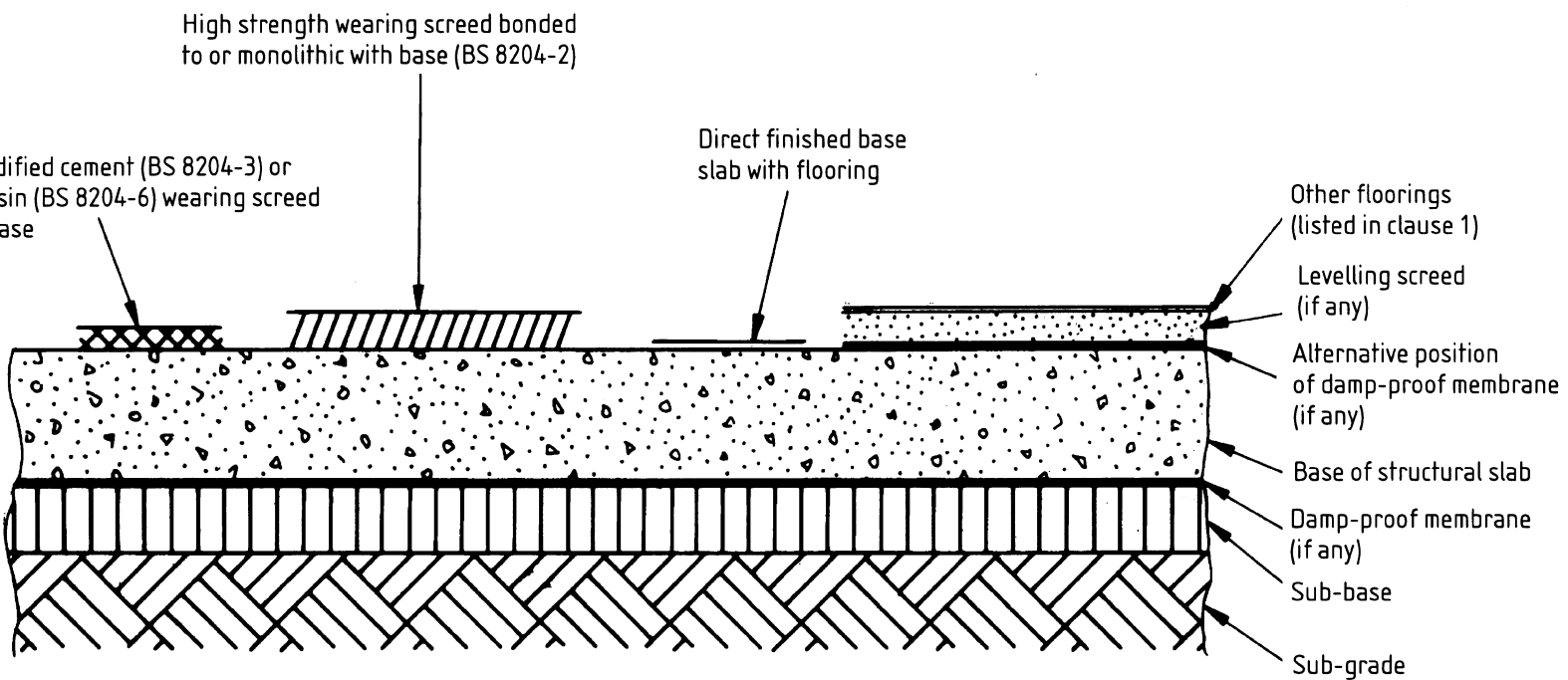


Figure 1 — Illustration of layers in a ground-supported concrete floor

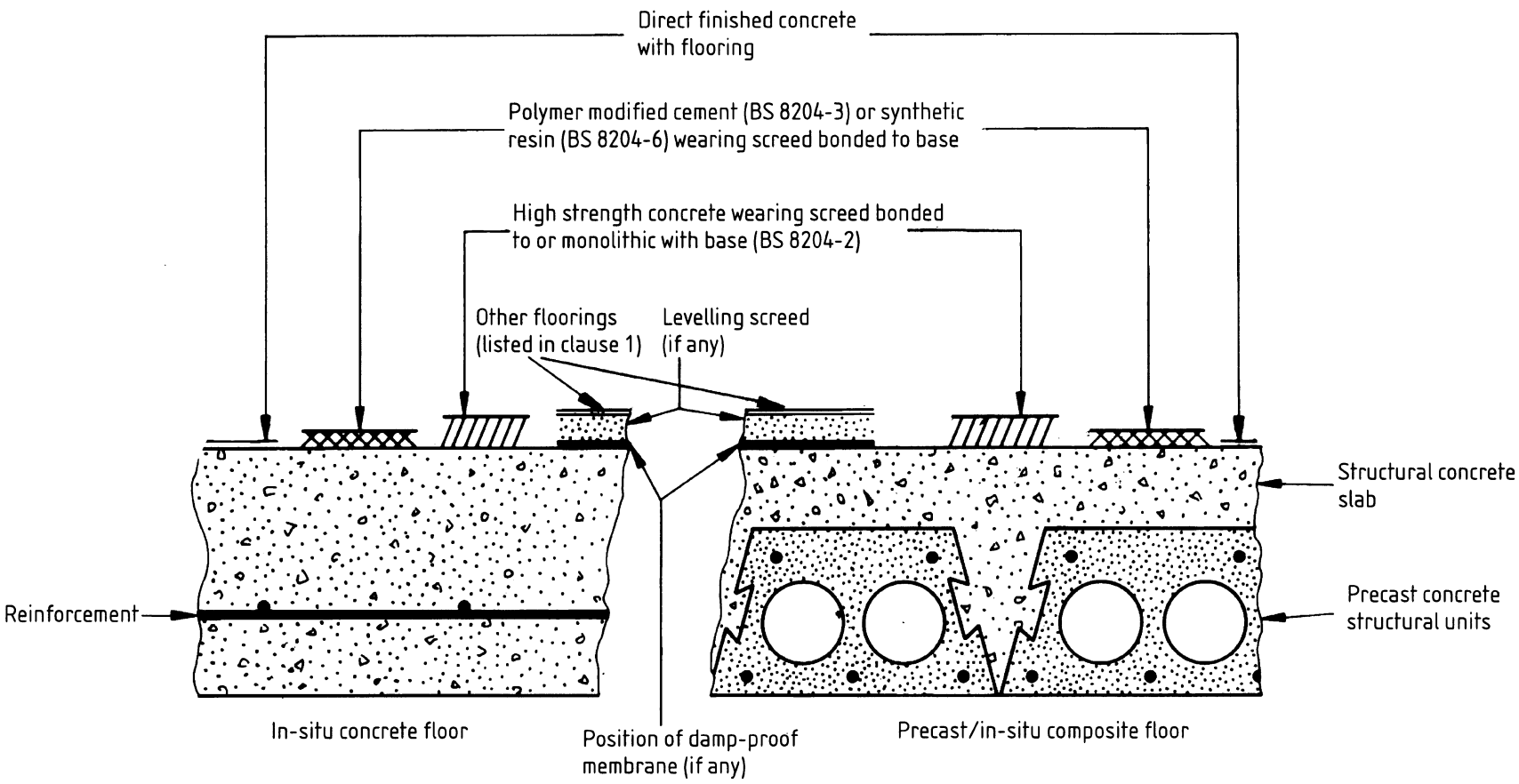


Figure 2 — Illustration of layers in a suspended concrete floor

3.5**screed**

layer of material laid in situ, directly onto a base, bonded or unbonded, or onto an intermediate layer or insulation layer, for one or more of the following purposes:

- to obtain a defined level;
- to carry the final flooring;
- to provide a wearing surface

3.6**levelling screed**

screed suitably finished to obtain a defined level and to receive the final flooring

3.7**wearing screed**

screed that serves as a flooring

NOTE This term was formerly known as high strength concrete topping or granolithic topping.

3.8**bonded screed**

screed that is bonded to the base

3.9**unbonded screed**

screed laid either onto a separating layer or onto a base not prepared to achieve bonding

3.10**floating screed**

screed laid on an acoustic and/or thermal insulating layer and completely separated from other building elements, such as walls and pipes

3.11**fine concrete screed**

screed consisting of concrete in which the aggregate is of nominal 10 mm single size

3.12**cement sand screed**

screed consisting of screed material containing sand up to a nominal 5 mm size

3.13**smoothing compound**

material applied to a base or screed to provide a smooth, even surface suitable for the installation of a floor covering

3.14**departure from datum**

deviation in height of the surface of a flooring layer from a fixed datum plane

3.15**surface regularity**

deviation in height of the surface of a flooring layer over short distances in a local area

NOTE Surface regularity is also known as flatness.

3.16**in situ crushing resistance (ISCR)**

resistance of levelling screeds to the crushing effect of imposed loads and traffic in service

NOTE ISCR was formerly known as soundness.

3.17**no-fines concrete basecoat (of a lightweight aggregate screed)**

layer forming the lower section of the screed, which can be either bonded to the concrete base or separated by an intermediate layer

3.18

cement sand topping (of a lightweight aggregate screed)

bonded surface layer of the screed, commonly cement sand of thickness approximately 15 mm, which provides a smoother finish suitable for the flooring

3.19

combinations

restricted range of Portland cements and additions which, having been combined in the mixer, count fully towards the cement content and water/cement ratio in concrete

NOTE A procedure for establishing the suitability of combinations is specified in Annex A of BS 8500-2:2002.

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. This will enable each party to have full knowledge of the particulars of the work so that they can 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 concrete base and/or cement sand levelling screed and to others whose work might 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 that might practically affect this particular work;
- c) degree of weather protection afforded by the structure;
- d) location and areas of floors to be covered;
- e) age and nature of the base and any preparatory treatment required;
- f) type of flooring to be laid;
- g) the cement type;
- h) number of layers;
- i) thickness of floor and flooring;
- j) finished floor level and maximum permissible departure from datum;
- k) class of surface regularity (see Table 6) of base or levelling screed;
- l) type of damp-proofing and insulation;
- m) type and thickness of levelling screed;
- n) category of in situ crushing resistance (soundness) required;
- o) any work consequent upon services passing through the floor;
- p) treatment of joints;
- q) treatment of skirtings;
- r) treatment of junctions with adjacent floor and floorings;
- s) type of surface finish of base or levelling screed;
- t) any requirement for a smoothing compound;
- u) any special requirements related to underfloor heating;
- v) minimum time intervals between stages of work and the application of heat in the building;
- w) date for the completion of preliminary work;
- x) dates for the start and completion of various sections of the floor;
- y) details of any compliance testing required;
- z) any other requirements for materials, design or work on site.

4.3 Time schedule

In considering the time schedule, in addition to the usual intervals between commencement and completion of work by the various trades involved, allowances should be made for the following:

- a) completion of the building envelope to allow construction of a floor or levelling screed protected from rain, wind and sun;
- b) delays due to frost and cold weather;
- c) laying underfloor services; this should be completed before the base is formed, as there is a risk of subsequent cracking if services are embodied in the flooring;
- d) curing and drying of the base concrete and/or levelling screed before the flooring is laid, where appropriate (see 7.9);
- e) period of protection of the base or screed from damage by other trades, including the period of restriction of access, until the flooring is laid;
- f) the risk of restrained drying shrinkage cracking in ground-supported floor slabs increasing if the floors are loaded soon after completion.

5 Materials

5.1 Cement

5.1.1 General

Cements and combinations, of strength class 42.5 N, have a compressive strength equivalent to that of ordinary Portland cement conforming to BS 12:1989. Lower strength classes of cement and combinations used either in concrete bases or in cementitious levelling screeds might need an increase in cement or combination content to obtain similar properties and performance. For example, a cement of strength class 32.5 N would probably require an increase in cement content of about 10 %. An additional period of curing might also be necessary (see Annex E).

There is limited experience of the use of some types of cement and combinations in cementitious levelling screeds, see 5.1.4.

CAUTION Calcium aluminate (high alumina) cement should be used with care. Guidance on the correct use of calcium aluminate cement should be sought from the manufacturers and current specialized publications (see 7.2).

WARNING 1 When Portland cement is mixed with water, or even becomes damp, alkalis are released that can be harmful to the skin. The effect depends on the length of contact, any abrasion, the individual and the part of the body involved. Suitable protective clothing should be worn. If eyes are affected, they should be washed out without delay and medical advice sought.

WARNING 2 Cement mortar and concrete mixers might, until set, cause both irritant and allergic contact dermatitis.

- Irritant contact dermatitis is due to a combination of the wetness, alkalinity and abrasiveness of the constituent material.
- Allergic contact dermatitis is caused mainly by the sensitivity of an individual's skin to hexavalent chromium salts.

5.1.2 Cement for concrete bases

The cement for concrete bases should be one of the following:

- a) Portland cement CEM I conforming to BS EN 197-1;
- b) low heat Portland cement conforming to BS 1370;
- c) sulfate-resisting Portland cement conforming to BS 4027;
- d) Portland slag cement CEM II/A-S or CEM II/B-S conforming to BS EN 197-1;
- e) blastfurnace cement CEM III/A or CEM III/B conforming to BS EN 197-1;
- f) blastfurnace cement BIII/A or BIII/B conforming to BS 146;
- g) Portland fly ash cement CEM II/A-V or CEM II/B-V conforming to BS EN 197-1;

- h) Portland limestone cement CEM II/A-L or CEM II/A-LL conforming to BS EN 197-1;
- i) calcium aluminate cement (high alumina cement) conforming to BS 915-2;
- j) combinations produced in the concrete mixer from Portland cement CEM I conforming to BS EN 197-1 and ground granulated blastfurnace slag conforming to BS 6699, where the proportions and properties conform to CEM II/A-S, CEM II/B-S, CEM III/A or CEM III/B of BS EN 197-1:2000 except Clause 9 of that standard;
- k) combinations produced in the concrete mixer from Portland cement CEM I conforming to BS EN 197-1 and ground granulated blastfurnace slag conforming to BS 6699, where the proportions and properties conform to BIII/A or BIII/B of BS 146:2002, except Clause 10 of that standard;
- l) combinations produced in the concrete mixer from Portland cement CEM I conforming to BS EN 197-1 and pulverized-fuel ash conforming to BS 3892-1, where the proportions and properties conform to CEM II/A-V or CEM II/B-V of BS EN 197-1:2000, except Clause 9 of that standard; or
- m) combinations produced in the concrete mixer from Portland cement CEM I conforming to BS EN 197-1 and limestone fines conforming to BS 7979, where the proportions and properties conform to CEM II/A-L or CEM II/A-LL of BS EN 197-1:2000, except Clause 9 of that standard.

With Portland limestone cement [see items c) and e)] and limestone fines, reference should be made to the Thaumasite Expert Group Report of the DETR for low temperature situations.

5.1.3 Cement for cementitious levelling screeds

The cement for cementitious levelling screeds should be one of the following:

- a) Portland cement CEM I conforming to BS EN 197-1;
- b) sulfate-resisting Portland cement conforming to BS 4027;
- c) Portland slag cement CEM II/A-S or CEM II/B-S conforming to BS EN 197-1;
- d) calcium aluminate cement (high alumina cement) conforming to BS 915-2;
- e) proprietary cements, designed to provide rapid drying and hardening properties, for which no British Standard exists. Reference should be made to the manufacturers for guidance on their use;
- f) combinations produced in the concrete mixer from Portland cement CEM I conforming to BS EN 197-1 and ground granulated blastfurnace slag conforming to BS 6699, where the proportions and properties conform to CEM II/A-S or CEM II/B-S of BS EN 197-1:2000, except Clause 9 of that standard.

5.1.4 Other cements for cementitious levelling screeds

There is limited experience of the use of the following cements and, where appropriate, the equivalent combinations in mixes for cementitious levelling screeds. Reference should be made to the manufacturers for guidance on their use.

- a) Air-entrained/enhanced Portland cement CEM I 32.5 R conforming to BS EN 197-1.
- b) Portland fly ash cement CEM II/A-V or CEM II/B-V conforming to BS EN 197-1.
- c) Portland limestone cement CEM II/A-L or CEM II/A-LL conforming to BS EN 197-1.
- d) Combinations produced in the concrete mixer from Portland cement CEM I conforming to BS EN 197-1 and pulverized-fuel ash conforming to BS 3892-1, where the proportions and properties conform to CEM II/A-V or CEM II/B-V of BS EN 197-1:2000, except Clause 9 of that standard.
- e) Combinations produced in the concrete mixer from Portland cement CEM I conforming to BS EN 197-1 and limestone fines conforming to BS 7979, where the proportions and properties conform to CEM II/A-L or CEM II/A-LL of BS EN 197-1:2000, except Clause 9 of that standard.

With Portland limestone cement [see items c) and e)] and limestone fines, reference should be made to the Thaumasite Expert Group Report of the DETR for low temperature situations.

5.2 Additions

Pulverized-fuel ash should conform to BS 3892-1, ground granulated slag should conform to BS 6699 and limestone fines should conform to BS 7979. There are no British Standards for other additions and their suitability should be ascertained from experience of their use in similar mixes.

5.3 Aggregates

NOTE See A.1 for the use of lightweight aggregates.

5.3.1 General

Aggregates and sands should not contain any deleterious material in sufficient quantity to affect adversely the surface of a directly finished base or levelling screed. For example, lignite, coal and iron pyrites in the aggregate can cause “pop-outs”. Some aggregates exhibit higher than average drying shrinkage and should not be used, as they can give rise to a greater risk of cracking (see BRE Digest 357 [3] and BS 812-120).

Attention is drawn to possible restrictions on the type of aggregate, e.g. in regard to strength, to be used in bases and levelling screeds to receive certain in situ floorings [see 5.3.2b)].

All the requirements of 5.3 should be passed to the aggregate, concrete and screed materials suppliers.

5.3.2 Aggregates for concrete bases

Aggregates for concrete bases should be either:

- a) aggregates conforming to BS 882; or
- b) aggregates of other types, provided that they are suitable having regard to the strength, density, shrinkage, durability and surface finish of the base.

5.3.3 Aggregates for fine concrete levelling screeds

Aggregates for fine concrete levelling screeds should be composed of 10 mm single-sized material conforming to BS 882:1992, Table 3, and of sand in accordance with 5.3.4.

5.3.4 Sand for cement sand levelling screeds

Sand for cement sand levelling screeds should conform to BS 882, except for the grading and fines limits, which should conform to Table 1 of this standard.

NOTE 1 These grading limits are tighter than those for gradings C and M of BS 882:1992, Table 4.

NOTE 2 Conformity to BS 882 ensures that the sand is clean, washed and free from clay and other minerals that would adversely affect either the workability of the screed material during application or the performance of the set and hardened levelling screed.

Where the screed is to be placed by pumping, a further restriction on the proportion passing a 300 μm sieve should be used (see 7.6). Other sands may be used provided there are satisfactory data on the properties of similar levelling screeds made with them, e.g. bonded, unbonded or floating.

Table 1 — Grading limits of sand for levelling screeds

Sieve size (BS 410)	Proportion by dry mass passing nominal mesh size %
10.00 mm	100
5.00 mm	90 to 100
2.36 mm	65 to 97
1.18 mm	40 to 90
600 μm	24 to 75
300 μm	8 to 40
150 μm	0 to 10
75 μm	0 to 3