BRITISH STANDARD

BS 8204-7:2003

Screeds, bases and in situ floorings —

Part 7: Pumpable self-smoothing screeds — Code of practice

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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

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Mortar Industries Association

National Federation of Terrazzo — Marble and Mosaic Specialists

National Specialist Contractors Council

Quarry Products Association

Society of Chemical Industry

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Contents

Foreword

This part of BS 8204 has been prepared by Subcommittee B/507/6. This is a new part and does not revise or supersede any previous versions.

This part of BS 8204 has been written to provide a Code of Practice for the use of pumpable self-smoothing screeds, a type of screed not covered by other parts of BS 8204.

The other parts of BS 8204 are the following:

— *Part 1:2002, Code of practice for concrete bases and cement sand levelling screeds to receive floorings*;

— *Part 2:2002, Code of practice for concrete wearing surfaces*;

— *Part 3:1993, Code of practice for polymer modified wearing surfaces*;

— *Part 4:1993, Code of practice for terrazzo wearing surfaces*;

— *Part 5:1994, Code of practice for mastic asphalt underlay and wearing surfaces*;

— *Part 6:2001, Synthetic resin floorings — Code of practice*.

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 23 and a back cover.

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1 Scope

This part of BS 8204 gives recommendations for materials, design, work on site, inspection and testing of pumpable self-smoothing screeds (often known as "self-levelling screeds").

NOTE There are two principal types of pumpable self-smoothing screeds, one predominately based on cementitious binders and the other predominately based on calcium sulfate binders.

The recommendations cover the use of pumpable levelling screeds and pumpable wearing screeds in buildings.

As a levelling screed, the screed is intended to receive floor coverings such as:

a) textiles;

b) linoleum;

c) polyvinyl chloride;

d) rubber;

e) cork;

or rigid floorings such as:

f) wood block and strip;

g) ceramic tiles;

h) natural stone;

i) synthetic resin wearing surfaces.

As a wearing screed, the screed is intended to provide a wearing surface itself.

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 5325, *Installation of textile floor coverings — Code of practice.*

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 6700, *Specification for design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages.*

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

BS 7976-2, *Pendulum testers — Part 2: Method of operation.*

BS 8201, *Code of practice for flooring of timber, timber products and wood based panel products.*

BS 8203, *Code of practice for installation of resilient floor coverings.*

BS 8204-1:2002, *Screeds, bases and in situ floorings — Part 1 Concrete bases and cement sand levelling screeds to receive floorings — Code of practice.*

BS 8204-2, *Screeds, bases and in situ floorings — Part 2: Concrete wearing surfaces — Code of practice.*

BS 8204-6, *Screeds, bases and in situ floorings — Part 6: Synthetic resin floorings — Code of practice.*

CP 102, *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 and BS 6100-6 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

3.3
direct finished base slab
base that is suitably finished to provide a wearing surface or to receive directly a flooring to be applied without the need for a levelling screed

3.4
screed material
proprietary mixture comprising binder, aggregates, water and, in some cases, admixtures and/or additives

3.5
screed
layer of material laid in situ, directly onto the base, bonded or unbonded, or onto an intermediate layer or insulation layer, for one or more of the following purposes:

— to obtain the defined level;

— to carry the final flooring;

— to provide the 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

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

3.12
surface regularity
deviation in height of the surface or a flooring layer over short distances in a local area

3.13
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.

3.14
pumpable self-smoothing scree
screed that is mixed to a fluid consistency, that can be transported by pump to the area where it is to be laid and which will flow sufficiently (with or without some agitation of the wet material) to give the required accuracy of level and surface regularity
NOTE Pumpable self-smoothing screeds are often known as "self-levelling" screeds.

3.15
flow ring value
measurement in millimetres that indicates the degree of flow of the wet screed material

4 Exchange of information and time schedule

4.1 General

To enable each party to have full knowledge of the particulars of the work so that they can co-operate in producing the conditions required to complete a satisfactory job, it is essential that consultations and exchange of information between all parties concerned with the building operations are arranged at an early date.

4.2 Selection of screed to be applied

It is essential that, in the design and construction stages, there should be full consultation with the manufacturer of the proprietary pumpable self-smoothing screed to ensure that the product selected is entirely suited for the conditions both during application and in subsequent service. Consideration should therefore be given to whichever of the following are applicable:

a) intended use of the floor, including the type, extent and frequency of trafficking;

b) whether in use the area will be basically dry or permanently damp;

c) type of flooring to be applied (if any);

d) type of construction (bonded, unbonded or floating);

e) thickness of screed required;

f) time available for the application, curing and drying of the screed;

g) category of screed and in situ crushing resistance (soundness) required;

h) class of abrasion resistance and/or slip resistance (for wearing screeds only);

i) age, specification, where known, and nature of the base;

j) the existence, or otherwise, of a damp proof membrane;

k) any information about any previous use that could affect adhesion;

l) any preparatory treatment required.

4.3 Information to be provided to the screeding contractor

It is essential that all relevant information be provided in good time to those responsible for installing the screed 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 that could 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) minimum time intervals between stages of work and the application of heat in the building;

g) date for the completion of preliminary work;

h) dates for the start and completion of the various sections of the floor;

i) type of flooring to be laid (for levelling screeds only);

j) number of layers;

k) thickness of flooring (for levelling screeds only);

l) type and thickness of screed;

m) type of damp-proofing and insulation;

n) finished screed level and maximum permissible departure from datum;

o) class (see Table 4) of surface regularity of screed;

p) any work consequent upon services passing through the floor;

q) treatment of joints;

r) treatment of skirtings;

s) treatment of junctions with adjacent floor and floorings;

t) type of surface finish;

u) any requirement for a smoothing compound;

v) any requirements related to underfloor heating;

w) details of any compliance testing required;

x) any other requirements for materials, design or work on site.

4.4 Information to be provided by the screeding contractor

It is essential that the screeding contractor provides, in good time to those responsible for the building, details of the conditions needed for the installation of the flooring, including whichever of the following are applicable:

a) the extent of areas to be provided for the storage of raw materials and whether these are to be weatherproof or heated;

b) the extent of areas needed for the siting of mixers and pumps and for access by delivery trucks;

c) ambient conditions required in the area to be screeded, including information on the degree of weatherproofing, draught-proofing, temperature of the base and the air, humidity, etc.;

d) power and lighting requirements in the area to be screeded;

e) power, lighting, water supply and any other service requirements in the screed mixing and pumping area;

f) minimum time period after the screed is installed before allowing foot traffic and following trades;

g) protection necessary for the flooring between installation and the laying of floor finishes or final handover.

4.5 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 screed protected from rain, wind and sun;

b) delays due to frost and cold weather;

c) laying underfloor services; this should preferably be completed before the base is formed, as there is a risk of subsequent cracking if the services are embedded in the flooring;

d) curing and drying of the base concrete and/or levelling screed before a flooring is laid (see **6.17**);

e) period of protection of the screed from damage by other trades, including the period of restriction of access.

5 Materials

5.1 General

Pumpable self-smoothing screeds will be proprietary formulations such that the manufacturer of the screed material is responsible for the formulation, the types, the quality and the correct proportioning and blending of the raw materials.

The formulation will either be for a complete screed material requiring only the addition of water (or a proprietary gauging liquid), or for a complete screed material delivered to the site with the water already added and ready to lay.

There are two principal types of pumpable self-smoothing screeds, one predominately based on cementitious binders and the other predominately based on calcium sulfate binders.

5.2 *Water*, this should be clean and free from materials deleterious to concrete and screeds in their wet and hardened state. In general drinking water is fit for this use.

5.3 *Gauging liquid*, a liquid, usually a polymer dispersion, which is to be the material supplied by the screed manufacturer and is to be used as instructed by the manufacturer.

5.4 *Reinforcement for crack control*, fibres or mesh, alkali resistant if used with cement.

6 Design considerations

6.1 Selection criteria

Most pumpable self-smoothing screeds are designed for use where rapid installation is required in dry, internal locations. The designer and contractor should be aware that the rate of installation of most pumpable self-smoothing screed materials is much quicker than for cement sand screeds. The advantages of pumpable self-smoothing screeds are not realized until relatively large areas can be made available for screeding in one visit. By their nature, they cannot be laid to significant falls.

Cement based pumpable self-smoothing screeds will often be chosen when there is a requirement to lay a thin screed section, when the screed is to be a wearing screed or receive a synthetic resin flooring for an industrial floor, or when quick drying is a requirement.

Calcium sulfate based pumpable self-smoothing screeds will often be chosen when the screed section is to be thicker, when there is a requirement for an unbonded or floating screed or when there is time in the programme for the drying out time required before application of floor finishes. Calcium sulfate screeds are generally not suitable for use as wearing screeds.

On direct-to-ground concrete slabs or on concrete bases that still contain a high level of construction moisture, it is essential that there is suitable protection against rising damp so that the normal drying properties of the screed will be achieved (see **6.16** and **6.17**).

In wet internal locations, where the hardened and dried screed will become wet in service, the material used for the screed and any necessary bonding treatment should be stable and maintain satisfactory strength characteristics when wet. Calcium sulfate based self-smoothing screeds and many rapid drying cement based screeds will be unsuitable in such circumstances. Calcium sulfate is corrosive to steel in damp conditions.

If a designer specifies the use of a thin sheet or tile floor, then the use of a smoothing compound should be specified in certain circumstances (see **7.8.10**).

6.2 Base

The sole function of the pumpable self-smoothing screed is to provide a suitable surface for the application of the flooring or, in the case of a wearing screed, to provide a surface finish appropriate for the intended use. It is not intended to make any contribution to structural performance. The base should therefore be designed independently of the screed to withstand all structural, thermal and mechanical stresses and loads that will occur during service. It should remain stable while covered by the screed and be provided with all necessary expansion, contraction and crack inducement joints to enable it to do so. Failure of the base to remain stable will invariably affect the stability of the finish. In particular, cracking of the base, however caused, is likely to reflect in the screed.

Pumpable self-smoothing screeds can flow down through holes and gaps in the base, so these should be sealed prior to screeding.

NOTE Further recommendations on the design of suitable bases are given in BS 8204-1.

6.3 Screed construction

6.3.1 *Bonded construction*

The screed is laid directly onto a set and hardened base, prepared as described in **7.4.2** and **7.4.3**.

Bonded construction permits installation of screeds at their minimum thicknesses (see **6.4.2**). Bonded construction should be used for wearing screeds and very heavily loaded levelling screeds.

6.3.2 *Unbonded construction*

The screed is laid onto a membrane that separates the screed from the base. Where a damp proof membrane is required, the membrane should be of appropriate type and grade.

Unbonded screeds permit the installation of a damp proof membrane between the base and the screed and minimize the requirement for base preparation and sealing of gaps.

6.3.3 *Floating construction*

The screed is laid onto an insulation board, for thermal insulation or void filling, or onto an impact sound insulation sheet.

In this form of construction, the screed will have little support from the base and it is therefore essential that it has greater strength and structural integrity.

6.4 Screed thickness

6.4.1 *General*

When considering the thickness of the screed, the deviations in level and surface regularity of the base should be considered, to ensure that the maximum and minimum permitted screed thicknesses are achievable at the points of maximum departure from datum in the base.

The manufacturers of proprietary pumpable self-smoothing screeds will detail the maximum and minimum permissible thicknesses for their products, which can vary from as little as 3 mm to as much as 80 mm. The following guidance is offered to designers to indicate the principal issues affecting screed thicknesses.

6.4.2 *Thickness of cement based pumpable self-smoothing screeds* (see Table 1)

These materials can provide economical screed designs at thicknesses around 10 mm, but material costs will mean that they are expensive at large thicknesses. Because they are laid thin, they will usually be laid with a bonded construction.

The minimum application thickness at which the products will retain flowing and self-smoothing properties is typically not less than 3 mm. Pumpable self-smoothing wearing screeds usually have a minimum application thickness of at least 6 mm.

Where a level but rough base is to be smoothed to receive a floor covering the application thickness of the material should be kept to a minimum. A nominal application thickness of at least 8 mm should be considered necessary to level and smooth a typical concrete slab. A minimum screed thickness of 10 mm should be considered necessary to apply a pumpable self-smoothing screed over a glass fibre mesh reinforcement.

The maximum thickness will be limited by technical factors, such as excessive heat of hydration, shrinkage, or material segregation. This will typically range from 10 mm to 50 mm, but the manufacturer will state the usual maximum application thickness for his product.

Where there is a requirement for a screed thickness in excess of the manufacturer's recommended maximum, then the thicker areas may be part filled with a suitable material prior to screeding the whole area with a reasonably constant thickness of the pumpable self-smoothing screed. Manufacturers may propose other methods of dealing with thick screed zones.

Pumpable self-smoothing screeds cannot be laid to significant falls, but the materials can be laid to sufficient falls to follow the general slope of a near level base. Considerable savings in material consumption can be achieved by following the slope of an existing floor, or not flattening all of the camber of a precast plank floor, while still remaining inside the tolerances of departure from datum (see **6.14.2**) and surface regularity (see **6.14.3**).

NOTE Any deviations in the levels and surface regularity of the base slab should be taken into consideration when determining the thickness of the pumpable self-smoothing screed to be laid, so as to ensure the minimum/maximum thickness can be achieved.

Table 1 — Minimum thickness of pumpable self-smoothing cement based screeds (both levelling and bonded wearing screeds)

Screed construction	Use	Minimum thickness at any point
Bonded levelling and wearing screed	Domestic, commercial and industrial	3 mm (typically 6 mm for an industrial screed)
NOTE Some cement based self-smoothing screeds may be laid unbonded or floating (see **7.4.4** and **7.4.5**).		

6.4.3 *Thickness of calcium sulfate based pumpable self-smoothing screeds*

These screeds may be laid bonded, unbonded or floating. They may be thicker than cement based pumpable self-smoothing screeds, but may be applied thinner than conventional unbonded and floating cement sand screeds. Subject to the recommendations of the proprietary screed manufacturer, the minimum thicknesses given in Table 2 should apply.

The design thickness will often be determined by the reduced drying times associated with thinner sections. The maximum permissible thickness will be the thickness at which there starts to be a risk of some material segregation or excessive bleed water and at these thicknesses drying times will be considerably extended. The maximum thickness will typically be quoted as about 80 mm. A design thickness of 35 mm will allow bonded and unbonded screed construction. Where levels need to be made up by more than about 60 mm, they generally should be constructed as floating screeds of minimum 40 mm thickness on an appropriate thickness of insulation board.

Table 2 — Minimum thickness of pumpable self-smoothing calcium sulfate based levelling screeds

Levelling screed construction	Area of use	Minimum thickness at any point
Bonded screed	Domestic and commercial	25 mm
Unbonded screed	Domestic and commercial	30 mm
Floating screed	Commercial	40 mm
	Domestic only	35 mm
NOTE Any deviations in the levels and surface regularity of the base slab should be taken into consideration when determining the thickness of the pumpable self-smoothing screed to be laid, so as to ensure the minimum/maximum thickness can be achieved.		

6.5 Bonding

The adequacy of the bond of the screed to the base should be considered in relation to the flooring to be applied and the envisaged duties of the floor. Wearing screeds are likely to require a high degree of bond, as will areas taking heavy traffic, impacts, particularly expensive floor finishes or areas where the consequences of any future screed failure are unacceptable. A lesser degree of bond may be deemed suitable in areas taking predominately light foot traffic.

To achieve the maximum possible bond between the screed and the base, the method of mechanical preparation and bonding given in **7.4.2** should be followed.

Proprietary bonding agents are available, and will often be recommended by proprietary screed manufacturers, for use as primers and bonding agents on the base slabs. Bonding agents based on epoxy resin are available for areas requiring a high degree of bond, and some can also act as damp proofing membranes. Where proprietary bonding agents are used, it is still essential that the recommendations in **7.4.2** for preparing and cleaning the base be followed.

6.6 Reinforcement of screeds

Cement based self-smoothing screeds are generally designed with insufficient thickness for the incorporation of steel fabric reinforcement. Bonded screeds on suitable bases do not normally require any reinforcement. Some proprietary formulations may contain short polypropylene fibres and/or the screed may be laid over a glass fibre mesh reinforcement. Glass fibres coated to give protection from attack by wet cements should be used.

Steel reinforcement should not be used in calcium sulfate screeds. Calcium sulfate is corrosive to steel in damp conditions.

6.7 Location of services

Attention is drawn to the need to comply with various statutory requirements. The laying of pipes or conduits within the thickness of a pumpable and self-smoothing screed should be avoided because cracking can occur over them and can lead to problems with subsequently applied flooring (see BS 6700 for specific recommendations on water pipes). Moreover, the design thickness of a pumpable self-smoothing screed will often preclude the inclusion of services. The services will therefore be better included within the thickness of the base. If the positioning of services within the screed is unavoidable, pumpable self-smoothing screeds will, by their nature, compact well around pipes. The pipes and conduits should be securely anchored in position and pipes should be pressure tested prior to screeding. Screed material can then be laid around and over them to a minimum thickness above the pipes of 25 mm for a calcium sulfate screed or 15 mm for a cement based screed (subject to the advice of the proprietary screed manufacturer).

Where trunking is to be installed that is to finish level with the top of the screed, the trunking should be rigid and securely fixed so that it cannot flex or float as the screed is pumped into place. It is essential that the trunking be leak-proof, such that the flowing screed cannot get into the trunking.

Pumpable self-smoothing screed systems may be combined with some partial access raised flooring systems to provide an alternative method of routing services.

6.8 Heated screeds

Heated screeds are generally laid as floating screeds in conjunction with proprietary underfloor heating systems with the heating elements at the base of the screed.

The heating pipes or cables should be fully secured to the surface of the insulation or to the base to prevent flotation during screeding. The manufacturer of the heating system should provide their installation details, but it is essential to ensure that the heating elements cannot float in the wet screed and that the wet screed cannot get between or under any insulation boards. The tying of heating pipes to a steel fabric will not provide sufficient resistance to flotation unless additional fixing is provided.

The thickness of the screed should be as detailed in section **6.4** but also ensuring a minimum cover over the heating pipes or cables of 25 mm for a calcium sulfate based screed or 15 mm for a cement based screed. Cement based screeds should not be heated until they are cured and dried because of the increased risk of cracking. The manufacturer's advice should be sought for suitable time-scales. Calcium sulfate based screeds may be heated once they are at least 7 days old, which can accelerate the drying of the screed.

In all cases, the screeds should be heated very slowly to their operating temperature and maintained at that temperature for several days before cooling down to room temperature, but not below 15 °C, before installing any flooring. The usual operating surface temperature of a heated screed is about 27 °C; however, some locations operate at higher temperatures, e.g. 35 °C. Higher temperatures than this can adversely affect the floor covering and the stability of the calcium sulfate screeds.

6.9 Screeds to stairs and screeds to falls

Pumpable self-smoothing screeds are generally not suitable for use on stairs or in areas requiring screeds to falls. These areas should be boxed out before the application of the pumpable screed and laid by hand later.

6.10 Joints

6.10.1 *Bay sizes, position of joints*

Pumpable self-smoothing screeds are generally laid in large areas, often without the need for joints. However, where there are structural movement joints or expansion joints in the base slab, it is essential that these should be continued through the screed to the surface of the finished flooring, directly over the joint in the base.

Where construction joints in the base slab have opened, or could open, they could reflect through an overlying bonded screed. Similarly, at positions of rigid supports in base constructions which are subject to deflection (e.g. supports to precast planks) there will be a risk of reflective cracking through an overlying screed. In both cases, if the floor finish is to be bonded and rigid, or if the screed is to be a wearing screed, a joint capable of accommodating the expected movement should be formed through the screed and (where relevant) the floor finish.

For unbonded or floating screed constructions, large area pours (for example with an unbroken length exceeding about 40 m) might need stress relief joints at intervals. The proprietary screed manufacturer's advice should be sought. Long thin strips of screed are more liable to stress cracking, and areas such as long corridors can benefit from joints at intervals to control such cracking.

Heated screeds should include joints across doorways and between areas with separate heating control zones. If the underfloor heating manufacturer recommends additional joints, their advice should be followed.

6.10.2 *Construction of joints*

Where a day joint is formed to divide up an area of work, but is not required to accommodate movement, the joint should be formed to provide neat vertical edges to the poured areas of screed.

Where a stress relief joint is required, the joint should be formed to provide neat vertical edges to the screed. Alternatively, joints may be saw cut into the completed and hardened screed, which procedure should be carried out within a few days of application of the screed before any random cracking develops elsewhere.

NOTE Structural movement and structural expansion joints are usually formed by incorporating a proprietary metal extrusion movement joint within the zone of the screed and floor finishes.

6.10.3 *Edge separation joints*

Unbonded and floating screeds should be separated from all walls, columns and other upstands by a strip of compressible foam material. The minimum thickness of foam should be 5 mm, with thicker foam recommended in large area pours, typically in areas exceeding about 40 m in length, when the advice of the proprietary manufacturer should be sought.

6.11 Levelling screeds, in situ crushing resistance category (soundness)

The in situ crushing resistance (ISCR) category of screed and the ISCR test detailed in BS 8204-1 may be used for specification and testing of pumpable and self-smoothing levelling screeds. However, the results for thin section screeds will indicate the combined performance of both the pumpable self-smoothing screed and the underlying base.

Generally these self-smoothing screeds will be self-compacting and, for screeds in excess of about 15 mm, will have an inherently high ISCR. Where the thickness is less than about 15 mm the ISCR of the base will affect the performance of the floor.

Where a thin cementitious self-smoothing screed is to be laid over an existing screed, the ISCR of the existing screed should be appropriate to the ISCR required of the finished screed. A thicker application of pumpable self-smoothing screed can bring about some improvement to the ISCR of the finished screed.

The ISCR test is not generally desirable for wearing screeds, as the test can mark the finished floor surface. Therefore it only should be used where the quality of the screed is in question.

Where an ISCR screed category is to be specified, the designer should refer to BS 8204-1 and select the ISCR required for the levelling screed to withstand the imposed loads and traffic in service. The ISCR is assessed by means of the BRE Screed Tester [1], [2] (see BS 8204-1, in which acceptance limits for the categories of ISCR are also given).

6.12 Wearing screed, resistance to abrasion

Wearing screeds can require a specified resistance to abrasion. The designer should select the category of abrasion resistance required. The manufacturer's advice should be sought in the selection of appropriate products.

A classification of abrasion resistance is given in Table 3. However it is unlikely that a pumpable self-smoothing screed will be able to provide the highest degree of abrasion resistance, such as "Special", without the further application of a wearing surface such as a synthetic resin flooring (see BS 8204-6). For methods of test for abrasion resistance, reference may be made to BS 8204-2 for wearing screeds, BS 8204-6 for synthetic resin flooring, or the appropriate standard for any other wearing surface applied.

Table 3 — Classification of abrasion resistance

Class	Service conditions	Application	Maximum test wear depth mm
Special	Severe abrasion and impact from steel or hard plastics wheeled traffic or scoring by dragged metal objects	Very heavy duty engineering workshops and very intensively used warehouses, etc.	0.05
AR1	Very high abrasion; steel or hard plastics wheeled traffic and impact	Heavy duty industrial workshops, intensively used warehouses, etc.	0.10
AR2	High abrasion; steel or hard plastics wheeled traffic	Medium duty industrial and commercial	0.20
AR3	Moderate abrasion; rubber-tyred traffic	Light duty industrial and commercial	0.40

6.13 Slip resistance

When they are dry, pumpable self-smoothing screeds will have adequate slip resistance. If a special slip resistance is required or if they are to be used in wet conditions, it is usual to apply a floor finish to the screed. For determination of the slip resistance the method of test given in BS 7976-2 should be used and the slip resistance value (PTV) should be not less than 40.

6.14 Tolerances on level and surface regularity

6.14.1 *General*

The designer should consider both the surface regularity and departure from datum of the finished surface of the base slab.

Some variations in surface regularity of the self-smoothing screed may be allowed without detriment to the satisfactory application of the flooring: the permissible limits associated with surface regularity and departure from datum depend on many factors. In general, the thinner the applied flooring the higher the class of surface regularity required.

When specifying departure from datum and surface regularity, and taking into account the types and thicknesses of the flooring and the levelling screed, the designer should consider:

a) the finished floor surface;

b) the screed surface;

c) the base slab to receive the screed.

For a floating screed, the thickness and the variation in thickness of the insulating layer should also be taken into account.

The limits of thickness within which it is permissible to apply the type of screed should be considered. A nominal screed thickness close to the minimum value (or indeed the maximum value) for that type of screed should not be specified unless the base slab can be laid to sufficiently close limits without prejudicing the requirements for level and surface regularity of the surface of the finished screed.

6.14.2 *Departure from datum*

The maximum permissible departure of the level of the screed from a specified or agreed datum plane should be specified taking into account the area of the floor and its use. For large areas for normal purposes, a departure of ±15 mm from datum can be found to be satisfactory. Greater accuracy to datum can be required in small rooms, along the line of partition walls, in the vicinity of door openings and where specialized equipment is to be installed directly on the floor.

6.14.3 *Surface regularity*

The class of local surface regularity of a screed should be selected from those given in Table 4 according to the use of the floor. In making this selection, account should be taken of the type and thickness of the flooring to be applied and the degree of surface regularity required of the finished floor. Class SR1 should be considered where a thin flooring is to be applied and/or where the minimum irregularity is required of the finished floor. Conversely, class SR3 may be selected where a thicker type of wearing surface is applied and where the regularity of the finished floor is not a significant factor.

NOTE Insistence on a higher class standard of surface regularity than is necessary will result in higher costs.

Pumpable self-smoothing screeds will not self-level to a very high standard of surface regularity. SR2 is a typical expectation. SR1 can be achieved with care.

The higher standard of level accuracy required for some specific applications, such as high bay narrow aisle warehousing, as detailed in [3], can be achieved by a self-smoothing screed, although it is difficult and can require hand application of a cementitious wearing screed between pre-levelled screed rails. This is a specialist application and will depend largely on the skill and experience of the screeding contractor.

The designer should specify the maximum permitted abrupt change in level across joints in screeds taking into account the type and thickness of the flooring to be applied. For some types of floorings, a maximum of 2 mm would be acceptable, taking into account the surface preparation necessary to receive flooring. For other types of floorings, especially thin floorings, changes in level across joints should be minimized.

Table 4 — Classification of surface regularity of pumped self-smoothing screeds

Class	Maximum permissible departure from a 3 m straightedge resting in contact with the floor (see BS 8204–1) mm	Application
Special	Not applicable[a]	Specific use for higher degree of level accuracy
SR1	3	High standard: for commercial and industrial buildings
SR2	5	Normal standard: for commercial and industrial buildings
SR3	10	Utility standard: for other floors, where surface regularity is less critical

[a] Alternative methods of assessment are described in Concrete Society Technical Report No. 34.

6.15 Liability to cracking

Cracking of screeds is generally associated with early shrinkage or expansion. The control of shrinkage and expansion of pumpable and self-smoothing screed mixes is a fundamental aspect of their formulation. Calcium sulfate based screeds are more stable as they dry out. Cementitious screeds will shrink as they dry, unless shrinkage compensation is included in their formulation. Correct formulation will reduce the risk of cracking. Cracking and curling are further influenced by the following factors which should be taken into account:

a) *Bonding*. As with most screed types, a bonded screed is generally less likely to crack than unbonded screeds.

b) *Water content*. Increasing the water content of a mix increases the drying shrinkage, so increasing the risk of cracking. The manufacturer's water addition rate should be strictly adhered to.

c) *Initial drying conditions*. The screed should be prevented from drying out too quickly before it has had a chance to gain some strength. Rapid early drying can lead to a screed cracking. Because the various proprietary screed mixes have such different hardening times, the manufacturer's advice should be sought for the appropriate length of time that each screed should be protected from rapid drying, but as a guide, a calcium sulfate based screed should be given 24 h and a cement based screed given 6 to 24 h during which it is protected from draughts and strong sunlight.

NOTE For levelling screeds, once the initial drying time indicated by the manufacturer has elapsed, it is generally desirable to provide the best possible drying conditions in order to dry out the screed prior to the application of floor finishes.

d) *Hot weather*. When screeds are laid in hot weather, the effects of early rapid drying can be exacerbated, and additional stresses from subsequent cooling of the material can result in more cracking. The risk can be reduced by ensuring the materials are kept as cool as possible, cold mixing water is used and the screeded floor is kept shaded and draught free.

6.16 Damp-proofing ground supported floors

Most pumpable self-smoothing screed formulations are intended to be laid in dry conditions. They are generally not suitable for use in permanently wet situations such as external areas or on swimming pool surrounds. Without specific advice from a proprietary manufacturer, it should be assumed that these screeds should be laid above any damp proof membranes.

Concrete bases and levelling screeds in contact with the ground without a damp-proof membrane should not be expected to keep ground moisture back either in liquid or vapour form. Ground moisture can pass through until it either disperses by free evaporation from the surface of the flooring or reaches a less permeable material under which it tends to accumulate.

The design data for damp-proofing new concrete floors in contact with the ground, including the degree of protection required by different floorings, is given in CP 102. For basement floors in contact with the ground, BS 8102 should be consulted. In addition to the damp-proofing materials listed in CP 102, proprietary resin compounds are available, which act as both damp-proof membranes and bonding agents. Levelling screeds laid over these resins in accordance with the manufacturer's recommendations may be considered as bonded.

Integral water proofing admixtures incorporated in concrete bases or levelling screeds do not provide adequate damp protection for moisture sensitive floorings and retard the drying process. They can also impair adhesion of the screed or floorings.

6.17 Eliminating construction moisture

Before moisture sensitive floorings and floor coverings are laid it is essential to ensure both that the floor is constructed to prevent moisture reaching them from the ground and that sufficient of the water used in the construction is eliminated (see BS 8204-1:2002, **6.11** and **8.2.10**).

With a cement based self-smoothing screed, short drying times can be expected. The manufacturer's advice should be sought, but for guidance drying times are normally in the range of one day to two weeks.

For calcium sulfate based self-smoothing screeds, one day should be allowed for each mm of thickness for the first 40 mm, plus a further two days for each mm over 40 mm thickness. It is reasonable to expect a screed 50 mm thick, drying under good conditions (20°, < 65 % RH), to be sufficiently dry in about two months.

Where levelling screeds are laid directly onto concrete bases without a damp-proof membrane between them, account should be taken of the time needed to dry the total thickness of base and screed. Concrete, being less permeable, takes longer to dry. In practice it has been found that even under good drying conditions concrete bases 150 mm thick often take more than a year to dry from one face only. Moderate and heavy use of power-float and power-trowel finishing methods can further delay drying.

Suspended concrete slabs cast on permanent metal decking or other impermeable materials have similar drying times to those laid over damp-proof membranes. The use of curing membranes significantly extends the drying out period. For slabs that can dry from both sides, about half the thickness may be considered to dry downwards.

Where moisture sensitive floorings or floor coverings are to be laid, schedules should be arranged to permit extended drying times for concrete bases. If this cannot be done, then it is essential at the design stage to specify the use of a sandwich damp-proof membrane between the base concrete and the levelling screed.

Accelerated drying of concrete bases and cementitious screeds by forced ventilation or heating should not be used. This can result in incomplete hydration of the cement and cracking. Most cement based pumpable self-smoothing screeds are, in any case, quick drying. However, accelerated drying of calcium sulfate based pumpable self-smoothing screeds may be used once the screed is at least seven days old.

6.18 Use of admixtures

Admixtures will generally form part of the proprietary screed mix, and no further addition should be made without reference to the manufacturer.

7 Work on site

7.1 Workmanship

Care should be taken to ensure good workmanship and efficient supervision. Competent operatives should be employed.

Those laying the screed should be in possession of the manufacturer's laying instructions and health and safety information.

7.2 Protection against the weather

7.2.1 *General*

Any area to be screeded should be enclosed within a weatherproof structure. If doors and windows are still missing, the openings should be covered over.

7.2.2 *Temperature*

The temperature of both the base slab and the air in the area where a screed is to be installed should remain in the range +5 °C to +30 °C, while the screed is being applied, and subsequently for at least 72 h. Note that in cold conditions it can take some time to raise the temperature of a cold concrete base.

If mixing and laying are to proceed during either hot or cold weather, measures should be taken to ensure that stored materials are maintained at between 5 °C and 30 °C, ideally at about 15 °C to 20 °C.

For cementitious screeds, screeding in very warm conditions can result in a loss of working time, and hence less effective self-smoothing, over-rapid drying and a risk of some shrinkage cracking. In very cold conditions there will be extended hardening and drying times and a risk of frost damage.

For calcium sulfate based screeds, very warm conditions can lead to extended setting times and over-rapid drying, with a risk of cracking. In very cold conditions there is a risk of frost damage and extended drying times.

7.2.3 *Drying conditions*

The area where a screed is being laid should be kept free from draughts as much as possible while the screed is being laid and during a subsequent period of 24 h. The relative humidity in the area should not fall below 50 % RH to prevent over-rapid early drying.

After this period, improved drying conditions may be established to promote the drying of levelling screeds to receive floor finishes. The best drying conditions are provided when the temperature is warm and the atmospheric humidity is low. The humidity may be reduced by providing good ventilation or alternatively by providing dehumidifiers in a sealed building, but note the increased risk of shrinkage cracks in a cementitious screed that is force dried (**7.8.8**). Any laitance from calcium sulfate based pumpable self-smoothing screeds should be removed to allow the screed to dry more quickly (see **7.8.10**).

7.2.4 *Wet weather and other water ingress*

The area where a screed is to be installed should be protected against ingress of rain or leaks of water. Once the area has been screeded, further water on the screed should be avoided as this can damage a recently laid screed and can considerably extend the drying time of the screed.

7.3 Installation of the base

BS 8204-1 gives recommendations on achieving a suitable base for a screed.

7.4 Preparation of the base to receive a pumpable and self-smoothing screed

7.4.1 *General*

Any holes, gaps between precast planks, ducts, lift thresholds, etc. should be sealed or shuttered before application of the screed.

NOTE The bond between the screed and the concrete base depends to a great extent upon the conditions of the surface of the base at the time of laying the screed.

The moisture content of the base and the possible need for a damp proof membrane between the base and the screed should be considered (see **6.17**).

7.4.2 *Preparation of the base for a bonded screed*

Before the screed is laid the reasons for any cracking or hollowness of the existing base should be sought and appropriate remedial treatment carried out. Cracks and loose or hollow portions should be cut out and made good.

In the case of in situ slabs, or precast units, where a high degree of bond is required, all contamination and the laitance on the base should be entirely removed by suitable mechanized equipment to expose cleanly the coarse aggregate. All loose debris and dirt should be removed, preferably by vacuuming.

The surface of precast concrete units should be left rough during production and should be thoroughly washed and cleaned, e.g. by wire brushing, to remove all adhering dirt.

To prevent later contamination or accumulation of dirt, these operations should be delayed until shortly before the levelling screed is laid.

Specialist treatment can be required for removal of particular contaminants, e.g. oil.

7.4.3 *Bonding treatment*

A primer and/or bonding system, as recommended by the screed manufacturer, should be used. This will generally be either an epoxy resin or a polymer dispersion.

Priming of the base is essential to seal the base, both so that air will not be released from the base (causing bubbles in the screed) and so that water from the screed mix will not be sucked down into the dry base (resulting in a loss of workability and over-rapid drying of the screed).

7.4.4 *Unbonded screeds*

Cementitious pumpable self-smoothing screeds are not generally laid unbonded, although some proprietary manufacturers' supply systems that include reinforcement, such as polypropylene fibres and glass fibre mesh, may be laid unbonded.

Calcium sulfate based screeds may be laid unbonded. They are usually laid over a polyethylene (or similar) sheet membrane of minimum 440 gauge (110 μm); the specification of the sheet may be upgraded to a damp proof membrane gauge where necessary.

When an unbonded levelling screed is to be constructed either on a new floor or on an old one being renovated, the base should be sufficiently clean and smooth to receive any separating material specified.

7.4.5 *Floating screeds*

Cementitious pumpable self-smoothing screeds are not generally laid as floating screeds. Some proprietary manufacturers' supply systems that include reinforcement, such as polypropylene fibres, glass fibre or steel mesh, may be laid floating.

Calcium sulfate based screeds may be laid floating, subject to the minimum thickness (see **6.4.2**).

Pumpable self-smoothing calcium sulfate based screeds may be laid over rigid flooring grade insulation of appropriate load capacity, or over thin sheet impact sound insulation such as extruded polyethylene foam sheet. A polyethylene (or similar) sheet membrane, which may be specified to be of damp proof membrane grade, will be required over the insulation, with lapped and taped joints to ensure that the screed material cannot get under the insulation.

In the case of rigid or semi-rigid insulation boards, the base should be finished sufficiently smooth and level to carry the insulation boards and so avoid boards sitting on high spots creating wide voids.

Base preparation should consist of generally cleaning off dirt and debris. If the base is insufficiently smooth and level further preparation, such as filling depressions (before laying the boards) with cement grout, mortar, or a levelling screed, is essential.

7.5 Services, conduit and trunking

Pipes and conduits that are set in a rebate in the base or that are to be buried in the screed, should be securely fixed to the base and anchored in position so that they cannot float.

Where trunking is to be installed that is to finish level with the top of the screed, the trunking should be laid down onto a ribbon screed or packing pieces to an accurate level and securely fixed so that it cannot flex or float while the screed is pumped into place. With the fluid nature of the screed as laid, there can be difficulties in finishing the screed flush with the top of a trunking and some remedial work to produce the precise level can be anticipated.

7.6 Construction of joints

Where a day joint is formed to divide up an area of work but is not required to accommodate movement, the joint should be formed to provide neat vertical edges to the poured areas of screed. When screeding continues at a later date, the vertical edge of the first bay of screed should be primed to achieve a good bond and prevent water being drawn from the newer screed into the older screed.

Where a stress relief joint is required, the joint should be formed to provide neat vertical edges to the screed. Alternatively, joints may be saw cut into the completed and hardened screed, which procedure should be carried out within a few days of application of the screed before any random cracking develops elsewhere.

The arrises of formed joints will require protection from construction traffic damage.

NOTE Structural movement and structural expansion joints are usually formed by incorporating a proprietary metal extrusion movement joint within the zone of the screed and floor finishes.

7.7 Edge separation joints

Unbonded and floating screeds should be separated from all walls, columns and other upstands by a strip of compressible foam material. This is generally installed by fixing the strip of foam to the wall, column or upstand before the screed is laid. The minimum thickness of foam should be 5 mm, with thicker foam recommended in large area pours, typically in areas exceeding about 40 m in length, when the advice of the proprietary manufacturer should be sought.

7.8 Installation of the screed

7.8.1 *Supply of materials*

Each delivery should be checked, by reference to the information to be provided in this clause and the following subclauses (**7.8.1.1** and **7.8.1.2**).

7.8.1.1 *Premixed dry materials*

Proprietary materials supplied to site in bags or silos should be identified with at least:

a) name of the manufacturer;

b) name of the product;

c) type of the binder;

d) batch reference;

e) date of manufacture and storage life, or use-by date;

f) health and safety information as required by legislation.

7.8.1.2 *Premixed wet screeds*

When delivered to the site as a wet, ready-to-lay material, each delivery should be accompanied by a delivery ticket including at least:

a) name of the producer or supplier;

b) registration number of the delivery vehicle;

c) type of the binder;

d) kind and type of screed mix, including, where appropriate, the strength class;

e) raw material batch codes or silo numbers;

f) date and time of mixing of the materials;

g) flow ring test result at time of despatch.

7.8.2 ***Batching***

All materials should be batched in accordance with a method statement provided by the manufacturer.

For wet premixed material batched off-site, materials should be batched by weight.

For site-mixed materials supplied in bags, the materials should be batched using full bags. Bags should not be split or proportioned due to the risk of segregation of constituent materials in the bags during transport and storage.

7.8.3 ***Mixing***

Materials that are supplied to site as premixed wet screed will have been mixed and any further mixing should be in accordance with the manufacturer's instructions.

The screed should be mixed on site in a continuous mixer machine. However, for small areas or repairs, the materials may be mixed using a large electric drill and mixing paddle. Other mechanical mixers can be suitable, but stirring a mix by hand is not recommended. As far as possible, avoid entraining air into the mix.

The materials should be added to the mix in the order specified by the proprietary supplier. The raw materials, water and additions (if any) should be mixed until a homogeneous slurry is obtained, free from lumps. The mixing time should be sufficiently long to ensure that any admixtures in the mix have been activated. Typically this will require at least one minute of mixing, but the manufacturer's advice should be followed.

7.8.4 ***Flow tests***

Once the material has been mixed, the flow of the material should be checked before it is laid on the floor (in accordance with Annex A). The diameter of the circle of material tested should lie within the limits set by the screed manufacturer.

For ready mixed screeds, the flow of the material in the truck should be checked for every load delivered before it is discharged to the pump. Adjustments to increase the flow may be made by the addition of water, strictly in accordance with the manufacturer's recommendations. Full records should be kept of the following:

a) details on the delivery ticket;

b) time of arrival on site;

c) flow test result on arrival;

d) amount of water added;

e) flow test result when accepted for discharge to the pump.

For material mixed through a continuous mixer, the start of each pumping session should include several tests to enable accurate adjustment of the water addition to achieve the correct flow. Thereafter checks should be carried out, typically at about 30 min intervals, to ensure the correct flow rate is maintained. In particular, a test should be carried out in the following instances:

1) whenever pumping resumes after a break;

2) when the batch numbers of the materials change;

3) if the flow appears to have changed.

7.8.5 *Pumping and laying*

The pumping system should deliver the screed material to the working area in a condition suitable for laying. The screed should be spread over the base in a layer of the desired thickness, delivered by means of flexible hoses long enough to reach the entire working area.

Accurate level control is essential at this stage. The screeding contractor may select his preferred method of level control. Suitable methods include:

a) setting screws into the base with their heads at the finished screed level;

b) using tripod level marks set with a laser level;

c) using a dipstick with a mark set at the required screed depth.

The screed should be applied to the base in such a manner as always to maintain a wet edge.

During each pour no interruptions longer than the working time of the screed should occur. If an interruption is unavoidable, e.g. due to a breakdown in supply of material, a temporary stop-end should be installed to retain the edge of screed.

7.8.6 *Finishing technique*

Immediately after the screed material has been poured, the floor screed surface may be agitated in order to drive out air bubbles and to assist with the levelling. For a thin self-smoothing screed, a spiked roller, a serrated edge spatula or light tamping bar may be used. For a thicker screed, a floating tamping bar is usually used.

7.8.7 *Curing*

Subject to any requirements of the screed manufacturer, it is not normally necessary to cure the pumpable self-smoothing screed under a membrane. However the screed should be protected for 24 h from draughts and direct sunlight. (See **7.2**.)

7.8.8 *Drying*

Accelerated drying of concrete bases and cementitious screeds by forced ventilation or heating should not be used. This can result in incomplete hydration of the cement and cracking. Most cement based pumpable self-smoothing screeds are, in any case, quick drying. However, accelerated drying of calcium sulfate based pumpable self-smoothing screeds may be used once the screed is at least seven days old.

7.8.9 *Protection*

All traffic should be kept off the screed until it has hardened sufficiently, in accordance with the manufacturer's recommendations. Thereafter, the screed should be protected from contamination and damage by following trades. Levelling screeds should be protected until the flooring is applied.

7.8.10 *Surface finishing*

Slight lipping at joints between adjacent pours and other surface irregularities such as drip marks may be removed with a floor sanding machine or grinder once the screed has set and hardened. Alternatively, with a levelling screed, a suitable smoothing compound may be applied.

Calcium sulfate based screeds will require removal of any laitance that forms on the surface. This should be removed by a floor sanding machine once the screed has sufficiently hardened and dried.

With any screed, regardless of how it is applied and finished, the surface texture might not be adequate for some thin floor coverings and coatings. In such cases, the levelling screed should be finished by applying a smoothing compound ("underlayment" in BS 8203) to the hardened screed as part of the floor covering system, just before laying the floor covering.

NOTE 1 A calcium sulfate based screed will almost certainly require a suitable primer before application of a smoothing compound.

NOTE 2 A cement based screed can require a primer. An alternative method of smoothing a cement based screed is to sand or grind the surface.

8 Inspection and testing

8.1 Inspection

Before screeding work is commenced, the base should be checked for level to ensure that the specified thickness of screed can be applied over the whole area. This is essential for precast concrete units as some planks can have appreciable camber.

The work should be inspected during progress and after completion, special attention being paid to the following points:

a) materials;

b) preparation of the base, where the screed is to be bonded;

c) sealing of gaps and holes in the base;

d) joints;

e) batching and mixing;

f) correct finishing;

g) levels and surface regularity;

h) correct curing.

8.2 Testing of the completed work

8.2.1 *General*

After completion of the work, the appropriate tests from the following, detailed in accordance with **4.3**w), should be carried out:

a) levels and surface regularity;

b) adhesion of bonded screed to the base;

c) curling and lipping of unbonded and floating screeds;

d) in situ crushing resistance;

e) abrasion resistance;

f) slip resistance.

NOTE Tests e) and f) are normally made only when there are specified performance requirements and the quality of the floor is in doubt.

8.2.2 *Levels and surface regularity*

When the base or levelling screed is tested by the methods given in BS 8204-1, the departure from datum should be within the limits specified by the designer. The surface regularity should be within the limit given in Table 4 for the appropriate class chosen by the designer (see **6.14**).

8.2.3 *Adhesion of bonded screeds to the base*

The adhesion of the screed to the base may be examined by tapping the surface with a rod or a hammer, a hollow sound indicating lack of adhesion.

Good preparation of the base is essential and, together with good workmanship, will minimize loss of adhesion. However, it cannot be guaranteed that adhesion will always be complete.

If any hollowness is found it is usually confined to the edges and corners of bays and on either side of any cracks that have developed in the screed. A small degree of hollowness, indicating lack of adhesion, does not necessarily mean that the screed is unsatisfactory unless it is accompanied by visible or measurable lifting of the edges of bays or at cracks, to the extent that the edges of screed could break under anticipated loads. The type of flooring to be applied subsequently, the thickness of the screed and the end use of floor may also influence whether hollowness is acceptable.

Where a thin levelling screed has been laid over a composite lightweight aggregate screed (a no-fines lightweight aggregate base with a cement sand topping) the tapping test is inappropriate.

Areas of screed that are considered to be unsatisfactory should be treated by one of the following two methods:

a) making good the affected areas by filling or injecting the hollow areas with a low-viscosity synthetic resin to stabilize and improve the bond between the levelling screed and the base;

b) isolating the affected areas by making vertical cuts into adjacent sound screed (taking care to minimize the effect of the cutting-out operation on the adhesion of the sound screed) and then removing unsatisfactory areas of screed and replacing with new material.

8.2.4 *Curling and lipping of unbonded and floating screeds*

Unbonded and floating screeds should only be considered unsatisfactory if they have lifted by a visible or measurable amount at joints and cracks, to the extent that there is a risk of fracture under superimposed loads. When tapped with a rod or hammer, unbonded and floating screeds sound hollow.

8.2.5 *In situ crushing resistance (ISCR) of bonded and unbonded screeds*

When the screed is tested by the method given in BS 8204-1, the indentation produced after dropping the weight four times should not exceed that given for the specified category (see also **6.11**). However, up to 5 % of indentations exceeding those given for the specified category by not more than 1 mm are acceptable. These are in addition to any allowance for roughness.

The screed should pass the ISCR test 14 days after it has been laid. In cold weather, low curing temperatures can require this period to be extended. Conformity may be established at an earlier age provided that the requirements of BS 8204-1:2002, Table 4 can be met.

8.2.6 *In situ crushing resistance of floating screeds*

The ISCR of this type of screed should be assessed by the method given in BS 8204-1. This method requires the screed to be at least 65 mm thickness, so in many situations will not be appropriate for pumpable self-smoothing screeds.

NOTE When the floating screed contains pipes or heating elements, tests should be carried out at least 75 mm from their known position to avoid possible damage to them.

Should the screed not meet the appropriate acceptance limits for the category chosen, the screed should not necessarily be rejected, because alternative methods (such as determination of the screed strength) may be used to ascertain whether the screed is sound and fit for its purpose.

8.2.7 *Abrasion resistance*

Where specified, the floor should be tested for abrasion resistance as described in BS 8204-2. The value for the mean depth of wear should be less than the appropriate limit value given in Table 3.

8.2.8 *Slip resistance*

Where specified, the floor should be tested for slip resistance as described in BS 7976-2. The slip resistance value [PTV (pendulum test value)] should be not less than 40 in both the wet and the dry state except where people using the floor wear special slip resistant footwear. In this latter situation a PTV of not less than 33 in the wet may be considered acceptable.

8.2.9 *Assessment of cracks*

Cracks should be assessed in relation to the area involved, the flooring to be applied and likely future movement.

NOTE Fine cracks are not normally detrimental to any applied flooring and do not need filling: wider cracks can need filling or other remedial work.

8.2.10 *Determination of moisture content*

The moisture contents of levelling screeds, onto which particular floorings are to be laid, and methods for measuring moisture content should be followed as given in BS 5325, BS 8201 and BS 8203; other methods can be recommended by the screed manufacturer.

The determination of relative humidity by hair hygrometer is equally suitable for calcium sulfate based screeds as for cement based screeds because the readings at around 75 % RH will be reliable. However, it should be noted that at higher values of RH, a hygrometer on a calcium sulfate based screed can give misleading results, making it impossible to determine how fast a screed is drying out. For this reason, alternative methods of determining moisture content of calcium sulfate based screeds are often employed. A CM tester ("carbide bomb") can be used or a sample can be oven dried at maximum 40 °C.

NOTE Typical values at which it would be permissible to lay moisture sensitive floor finishes on a calcium sulfate based screed are 0.5 % w/w moisture content for impermeable floors and 1.0 % w/w moisture content for more permeable finishes such as carpet tiles.

Annex A (normative)
Method for the determination of the flow value

A.1 Principle

An accurately measured volume of screed material is placed on a smooth, level, non-absorptive plate and allowed to spread out. The diameter of the resulting circle of material is recorded. This measurement is referred to as the flow value of the self-smoothing screed.

A.2 Apparatus

A.2.1 *Measuring ring*, either a cylinder or cone, of dimensions specified by the screed manufacturer.

There are several different sizes of cylinder and cone currently used for this test, including:

a) cylinder diameter 30 mm × height 50 mm;

b) cylinder nominally 68 mm diameter × 35 mm high, to contain 127 cm^3;

c) cylinder nominally 65 mm diameter × 40 mm high, to contain 133 cm^3;

d) truncated cone top diameter 70 mm, bottom diameter 100 mm, height 60 mm.

A.2.2 *Stainless steel plate*, melamine board or glass plate (glass is generally impractical on site).

A.2.3 *Measuring tape or ruler*.

A.2.4 *Watch or clock*, capable of measuring seconds.

A.2.5 *Container*, to collect the screed sample.

A.2.6 *Cleaning equipment (water and cloths).*

A.3 Procedure

A.3.1 Clean and dry the equipment before carrying out the test.

A.3.2 Take material to be tested from the discharge end of the pump hose, if material is produced on site through a continuous mixer/pump.

Take material to be tested from the delivery vehicle before it is discharged to the pump, if material is delivered to site as a wet, ready-to-lay screed.

A.3.3 Place the plate on a firm level surface.

A.3.4 Place the ring roughly at the centre of the plate.

A.3.5 Pour the sample into the ring until the cylinder is full.

A.3.6 With a quick, vertical movement, lift the ring up off the plate and allow the sample to spread out on the plate. Hold the ring over the sample material for about 15 s while the majority of any material that will drip off the ring drips into the sample material.

A.3.7 Measure the diameter of the circle in two directions, approximately at right angles to each other, once the material has ceased to flow. Record the average of the two readings as the test result.

A.4 *Interpretation of results*

The diameter of the circle of material should lie within the limits set by the screed manufacturer. See Table A.1 for the causes and consequences if the diameter is not within this limit.

Table A.1 — Interpretation of results

Result	Probable cause	Consequence
If the circle is too big	Water content is too high	Screed strength will be reduced Risk of drying shrinkage Risk of segregation, giving a weaker and/or dusty surface
If the circle is too small	Water content is too low	Self-levelling will be poor

blank

Bibliography

[1] PYE, P.W. *BRE Screed tester: classification of screeds, sampling and acceptance limits*. Building Research Establishment Information Paper IP 11/84, 1984.[1)]

[2] PYE, P.W. & WARLOW, W.J. *A method of assessing the soundness of some dense floor screeds*. Building Research Establishment Current Paper CP 72/78, 1978.[1)]

[3] THE CONCRETE SOCIETY. *Concrete industrial ground floors — A guide to their design and construction*. Technical Report No. 34, 1994.[2)]

[1)] Obtainable from Construction Research Communications Ltd., 151 Roseberry Avenue, London, EC1R 4QX or from The Stationery Office.

[2)] Obtainable from the Concrete Society, Century House, Telford Avenue, Crowthorne, Berks RG45 6YS.

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