

Chapter 9.3



Floor finishes

This chapter gives guidance on meeting the Technical Requirements for floor finishes, including:

- integral insulation
- screeds
- ceramic, concrete and similar tiles
- flexible sheet and tiles
- woodblock
- asphalt.

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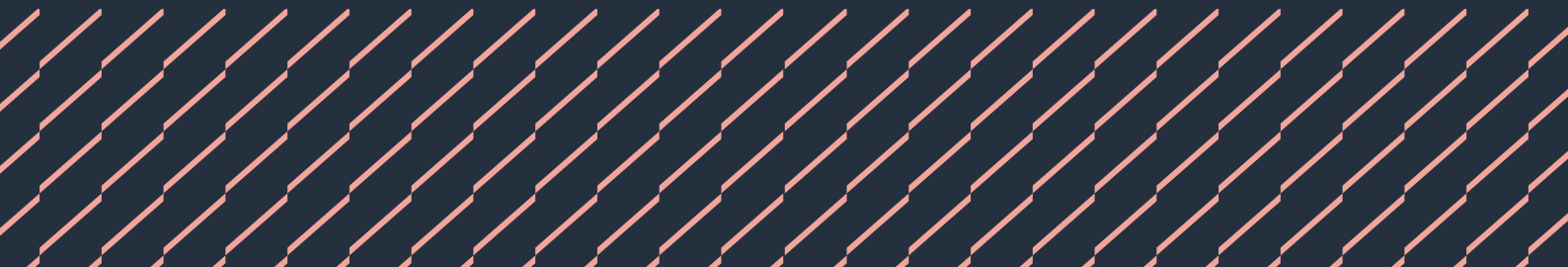


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9.3.1 Compliance

Also see: Chapters 2.1, 5.1, 5.2, 6.4 and 8.1

Floor finishes shall comply with the Technical Requirements.

Floor finishes which comply with the guidance in this chapter will generally be acceptable (structural floors should be in accordance with the relevant Standards Chapters 5.1 Substructure and ground bearing floors, 5.2 Suspended ground floors, 6.4 Timber and concrete upper floors and 6.10 Light steel framed walls and floors).

9.3.2 Provision of information

Designs and specifications shall be produced in a clearly understandable format, include all relevant information and be distributed to the appropriate personnel.

Designs and specifications should be issued to site supervisors, relevant specialist subcontractors and suppliers, and include the following information:

- schedule of finishes
- screed thickness and mix
- details of sound insulating floors
- extent and detail of tiled surfaces
- location of services adjacent to tiled surfaces
- details of staircase finishes.

9.3.3 Insulation

Thermal and acoustic insulation shall provide appropriate performance, and be suitable for the intended location and use.

Materials and constructions which are in accordance with Building Regulations are generally acceptable.

Suitable sound insulation materials include:

- flexible material
- mineral fibre quilt insulation
- board material for use under screeds (eg EPS SD grade expanded polystyrene)
- proprietary products which have been assessed in accordance with Technical Requirement R3.

Table 1: Thermal insulation materials

Material	Standard	Grade or description
EPS (expanded polystyrene)	BS EN 13163	70
PUR (rigid polyurethane)	BS 4841	For use under screeds
PIR (rigid polyisocyanurate)		
Fibre building board	BS EN 622	Insulating board (softboard)
Proprietary material	Technical Requirement R3	

9.3.4 Screed

Also see: Chapters 3.2 and 8.1

Non-structural floor screeds shall be adequate for the location and intended use, and provide a suitable background for floor finishes. Issues to be taken into account include:

- 1) installation
- 2) non-structural screed thickness
- 3) screed over insulation.

9.3.4.1 Installation

Before screeding, background surfaces should be:

- clean and free of debris (eg dust and gypsum removed); concrete should be wetted and brushed
- suitably prepared to provide an adequate mechanical key; where bonded screeds are required, cement grouting or a bonding agent should be specified to provide adequate adhesion.

Damp proofing should be completed before screeding starts.

Screeding should not take place in weather conditions which could adversely affect the finished construction, and:

- should be scheduled to allow suitable drying time before following trades
- in hot or dry weather, precautions should be taken to prevent the screed surface drying out too quickly
- in cold weather, screeds should not be installed (screed damaged by cold should be removed and replaced).

Non-structural screed should be:

- installed to the specified thickness and provide an even surface, suitable for the intended finish in accordance with the relevant British Standards and the floor finish manufacturer's recommendations
- of a suitable sand cement mix (generally between 1:3 and 1:4½ cement:sand); where deeper than 40mm, concrete may be used
- installed within three hours of the concrete sub-floor being poured (where the floor is to include a monolithic slab)
- mixed using only proprietary additives that have been assessed in accordance with Technical Requirement R3
- thoroughly compacted, where required by the design, using either a heavy tamper, mechanical compactor or vibrator.

Proprietary non-structural screeds should be installed in accordance with the manufacturer's recommendations.

Surface sealers or hardeners should only be used in accordance with the manufacturer's instructions.

Where services are bedded in the screed:

- there should be a minimum 25mm of cover over the highest point of pipes and insulation
- provision should be made for the thermal movement of water pipes
- pipes should be protected against chemical attack (eg by using purpose-made sleeves or ducts).

Non-structural screed over underfloor heating should:

- be sub-divided into bays not exceeding 40m², with a maximum length of 8m, or installed per room
- have expansion joints which are consistent with those in the substructure
- have expansion joints between independently controlled heating zones.

Where proprietary non-structural screeds are used in conjunction with underfloor heating, the manufacturer's recommendations should be followed in relation to installation and the provision of expansion joints.

Where tiles are applied to proprietary screeds, movement joints should be provided in accordance with Clause 9.3.5.

Where concrete floor slabs are to serve directly as a wearing surface without an additional topping, they should be in accordance with BS 8204-2 and power floated.

Completed floor finishes should be protected against damage from traffic.

Standards relevant to screeding include:

BS 8204	Screeds, bases and in-situ floorings
BS 8201	Code of practice for installation of flooring of wood and wood-based panels
BS 8203	Installation of resilient floor coverings. Code of practice
BS EN 1264	Water based surface embedded heating and cooling systems

9.3.4.2 Non-structural screed thickness

Thickness of cement and sand screeds should be in accordance with with Table 2.

Table 2: Thickness of non-structural screed

Method of laying	Minimum thickness at any point (mm)
Installed monolithically with base	12
Installed on, and bonded to, a set and hardened base	25
Installed on a separating membrane (eg 1000g polyethylene)	50
Installed on resilient slabs or quilts (screed reinforced with wire mesh)	65
Above services, reinforcement or insulation to services	25

For concrete ground-bearing floors, a maximum 20mm monolithic screed may be acceptable as part of the required thickness.

9.3.4.3 Screed over insulation

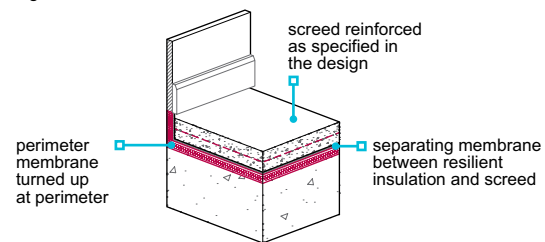
Where screed is to be installed over insulation, the screed should be reinforced, and the insulation should:

- provide adequate compressive strength to support wet construction screeds and floor loads
- be tightly butted and, where required, turned up at perimeters to prevent thermal bridging
- be separated from the screed by a membrane (the membrane should be compatible with the insulation, and have joints lapped and taped, and be turned up at the perimeter).

Sound insulating floating floors should be in accordance with building regulations.

Where proprietary fibre-reinforced screeds are installed on resilient slabs or quilts, specification and installation should be in accordance with the manufacturer's recommendations, and the fibres should have satisfactory independent technical assessment for use in the control of shrinkage in screeds or concretes.

Figure 1: Screed over insulation



9.3.5 Ceramic, concrete, terrazzo and similar tile finishes

Tile flooring shall provide a suitable wearing surface for the location and intended use.

Before tiling is started:

- ensure that the substrate is sufficiently dry (generally, six weeks for concrete bases and three weeks for screed is adequate)
- ensure the substrate is reasonably true and flat ($\pm 3\text{mm}$ using a 2m straight edge)
- ensure that falls, where required, are in accordance with the design
- differences in level should be dubbed out
- the surface should be clean and free from laitance, dirt, dust, grease and materials incompatible with the adhesive.

Where a calcium sulphate (anhydrite) screed is used:

- ensure that the substrate is sufficiently dry (calcium sulphate screeds generally should be allowed to dry at a rate of one day per mm of screed thickness for screeds up to 40mm thickness, and two days per mm for any additional thickness over 40mm; however, it should be ensured that the moisture content does not exceed 75% RH before tiling begins)
- the weak layer of laitance which forms on the surface of the screed should be removed
- the screed should be sealed with an appropriate primer in accordance with the manufacturer's recommendations
- where it is likely to be exposed to occasional wetting (ie, where a bath or shower is present), it should be protected by the application of an additional intermediate waterproofing layer (tanking system) prior to the installation of tiling.

When installing tiles to floors:

- they should be bedded on a solid bed of mortar or proprietary adhesive, of a thickness appropriate for the material
- the manufacturer's recommendations should be followed where proprietary adhesives are used
- they should be arranged to minimise cutting and to provide joints which are straight, neat and of even width
- accessories, such as covings and skirtings, should match the tile pattern, and be fixed so that joints are aligned with those in the floor
- they should be installed with minimum 3mm joints, unless otherwise specified by the manufacturer.

Where tiles are to be fixed to a wood-based substrate:

- the floor should be designed to take the additional loads of tiles, and any other materials (eg overlays)
- they should be suitable for laying over a timber base
- they should be bedded with deformable (flexible) tile adhesive, eg C2S1, and grouted in accordance with the manufacturer's recommendations. Guidance on suitable backing surfaces for tiling on wood-based floors can be found in Table 3. For further guidance, see BS 5385 Parts 3 and 4.

Table 3: Suitable backing surfaces for tiling on wood-based floors

Conditions	Example location	Acceptable substructure	Intermediate waterproofing layer (tanking system) required	Additional requirements
Installations in normal internal conditions	Rooms which do not contain a shower or bath (eg kitchen/utility room, cloakrooms/WC)	Moisture-resistant wood-based floor decking: plywood ⁽¹⁾ to BS EN 636-3S or P5 chipboard ⁽²⁾ overlaid with 10mm plywood to BS EN 636-3	No	Tiles solidly bedded on flexible tile adhesive (eg C2S1) Water-resistant grout
Installations not immersed but subject to occasional wetting	Domestic bathrooms	Moisture-resistant wood-based floor decking (ie, BS EN 636-3S plywood ⁽¹⁾ or P5 chipboard ⁽²⁾), overlaid with minimum 10mm thick proprietary tile backing board (fibre-reinforced gypsum tile backer boards subject to assessment), or alternative wood-based board where approved for use as a tiling substrate by the manufacturer	No	Tiles solidly bedded on flexible tile adhesive (eg C2S1) Water-resistant grout
		proprietary tile backing board (fibre-reinforced gypsum tile backer boards subject to assessment) of an appropriate type and thickness used as the floor decking ⁽³⁾		
Installations not immersed but subject to frequent wetting	Wet rooms and communal showers	Moisture-resistant wood-based floor decking (as above), overlaid with minimum 10mm thick proprietary tile backing board (fibre-reinforced gypsum tile backer boards subject to assessment)	Yes (unless the manufacturer can demonstrate that the board is inherently watertight)	Tiles solidly bedded on flexible tile adhesive (eg C2S1) Water-resistant grout
		Proprietary tile backing board (fibre-reinforced gypsum tile backer boards subject to assessment) of an appropriate thickness suitable for use as the floor decking ⁽³⁾		
Installations in high-humidity areas	Areas with constant high-humidity (eg saunas and steam rooms)	Moisture-resistant wood-based floor decking (as above), overlaid with minimum 10mm thick proprietary tile backing board (fibre-reinforced gypsum tile backer boards subject to assessment)	No	Tiles solidly bedded on flexible tile adhesive (eg C2S1) Water-resistant grout
		Proprietary tile backing board (fibre-reinforced gypsum tile backer boards subject to assessment) of an appropriate type and thickness suitable for use as the floor decking ⁽³⁾		

Notes

1. Plywood to BS EN 636-3S (minimum 15mm for joists at 400/450mm centres and minimum 18mm for joists at 600mm centres) screwed to the joists at 300mm centres with all square edges supported on joists or noggings (plywood should be installed with a 1.5-2mm movement gap between boards and at abutments, and be acclimatised to the room conditions and sealed on the underside and square edges, before laying, with a suitable sealer such as polyurethane varnish).
2. Moisture-resistant P5 chipboard grade overlaid with minimum 10mm plywood to BS EN 636-3, acclimatised, sealed and fixed as previously indicated, or proprietary separating/decoupling layers, tile backing boards or tile bedding reinforcement sheets used in accordance with the manufacturer's recommendations.
3. Proprietary tile backing boards should be assessed in accordance with NHBC Technical Requirement R3.

Movement joints should be:

- provided around the floor perimeter and at rigid upstands, where tiled areas are wider than 2m
- used to separate bays at 8-10m centers (where underfloor heating is proposed, the floor area should be divided up by intermediate movement joints into bays of a size no greater than 40m² with an edge length not greater than 8m
- a minimum of 3mm wide, unless otherwise specified by the manufacturer
- provided on suspended floors where tiles continue over changes in the sub-floor construction and flexing is likely to occur, eg over a supporting wall where end bearings of beam and block joists may be found.

Grout should be:

- cement-based epoxy resin or a proprietary product
- water-resistant, where tiles may become saturated.

Standards relevant to floor finishes include:

BS 8204-3	Screeds, bases and in-situ floorings — Polymer modified cementitious levelling screeds and wearing screeds. Code of practice
BS EN 13748-1	Terrazzo tiles — Terrazzo tiles for internal use
BS EN 14411	Ceramic tiles. Definition, classification, characteristics, assessment and verification of constancy of performance and marking
BS 5385-3	Wall and floor tiling — Design and installation of internal and external ceramic and mosaic floor tiling in normal conditions. Code of practice
BS 5385-4	Wall and floor tiling — Design and installation of ceramic and mosaic tiling in specific conditions. Code of practice
BS EN 13888	Grout for tiles. Requirements, evaluation of conformity, classification and designation

9.3.6 Wood finishes

Also see: BS 5250 and BRE Report 211 Thermal insulation: avoiding risks

Wood and wood-based flooring shall provide a suitable wearing surface for the location and intended use. Issues to be taken into account include:

- | | |
|--------------------------------|---|
| 1) thermal insulation and DPMs | 4) directly applied finishes (wood blocks, parquet, wood mosaic, etc) |
| 2) sound insulation | 5) indirectly applied finishes (soft wood boarding, wood-based panel products). |
| 3) condition of the substrate | |

Wood and wood-based flooring should be installed ensuring that:

- services beneath the floor finish are tested before the floor is installed
- underfloor heating is kept on before and during the floor laying
- wood finishes are conditioned to the appropriate moisture content
- where required, DPMs are incorporated in accordance with the manufacturer's recommendations and the design.

Standards relevant to wood floor finishes include:

BS 8201	Code of practice for installation of flooring of wood and wood-based panels
BS 1187	Specification for wood blocks for floors
BS 4050	Specification for mosaic parquet panels
BS 1202	Specification for nails
BS 1297	Specification for tongued and grooved softwood flooring

9.3.6.1 Thermal insulation and DPMs

Methods of providing insulation include:

- insulation positioned above in-situ concrete slab (DPM required)
- insulation positioned above dry, precast system (in certain circumstances, a DPM maybe omitted; see Chapter 5.2 Suspended ground floors for further information).

Figure 2: Location of DPM and insulation on ground-bearing slab

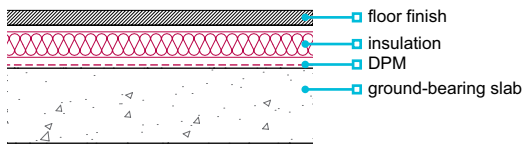
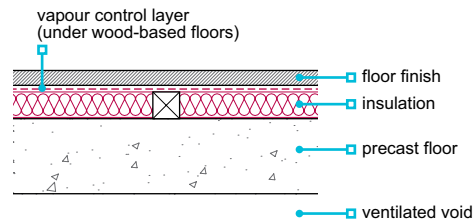


Figure 3: Location of DPM, VCL and insulation on precast floor



Proprietary insulated flooring should be in accordance with:

- Technical Requirement R3
- the manufacturer's recommendations on vapour control layers and DPMs.

9.3.6.2 Sound insulation

Floating floor finishes should be designed and constructed to:

- isolate the floor finish from the supporting floor and walls
- avoid excessive movement or squeaking
- avoid the use of fixings which penetrate the insulation layer
- ensure there are no air paths, especially at the perimeter.

Where flooring is to be installed on a resilient material on a separating floor, edges should be isolated from walls and skirtings by a resilient layer.

Where a floor relies on a soft floor covering to provide the minimum standard of sound insulation, the covering should be fixed permanently in position.

9.3.6.3 Condition of the substrate

Screeds or concrete to receive wood flooring should be dry. The floor should:

- be tested and the moisture content suitable, in accordance with BS 8201
- be allowed to cure for a sufficient period of time (generally two months for 50mm screed, and six months for concrete slabs), or
- have a DPM and/or air and vapour control layer incorporated in the floor construction to protect the wood finishes (moisture should not be trapped between the layers).

Screeds or concrete to receive wood flooring should:

- be free from high spots, nibs and major irregularities
- have differences in level dubbed out.

9.3.6.4 Directly applied finishes (wood blocks, parquet, wood mosaic, etc)

Directly applied finishes should be installed:

- in accordance with the manufacturer's recommendations
- using the correct adhesives, eg bitumen rubber emulsion in accordance with BS 8201 or proprietary adhesives assessed in accordance with Technical Requirement R3
- using evenly spread adhesives
- according to the specified pattern, and leaving gaps around the perimeter for movement.

Screeds or concrete surfaces should be treated with a suitable primer in accordance with the adhesive manufacturer's recommendations.

9.3.6.5 Indirectly applied finishes (softwood boarding, wood-based panel products)

Indirectly applied finishes should be installed with:

- air and vapour control layers where required
- preservative treated battens, in accordance with Chapter 3.3 Timber preservation (natural solid timber)
- provision made to support heavy items, such as storage heaters and boilers
- battens fixed to prevent excessive movement
- battens spaced in accordance with Table 4.

Table 4: Spacing of battens for indirectly applied floor finishes

	Thickness of finish (mm)	Maximum batten centres (mm)
P5 chipboard	18	450
	22	600
Plywood	15	450
	18/19	600
Oriented strand board (type OSB3)	15	450
	18/19	600
Other types of floor	In accordance with the manufacturer's instructions	

Chipboard and oriented strand board should be fixed to battens:

- with flat-head ring shank nails or screws
- with fixings 2.5 x the thickness of the board
- at 200mm-300mm centres at perimeters
- at 400mm centres on intermediate supports.

Plywood should be fixed to battens:

- with 10 gauge nails or screws
- a minimum of 10mm from the edges of boards
- at 150mm centres at perimeters
- at 300mm centres on intermediate supports.

9.3.7 Flexible sheet and flexible tile finishes

Also see: BS 5250 and BRE Report BR 262

Flexible sheet and flexible tile finishes shall provide a suitable wearing surface for the location and intended use.

Flexible sheet and flexible tile finishes should be:

- installed in accordance with the manufacturer's recommendations, and generally be fully bonded
- installed on a backing surface which is even and without high spots or cracks; where necessary, using a fabricated underlay of a type and thickness recommended by the flooring manufacturer or in accordance with Table 5
- reasonably level and smooth, particularly at doorways and junctions
- fitted with skirtings, coves, coverstrips and other preformed components, where required, and in accordance with the manufacturer's recommendations.

Table 5: Acceptable types of fabricated underlay for boarded surfaces

Type of underlay	Minimum thickness (mm)
Hardboard	4.8
Plywood	5.5

Plywood or hardboard fabricated underlays should be fixed:

- with ring shank nails or screws finished flush with surface
- with fixings 2.5 x the thickness of the underlay (but no longer than the combined thickness of the underlay and deck)
- with nails/screws at least 10mm from the edge of the panel
- around perimeters, at 100mm centres
- across the sheets, at 150mm centres.

Flexible sheet flooring materials should:

- be stored in a clean and ventilated place
- not be stored in cold conditions, unless permitted by the manufacturer
- not be exposed to temperatures less than 18°C for a period of 24 hours before, or during, laying.

The substrate should be sufficiently dry to prevent adverse effects on the flooring, and where:

- there is a risk of trapping moisture or interstitial condensation, permeable finishes should be used
- flexible sheet or tile flooring is installed on ground-bearing concrete floors, a DPM should be incorporated to prevent rising moisture adversely affecting floor finishes.

When installing flexible sheet or tile flooring:

- ensure underfloor services are not damaged
- it should be cut so that it fits neatly around fittings, pipes, etc
- adhesives should be spread evenly and left for the correct period of time to ensure full bonding
- the surface should be pressed down firmly, loaded or rolled as necessary to prevent curling, lifting or bubbling
- surplus adhesive should be removed
- welded joints should be provided in accordance with the manufacturer's recommendations
- adjustment after initial contraction or expansion should be made where necessary.

Standards relevant to flexible sheet and tile finishes include:

BS EN ISO 10581	Resilient floor coverings. Homogeneous poly(vinyl chloride) floor covering. Specifications
BS EN ISO 10595	Resilient floor coverings. Semi-flexible/vinylcomposition (VCT) poly(vinyl chloride) floor tiles. Specification
BS EN 650	Resilient floor coverings. Polyvinyl chloride floor coverings on jute backing or on polyester felt backing or on a polyester felt with a polyvinyl chloride backing. Specification
BS EN 651	Resilient floor coverings. Polyvinyl chloride floor coverings with foam layer. Specification
BS EN 12104	Resilient floor coverings. Cork floor tiles. Specification
BS 8203	Installation of resilient floor coverings — Code of practice

9.3.8 Asphalt finishes

Asphalt finishes shall be suitable for the location and intended use.

Mastic asphalt floor finishes should be:

- designed and constructed in accordance with BS 8204-5
- either Grade I or II and 15mm-20mm thick (which applies to the floor finishes and underlay)
- applied as one coat when used as underlay for other finishes
- in accordance with the floor manufacturer's recommendations when used with a suspended floor system.

9.3.9 Staircase finishes

Also see: Chapter 6.6

Staircase finishes shall permit safe usage and be suitable for their intended use.

The rise and going should remain uniform after application of the staircase finish, including at the top and bottom of the flight (see Clause 6.6.8).

For communal stairs (eg in escape routes in blocks of flats), non-slip nosings or inserts should be:

- provided where specified
- fixed in accordance with the manufacturer's recommendations.

9.3.10 Further information

- *BS 5250:2021 Management of moisture in buildings. Code of practice*
- *BRE Report BR 262 Thermal insulation: avoiding risks. 3rd Edition*

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