

Structural design of low-rise buildings —

Part 4: Code of practice for suspended concrete floors for housing

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee B/204, Structural design of low-rise buildings, upon which the following bodies were represented:

- Building Employers Confederation
- Chartered Institute of Building
- Consumer Policy Committee of BSI
- Department of the Environment (Building Research Establishment)
- Department of the Environment (Construction Directorate)
- Federation of Master Builders
- House Builders' Federation
- Institute of Building Control
- Institution of Civil Engineers
- Institution of Structural Engineers
- National Council of Building Material Producers
- National House-Building Council
- Royal Institute of British Architects
- Scottish Office (Building Directorate)

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- Aggregate Concrete Block Association
- Association of Building Engineers
- Autoclaved Aerated Concrete Products Association
- British Cement Association
- British Precast Concrete Federation Ltd.
- Department of the Environment for Northern Ireland

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Foreword

This Part of BS 8103 has been prepared by Technical Committee B/204, Structural design of low-rise buildings.

BS 8103 will be published in four Parts:

- *Part 1: Code of practice for stability, site investigation, foundations and ground floor slabs for housing;*
- *Part 2: Code of practice for masonry walls for housing;*
- *Part 3: Code of practice for timber floors and roofs for housing (in preparation);*
- *Part 4: Code of practice for suspended concrete floors for housing.*

A large proportion of the building programme is concerned with new housing and alterations in both the public and private sectors where traditional methods of construction are used for the majority of houses, and it is to these that this standard is applicable.

It is assumed that this standard will be used by those with expertise in building construction, but not necessarily in structural engineering design. The recommendations in this standard are intended to provide safe design without the need for design calculations.

NOTE For any conditions outside the limitations of this standard specialist advice should be obtained.

When using this standard it is important to ensure that overall stability of the dwelling is achieved, by following the recommendations of BS 8103-1.

The diagrams in this standard do not show all constructional details and are not intended to illustrate compliance with any requirements or other recommendations. They are not necessarily to scale and should not be used as working details.

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

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 22, an inside back cover and a back cover.

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

1 Scope

This Part of BS 8103 gives recommendations for suspended precast and cast in situ concrete floors for low-rise housing, comprising detached, semi-detached and terraced houses and flats (with not more than four self-contained dwelling units per floor accessible from one staircase) of not more than three storeys above ground, intended for domestic occupation. The recommendations also apply to certain single storey non-residential buildings, e.g. domestic garages and annexes to residential buildings not greater than 36 m² in floor area.

Recommendations are given for the following types of concrete floors:

- a) in situ ground floors not permanently supported from the ground;
- b) precast floors at ground, first and second levels;
- c) in situ and precast garage floors.

These recommendations do not apply to basement floors.

Proprietary housing systems and houses of timber, steel or concrete framed constructions are not covered by this standard.

The structural design recommendations described in this standard are not specifically intended to cover other considerations such as fire resistance, thermal and sound insulation, and resistance to damp penetration. Reference should be made to other standards and to statutory regulations and their supporting technical documents.

This Part of BS 8103 applies only to buildings in which the maximum clear span of the floor does not exceed 6 m. This limitation applies to the shorter span in the case of a rectangular floor slab supported on all four sides.

2 References

2.1 Normative references

This Part of BS 8103 incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on the inside back cover. For dated references, only the edition cited applies; any subsequent amendments to or revisions of the cited publication apply to this Part of BS 8103 only when incorporated in the reference by amendment or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

2.2 Informative references

This Part of BS 8103 refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

3 Definitions

For the purposes of this Part of BS 8103, the following definitions apply.

3.1

aspect ratio

the longer span divided by the shorter span

3.2

clear span

distance between opposite faces of supports

NOTE See also Figure 1.

3.3

heave

an upward movement of the ground

3.4

longer span

the longer of the two clear spans of a rectangular floor slab supported on all four sides

NOTE See also Figure 1.

3.5

parallel partition

partition which is supported by the floor slab and is aligned *parallel* to the shorter span

NOTE See also Figure 1.

3.6

perpendicular partition

partition which is supported by the floor slab and is aligned *perpendicular* to the shorter span

NOTE See also Figure 1.

3.7

shorter span

the shorter of the two clear spans of a rectangular floor slab supported on all four sides

NOTE See also Figure 1.

3.8

slab depth

the overall thickness of the slab

NOTE See also Figure 1.

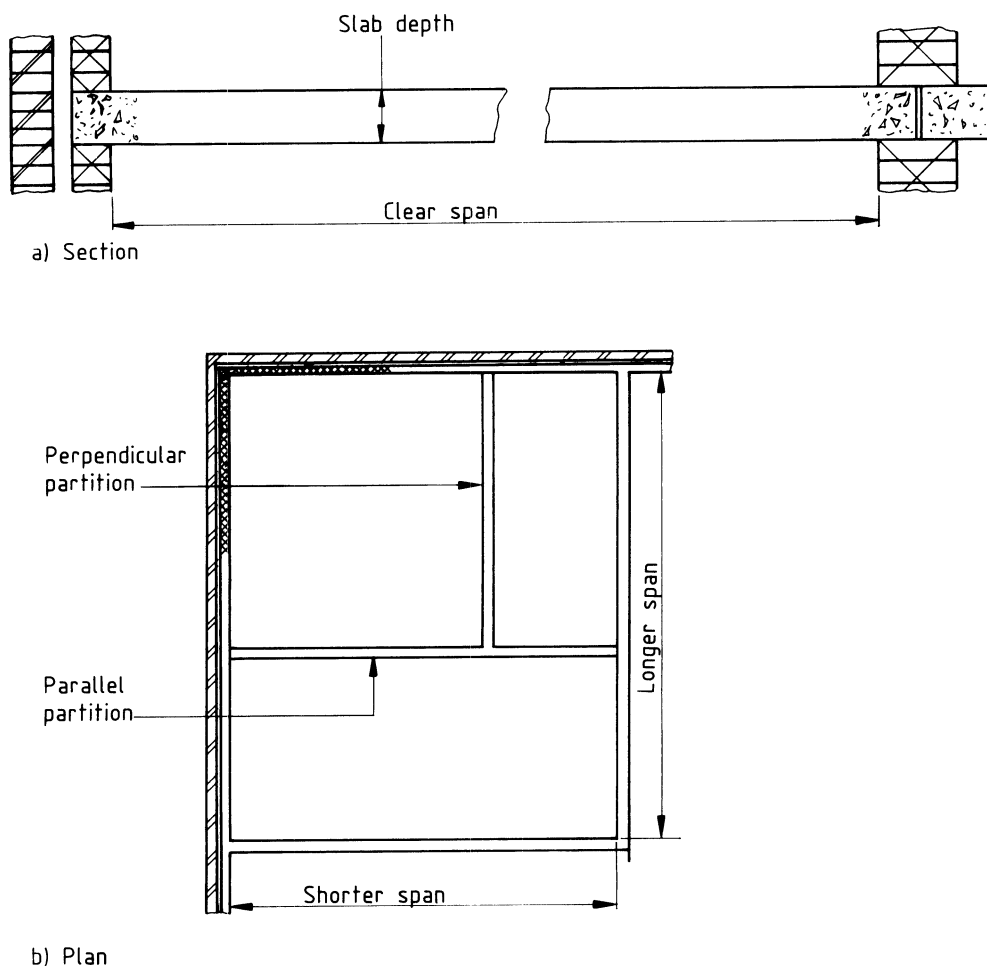


Figure 1 — Definitions

4 General

4.1 Criteria for choosing suspended floor construction

Suspended floor construction should be considered on all sites but is particularly necessary for ground floors in the following circumstances:

- where, for any reason, the floor would be on ground, or fill, which could result in a differential settlement, or heave, between the floor and the foundation;
- where the depth of the oversite fill is greater than 600 mm;
- Where chemically aggressive ground conditions would be deleterious to the concrete floor, e.g. presence of sulfates, chlorides, acids, etc.;
- where, due to the presence of radon, methane or other potentially dangerous gases, a ventilated void is required beneath the slab.

4.2 Information to be supplied to the designer regarding layout and construction

The following details should be supplied:

- the construction and location of all loadbearing walls;
- the construction and location of all non-loadbearing internal walls;
- the construction of floor finishes, applied screed, tiles, etc.;
- the weight and position of any heavy point load or line load such as water tanks or partitions carrying secondary loads, mechanical plant, vehicle jacking;
- the position and size of any openings in the floor slabs required for ducts, etc.;
- the form and location of any tying requirements between the floor and wall elements, as recommended by BS 8103-1.

4.3 Information to be supplied to the designer regarding dead and imposed loads

Floors should be adequate to support the loadings in BS 6399-1.

For a self-contained dwelling unit the imposed load to be considered relates to residential occupancy class type 1 and is 1.5 kN/m^2 or a point load of 1.4 kN , whichever provides the greater stresses.

For a domestic garage the imposed load to be considered is 2.5 kN/m^2 or a point load of 9 kN , whichever provides the greater stresses.

4.4 Construction loads

Care should be taken not to overload floors during construction, e.g. with stored materials or equipment.

Protective boarding, or similar, should be laid across any areas of flooring used for the storage of construction materials or equipment.

To guard against the possibility of overloading, such storage areas should be located as close as possible to the floor supports.

5 Suspended precast concrete floors

5.1 General

The normal practice is for the floor to be designed on behalf of the manufacturer, by an appropriately qualified person. The design and manufacture of reinforced or precast prestressed concrete members should be in accordance with BS 8110-1.

Proprietary floor systems comprising beams and infill blocks should incorporate a reinforced concrete topping when used for garages.

Where a floor is built into a wall (see Figure 2) the strength of that part of the floor should be not less than the required strength of the wall.

5.2 Generic types of precast floor system

Generic types of precast floor system are shown in Figure 3

5.3 Voids below ground floors

A void of at least 75 mm in depth should be provided between the underside of the floor and the ground surface. The depth of void should be increased to at least 150 mm , and be ventilated, where there is a risk of gas accumulation. For those sites susceptible to heave, the depth of void should be increased to at least 225 mm unless recommended otherwise by an appropriately qualified person.

5.4 Support for precast concrete floors

The bearing of precast concrete floors on to walls should be determined from consideration of the need to provide vertical support to the floor and lateral restraint to the wall.

Where the bearing of a precast member is less than 90 mm (for example, an internal 150 mm thick wall with floor spans on either side) the advice of an appropriately qualified person should be sought.

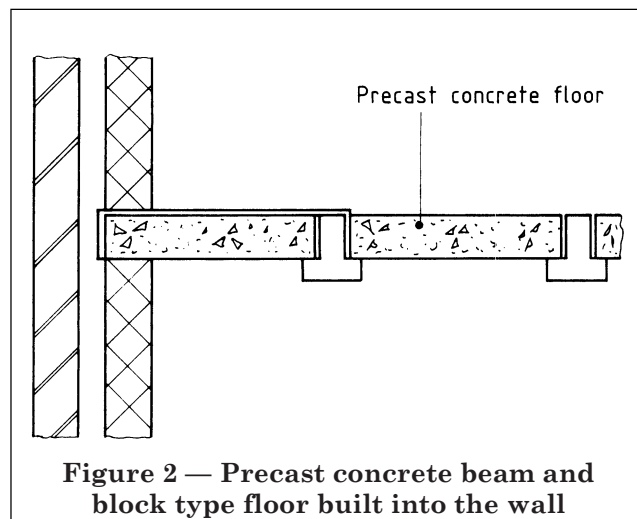


Figure 2 — Precast concrete beam and block type floor built into the wall

Precast concrete floor units should be laid directly upon a carefully regulated course of bricks or blocks without any form of mortar or resilient bedding material only when the bearing is level and clear of debris. Typical bearing details are shown in Figure 4.

5.5 Installation of precast floors

Care should be taken with the handling, stacking and installation of precast elements and the manufacturer's recommendations should be closely adhered to in this respect. The other recommendations given in subsection 5 of BS 8000-2.2:1990 should be followed, as applicable to the precast flooring system.

5.6 Jointing and tying in

Any grouting or infill required between precast concrete units should be provided following manufacturers' instructions.

NOTE See BS 8103-1 for recommendations concerning lateral restraint straps to tie the floors to the masonry walls.

5.7 Durability

Where a precast floor is used at ground floor level, the floor should be regarded as being in a moderate environment as defined in Table 3.2 of BS 8110-1:1985. The recommendations for the cover of steel and for concrete quality to suit this condition for reinforced concrete and for prestressed concrete are given in BS 8110-1. The recommendations for concrete not containing embedded metal are also given in that standard.

6 Suspended cast in situ concrete floors at ground level

6.1 Design

The design of suspended cast in situ concrete ground floor slabs should be undertaken either in accordance with **6.5**, or by an appropriately qualified person in accordance with the recommendations of BS 8110-1.

6.2 Site preparation

Unless a void is required below the ground floor, the slab may be cast directly on to the prepared ground, provided that the ground or any imported fill material:

- a) does not contain any organic matter or contaminants that may be harmful to the concrete floor or masonry walls;
- b) is not susceptible to heave;
- c) is capable of providing adequate temporary support to the slab during construction and until the design strength of the slab is attained;
- d) is blinded with fine granular material to provide a flat level surface.

Suitable measures should be taken to guard against the water or cement grout from the fresh concrete being absorbed into the ground and resulting in honeycombing or cracking of the slab, for example by covering the prepared ground with a suitable membrane, such as 250 μ m (1 000 gauge) polythene.

6.3 Support for cast in situ concrete slabs

The bearing of cast in situ concrete floors on to walls should be determined from consideration of the need to provide vertical support to the floor and, if required, lateral restraint to the wall.

The bearing width of supports should be at least 90 mm (see Figure 5). Unless special provisions are made in the design, all perimeter edges of the slab should be continuously supported, except for garage slabs which may be supported only along two opposite edges. Special provisions could consist of the following:

- a) over small openings or other discontinuities in the support (not exceeding 1 m wide), the provision of additional special reinforcement. Two 10 mm diameter reinforcing bars, high yield conforming to BS 4449, placed on the reinforcing mesh within 300 mm of the slab edge and extending a distance at least equal to the slab depth beyond the opening on either side are adequate for this purpose;
- b) over wider gaps, the provision of a downstand beam designed in accordance with BS 8110-1: by an appropriately qualified person.

6.4 Materials and basic requirements for slabs

6.4.1 Concrete

Concrete should be purchased from a producer holding current product conformity certification based on product testing and surveillance, coupled with an approved quality system conforming to BS EN ISO 9001.

Concrete should be an RC 35 designated mix conforming to BS 5328-2, BS 5328-3 and BS 5328-4, having a 20 mm nominal maximum size aggregate and a 75 mm slump, or an equivalent “designed” or “prescribed” mix conforming to BS 5328 and designed by an appropriately qualified person. The concrete should be compacted by use of a vibrating poker or by tamping, and should have a trowelled or floated finish.

To ensure that the concrete supplier is provided with all the pertinent technical data, the purchaser should use form D of BS 5328-2:1991 for specifying the concrete mix requirements. Figure 6 shows an example of a form D which has been completed in longhand to show the foregoing concrete mix requirements.

“Standard” mixes to BS 5328 should not be used.

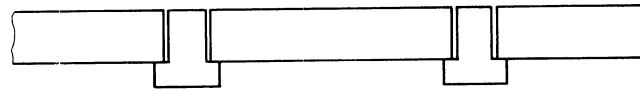
6.4.2 Reinforcement

The reinforcement should consist of grade 460 welded steel fabric conforming to BS 4483.

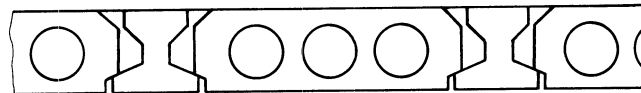
The reinforcement should be fixed to provide a nominal concrete cover of 50 mm, except at the ends of any reinforcement where a nominal 15 mm of concrete cover should be provided. At supports the reinforcement should extend at least 75 mm beyond the face of the support (see Figure 7).

Where it is necessary to lap reinforcement the minimum lap length provided should be the greatest of the following:

- a) for fabric comprising deformed type 2 reinforcement in accordance with the conditions specified in BS 4482: $34 \times$ the wire diameter;
- b) for fabric comprising plain or deformed type 1 reinforcement in accordance with the conditions specified in BS 4482: $61 \times$ the wire diameter;
- c) 250 mm.

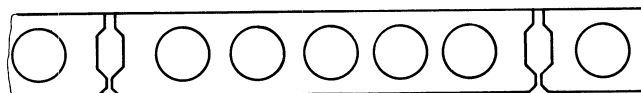


1) Example 1

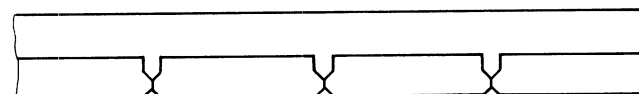


2) Example 2

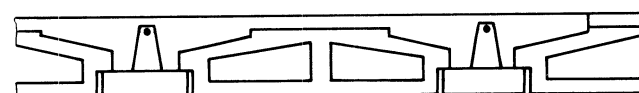
a) Beam and block



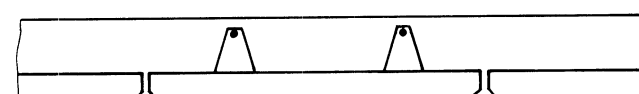
b) Hollow core slab



c) Solid composite slab



d) Composite beam and pot



e) Composite plate slab

Figure 3 — Generic types of precast floor systems