BS 8103-1:2011

BSI Standards Publication

Structural design of low-rise buildings

Part 1: Code of practice for stability, site investigation, foundations, precast concrete floors and ground floor slabs for housing

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 58, an inside back cover and a back cover.

Foreword

Publishing information

This part of BS 8103 is published by BSI and came into effect on 30 November 2011. It was prepared by Technical Committee B/204, *Structural design of low-rise buildings*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This part of BS 8103 supersedes BS 8103-1:1995 and BS 8103-4:1995, which are withdrawn.

Relationship with other publications

BS 8103 will be published in three 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.*

Information about this document

The scope and limitations of this part of BS 8103 are similar to A1/2 Section 2 of Approved Document A to The Building Regulations [1]. A particular exception is that the maximum clear span for roofs is up to 12 m rather than 9 m in Approved Document A.

A large proportion of the national building programmes 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 part of BS 8103 is applicable.

Use of this document

It is assumed that this standard will be used by those with expertise in building construction but not necessarily in structural engineering design. Houses constructed within the limitations stated in the relevant clauses will not require additional specialist advice. For any conditions outside the limitations of this standard appropriate specialist advice has to be obtained.

When using this standard, it is important to ensure that the overall stability of the house is achieved and that the work of any specialist engaged is properly coordinated. The situations included in this standard which require the consultation of suitably qualified persons are identified in the clauses to which they relate.

All drawings in this document only show structural details. Other details, e.g. damp proof courses, are not included.

In particular, it is expected that changes in the regulatory requirements for energy conservation are likely to modify the use of the traditional details. Examples are providing insulation below ground bearing floors, or increased thicknesses of insulation in cavity walls. Such items are outside the scope of this British Standard, which deals only with the basic structural issues.

As a code of practice this part of BS 8103 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.

Any user claiming compliance with this part of BS 8103 is expected to be able to justify any course of action that deviates from its recommendations.

Presentational conventions

The provisions in this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is "should".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

The word "should" is used to express recommendations of this standard. The word "may" is used in the text to express permissibility, e.g. as an alternative to the primary recommendation of the clause. The word "can" is used to express possibility, e.g. a consequence of an action or an event.

Contractual and legal considerations

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 cannot confer immunity from legal obligations.

1 Scope

This part of BS 8103 gives recommendations for the structural design of low-rise housing and covers the stability of the structure, site investigation and foundations and ground floor slabs used in the construction. Foundations comprising strip footings or trench fill founded in normal ground are the only type described.

Low-rise housing comprises 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 and of traditional masonry construction with timber roofs and floors of timber or concrete. For the purposes of this standard, additional habitable accommodation in the roof space constitutes a storey of the house. The recommendations also apply to certain single storey, non-residential buildings, e.g. domestic garages and annexes to residential buildings with a floor area not exceeding 36 m^2. This standard does not include the design of basements but, providing the basement is of one level only and is designed to provide a firm platform at ground level, the provisions of this standard may apply to the superstructure.

Proprietary housing systems and houses of timber, steel or concrete framed construction 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, resistance to damp penetration and durability.

For the purposes of this part of BS 8103, the following limitations apply:

a) roof: maximum clear span 12.0 m;

b) floor: maximum clear span 6.0 m;

c) a dynamic wind pressure not exceeding a value of 1.2 kN/m^2 (see **4.3**);

d) no part of wall or roof higher than 15 m above lowest adjacent ground level;

e) storey height: maximum 2.7 m;

f) maximum clear length of a loadbearing wall between vertical lateral supports of 9.0 m;

g) maximum length of any opening in loadbearing walls: 3.0 m;

h) only strip footings or trench fill foundations in normal ground conditions (see **6.1**).

NOTE Where foundations other than those given in item h) have been designed by suitably qualified persons, the remainder of the building may be constructed in accordance with the relevant clauses of this standard.

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 8000-2.2:1990, *Workmanship on building sites – Part 2: Code of practice for concrete work – Section 2.2 Sitework with in situ and precast concrete*

BS 8500-1, *Concrete – Complementary British Standard to BS EN 206-1 – Part 1: Method of specifying and guidance for the specifier*

BS 8500-2:2006, *Concrete – Complementary British Standard to BS EN 206-1 – Part 2: Specification for constituent materials and concrete*

BS EN 845-1:2003+A1:2008, *Specification for ancillary components for masonry – Part 1: Ties, tension straps, hangers and brackets*

BS EN 1991-1-1, *Eurocode 1: Actions on structures – Part 1-1: General actions – Densities, self-weight, imposed loads for buildings*

NA to BS EN 1991-1-1, *UK National Annex to Eurocode 1: Actions on structures – Part 1-1: General actions – Densities, self-weight, imposed loads for buildings*

BS EN 1992-1-1:2002*, Eurocode 2: Design of concrete structures – Part 1-2: General rules – Structural fire design*

NA to BS EN 1992-1-1, *UK National Annex to Eurocode 2: Design of concrete structures – Part 1-2: General rules – Structural fire design*

BS EN 13670:2009, *Execution of concrete structures*

PD 6697:2010, *Recommendations for the design of masonry structures to BS EN 1996-1-1 and BS EN 1996-2*

[N1]BUILDING RESEARCH ESTABLISHMENT. Concrete in aggressive ground (Special Digest 1). Watford: BRE, 2005 [1)]

3 Terms and definitions and symbols

3.1 Terms and definitions

For the purposes of this part of BS 8103, the following terms and definitions apply.

3.1.1 aspect ratio

longer span divided by the shorter span

3.1.2 buttress

section of wall or pier, bonded or securely tied to an adjacent wall providing support against lateral forces acting on the wall

3.1.3 cavity

space between two leaves of a cavity wall

3.1.4 cavity wall

two parallel single-leaf walls spaced at least 50 mm and not more than 300 mm apart and tied together with wall ties

3.1.5 clear span

distance between opposite faces of supports

NOTE See also Figure A.1.

3.1.6 foundation

part of a structure in direct contact with and transmitting loads to the ground

3.1.7 foundation depth

distance between the finished external ground level and the underside of the concrete in strip footings or trench fill construction

[1)] Available from the Building Research Establishment, Garston, Watford, Herts, WD2 7JR.

3.1.8 ground-supported slab
concrete slab constructed directly on and supported by the ground to receive material forming or supporting the wearing surface

3.1.9 heave
upward movement of the ground

3.1.10 hoggin
inert natural mixture usually consisting of gravel, sand and clay

3.1.11 loadbearing wall
wall that carries vertical and/or lateral loads in addition to its self-weight

3.1.12 longer span
longer of the two clear spans of a rectangular floor slab

NOTE See also Figure A.1.

3.1.13 masonry
assemblage of structural units that are bonded or solidly put together with mortar

3.1.14 nogging
solid piece of timber between timber members to provide support for an attachment point

NOTE In Scotland a nogging is commonly known as a "dwang".

3.1.15 orographic factor
multiplier to take into account the effect of hills, ridges, cliffs and escarpments

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

NOTE See also Figure A.1.

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

NOTE See also Figure A.1.

3.1.18 pier
integral thickened section located in a wall

3.1.19 separating wall
wall between two buildings that is common to both

3.1.20 shorter span
shorter of the two clear spans of a rectangular floor slab

NOTE See also Figure A.1.

3.1.21 slab depth
overall thickness of the slab

NOTE See also Figure A.1.

3.1.22 storey height
underside to underside distance between floors or between a floor and roof or, in the case of a ground storey, the distance between the top of the ground floor and the underside of the floor above

3.1.23 strip footing
bed of concrete laid in the bottom of a trench, its thickness being less than its width, that forms a strip foundation to carry a masonry wall

3.1.24 trench fill
deep bed of concrete filling a trench that forms a strip foundation to carry a masonry wall

3.2 Symbols

For the purposes of this part of BS 8103, the following symbols apply:

a	retained height of ground
d	depth of fill material
h_1	height of main building measured to the highest part of the wall or roof
h_2	height of wing or annexe measured to the highest part of the wall or roof
l	length of wall to wing or annexe
p_1	projection of wing extending for more than one storey
p_2	projection of single storey wing or annexe
p_{sf}	projection of strip footing beyond face of supported wall
s	step height in foundations
t	overall thickness of wall
t_1	thickness of leaf 1 of cavity wall
t_2	thickness of leaf 2 of cavity wall
t_{sf}	thickness of strip footing
t_{tf}	thickness of trench fill
w_1	width of wall to main building
w_2	width of wall to single storey wing or annexe
w_3	width of wall to a wing extending for more than one storey

4 Stability and connections between elements

4.1 Stability considerations

*COMMENTARY ON **4.1***

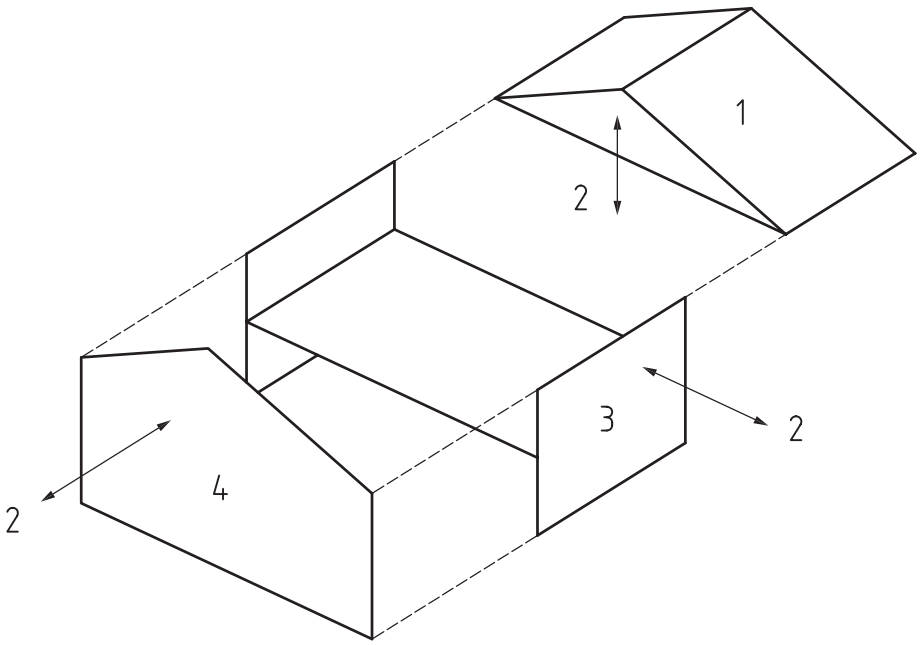
This part of BS 8103, together with BS 8103-2 and BS 8103-3, gives recommendations on the sizing of individual elements of a building: foundations, walls, floors and roof in relation to the forces acting on them due to self-weight and imposed loads.

In the situations shown in Figure 1 with the force derived from wind action at right angles to the gable, the gable in isolation is extremely vulnerable. The front and rear walls in combination with the floor, offer substantial lateral support provided that the wind forces from the top of the gable can be transferred to them. A braced roof, if adequately connected, laterally restrains the top of the gable and transfers the loads to the front and rear walls.

Likewise, the front and rear walls depend upon the lateral support provided by the floors and roof connected to the gable walls.

A building is not totally resistant to the excessive forces that might arise due to extreme causes such as earth tremors, explosion or impact by vehicles. Provided that the design procedures recommended in this standard are correctly followed, particularly the recommendations for connections between elements, then the effects of the excessive forces will be minimized if they occur.

Figure 1 **Diagram illustrating the action of wind forces**

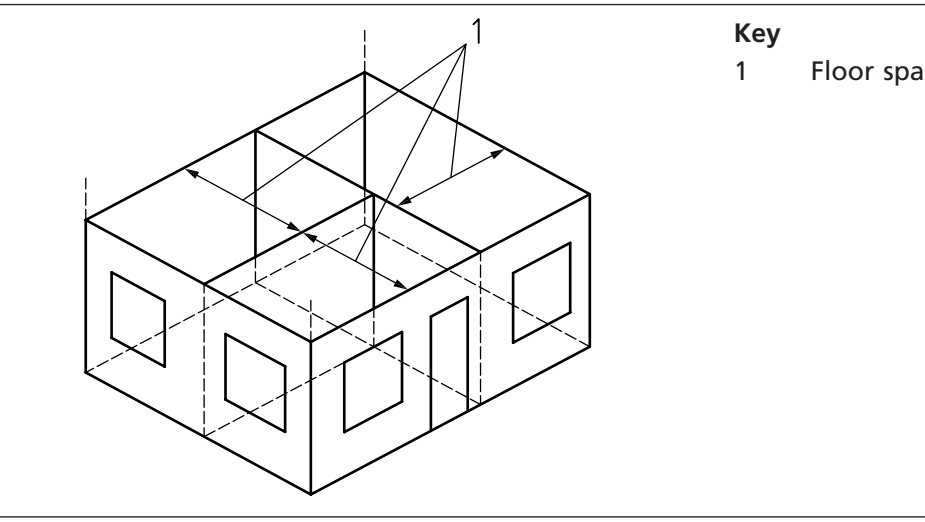


Key

1	Roof	3	Front
2	Wind force	4	Gable

In order to provide overall stability to the structure in any likely loading condition, it is essential that the foundations, walls, floors and roof are properly joined together. In the plan form of the building, for the ground floor, it is essential that the external walls interact to form the sides of a rigid box completed by the floors and roof (see Figure 2). In these forms of construction, the planes of the roof should be braced in order to contribute to the overall stability.f

Figure 2 **Box construction plan form to give stability**



Internal masonry walls should be connected to interact with external walls and brace the structure. Internal lightweight partitions should also be connected so that they contribute to the overall stability but they should be discounted in the design of the masonry. The connections between structural elements described in **4.4** should be used as necessary to ensure that the elements of the box interact fully in order to transfer and share loads placed on one element with other elements.

It is particularly important to ensure that wind loads are transferred to buttress walls, piers and chimneys.

4.2 Dimensional limits to ensure stability

4.2.1 Ground levels either side of walls

Where a wall is subjected to a lateral load from retained material due to a difference in levels on opposite sides, the difference in level above fully compacted backfill should not exceed the dimensions shown in Figure 3.

NOTE Figure 3b does not apply where there is an adjacent roadway on the upper level, used other than by private cars, and where the roadway for such vehicles is closer than a distance equivalent to 1.25 times the retained height. Such situations are outside the scope of this standard.

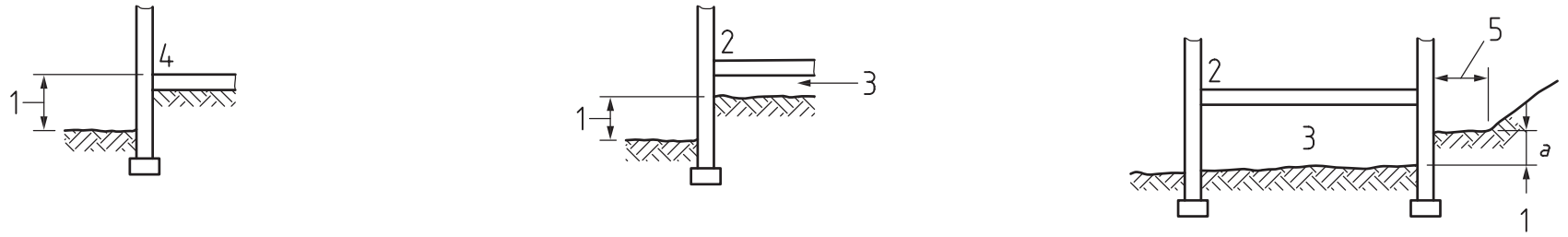
4.2.2 Building shape

For residential buildings, adequate stability against wind forces is achieved if the building dimensions, as shown in Figure 4 and following the recommendations in **4.3**, do not exceed the following values.

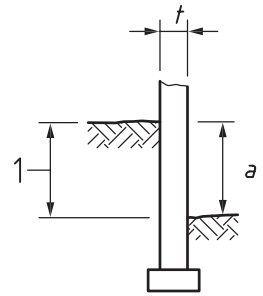
a) The height of the main building (h_1) should not be greater than twice the width of the building. The width should be taken as w_1 if p_1 is equal to, or less than w_3, or as w_3 if p_1 is greater than w_3.

b) The width of an annexe (w_2) should not be less than half the height of the annexe (h_2) if its length (p_2) is greater than twice its width (w_2).

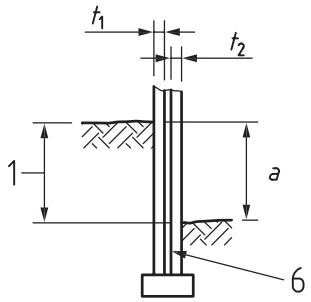
Figure 3 **Walls with a difference in level on opposite sides**



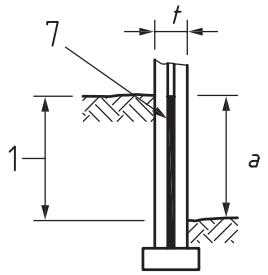
a) Situations where differences in level may occur



a should be ≤1m and ≤4*t*



a should be ≤1m and ≤4 (t_1+t_2)



*a should be ≤1m and ≤4*t

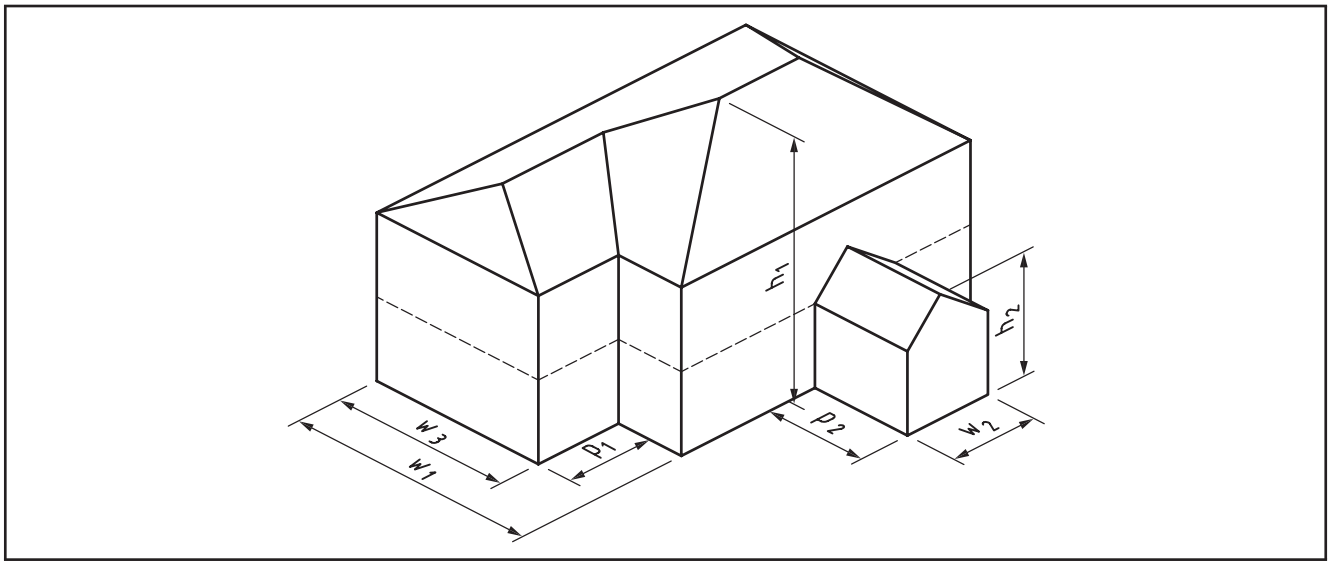
b) Maximum difference in permitted level

Key

1 Retained height
2 Suspended ground floor
3 Void
4 Ground supported floor slab
5 To be level for a distance of not less than 1.2 *a*
6 Clear wall cavity (unfilled with structural material)
7 Concrete fill to wall cavity

NOTE Figure 3 does not apply to free-standing walls.

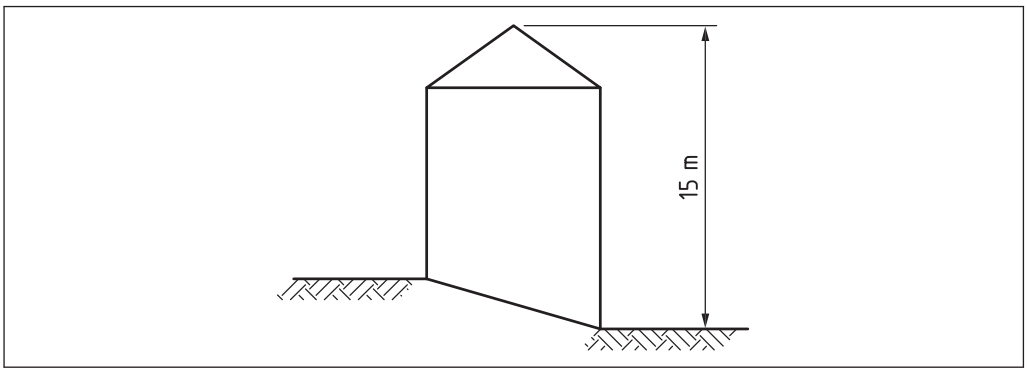
Figure 4 **Building shape**



4.2.3 Height of building

The maximum height above the lowest finished ground level adjoining the building should not exceed 15 m as shown in Figure 5.

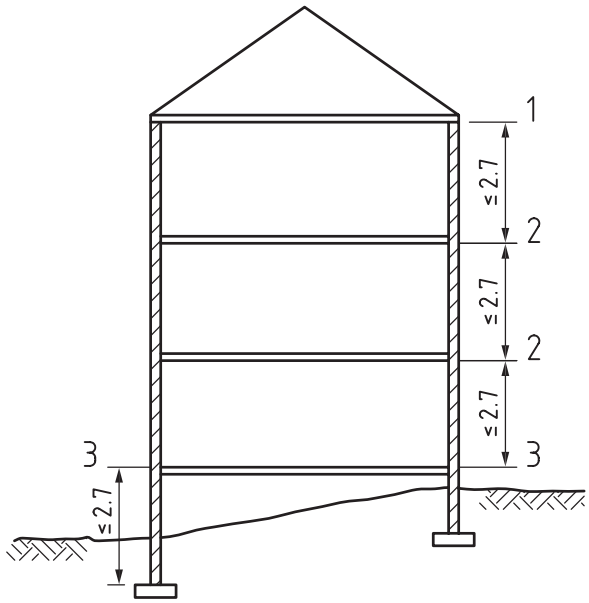
Figure 5 **Maximum height of building on sloping ground**



4.2.4 Storey height

The maximum height should not exceed 2.7 m measured as shown in Figure 6. The height of substructure walls, measured between the top of the foundation and the top of the ground floor slabs, should not exceed 2.7 m.

Figure 6 **Measurement of storey height of walls in metres**



Key
1 Underside of roof lateral support
2 Underside of floor
3 Top of ground floor

4.3 Wind loading

A simplified method of checking that the dynamic wind pressure does not exceed 1.2 kN/m² is given in Table 1, Table 2 and Table 3 and is as follows.

a) Determine the basic wind speed, V, at the site of the building from the map in Figure 7.

b) Determine the altitude factor, A, from Table 1 for the altitude of the site.

c) Determine, the orography factor, O. It can be taken as 1.0 for normal level sites. For sites on hills and escarpments determine factor O from Table 2 and Figure 8 taking into account the slope of the whole hillside and the position of the building in relation to the ridge of the hill or edge of the escarpment. Alternatively, a more accurate value for factor O may be determined using Figure 9 or Figure 10.

d) Calculate the value of S by multiplying together basic wind speed, V, by factor A by factor O.

e) Determine the maximum permissible height of the building from Table 3 depending on the value of S, whether the building is within a town or country location and the distance to the coast.

NOTE The magnitude of wind pressure to which a building is exposed is dependent on its height, geographical location and degree of exposure. This simplified method cannot take into account all local variations and the results might differ from local experience. Where a more accurate estimate of the allowable building height is desired, appropriate advice can be sought. BS EN 1991-1-4 and NA to BS EN 1991-1-4 can be used to do this, by calculating the peak velocity pressure, $q_{p,}$ for the site at the desired building height of up to 15 m. If q_p is ≤1.2 kN/m² then that building height is allowed within the scope. If q_p is >1.2 kN/m² then incrementally reduce the building height and repeat the calculation until q_p is ≤1.2 kN/m² this then gives the maximum allowable building height.

Table 1 **Altitude factor**

Site altitude	Factor A
m	
0	1.00
50	1.05
100	1.10
150	1.15
200	1.20
300	1.30
400	1.40
500	1.50

NOTE 1 When sites are elevated on hillsides or similar topographic features and fall within the shaded zones identified on Figures 9 and 10, orography is significant and a more accurate assessment of Factor A can be obtained by using the altitude of the general land level at the base of the topographic feature instead of the altitude at the site (see Figure 8).

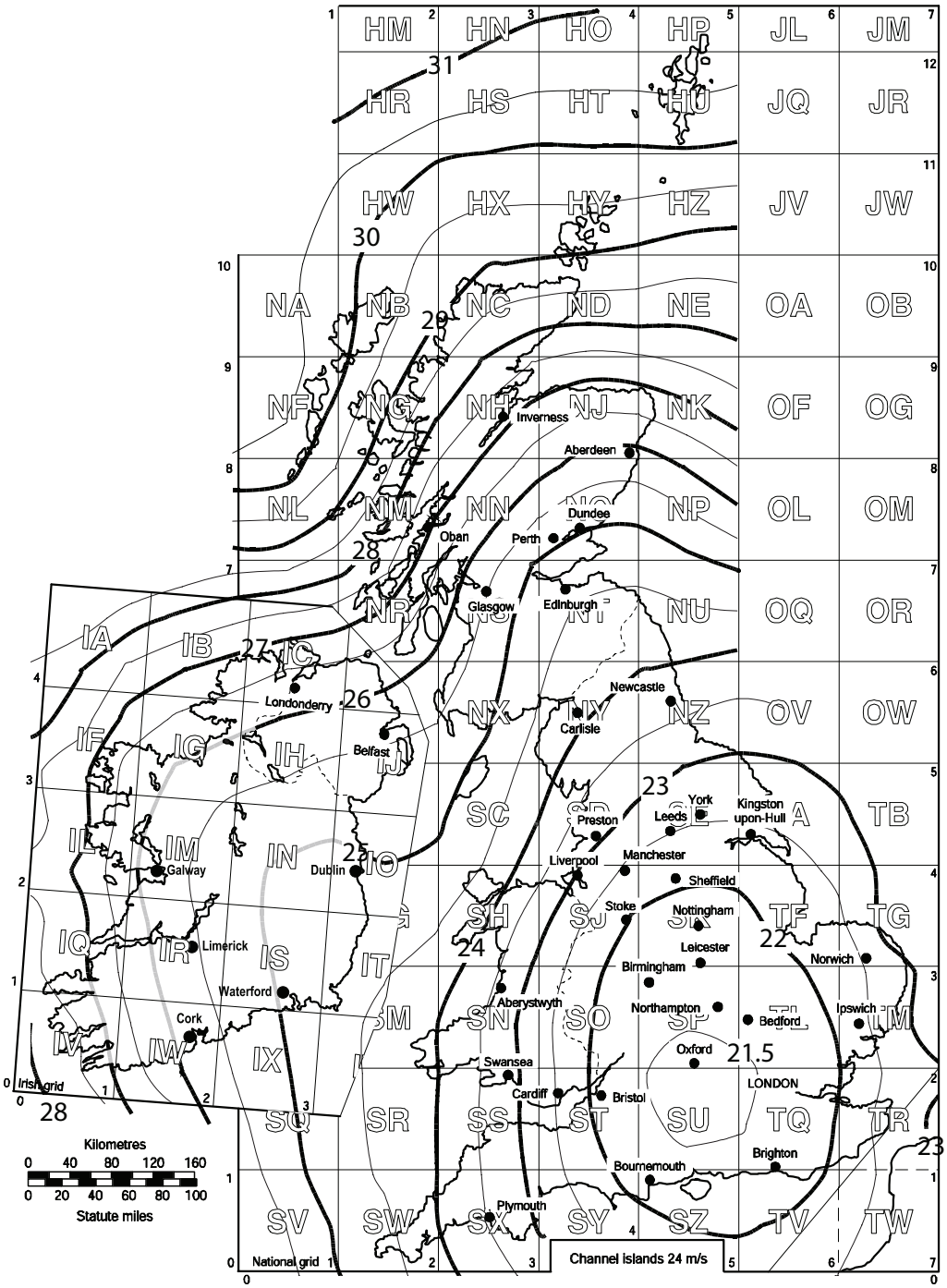
NOTE 2 Interpolation may be used.

Table 2 **Factor O**

Topographic category and average slope of whole hillside, ridge, cliff or escarpment	Factor O		
	Zone 1	Zone 2	Zone 3
Category 1: Nominally flat terrain, average slope <1/20	1.0	1.0	1.0
Category 2: Shallow terrain, average slope <1/10	1.12	1.07	1.05
Category 3: Moderately steep terrain, average slope <1/5	1.24	1.13	1.10
Category 4: Steep terrain, average slope >1/5	1.36	1.20	1.15

NOTE Outside of the zones the factor O = 1.0.

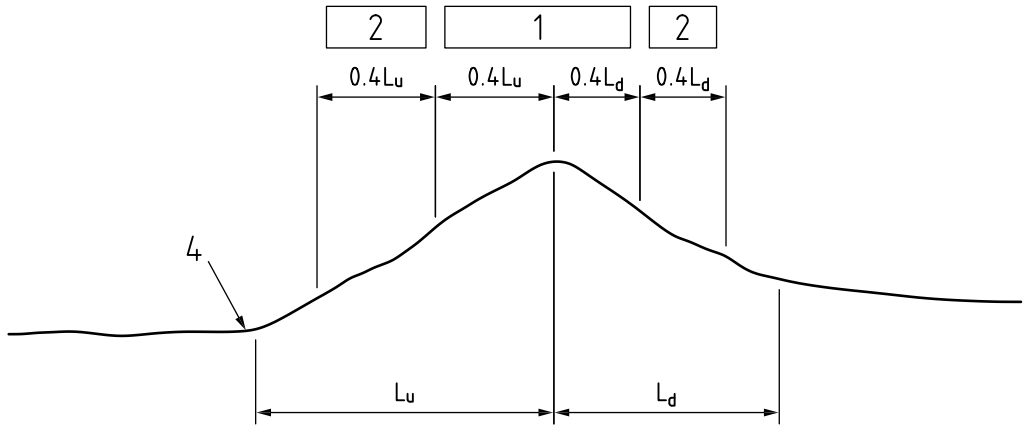
Figure 7 **Basic wind speed, V, map (m/s) before the altitude correction is applied**



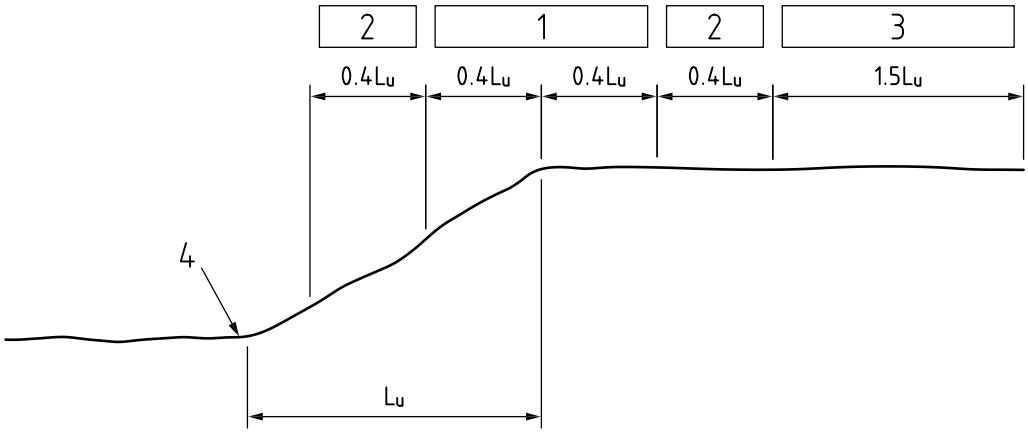
NOTE 1 This map is intended for sites in the United Kingdom, Isle of Man and Channel Islands only.

NOTE 2 The isopleths in the Irish Republic are shown for purposes of interpolation only.

Figure 8 **Orographic zones for factor O**



a) Orographic zones for factor O for hills and ridges

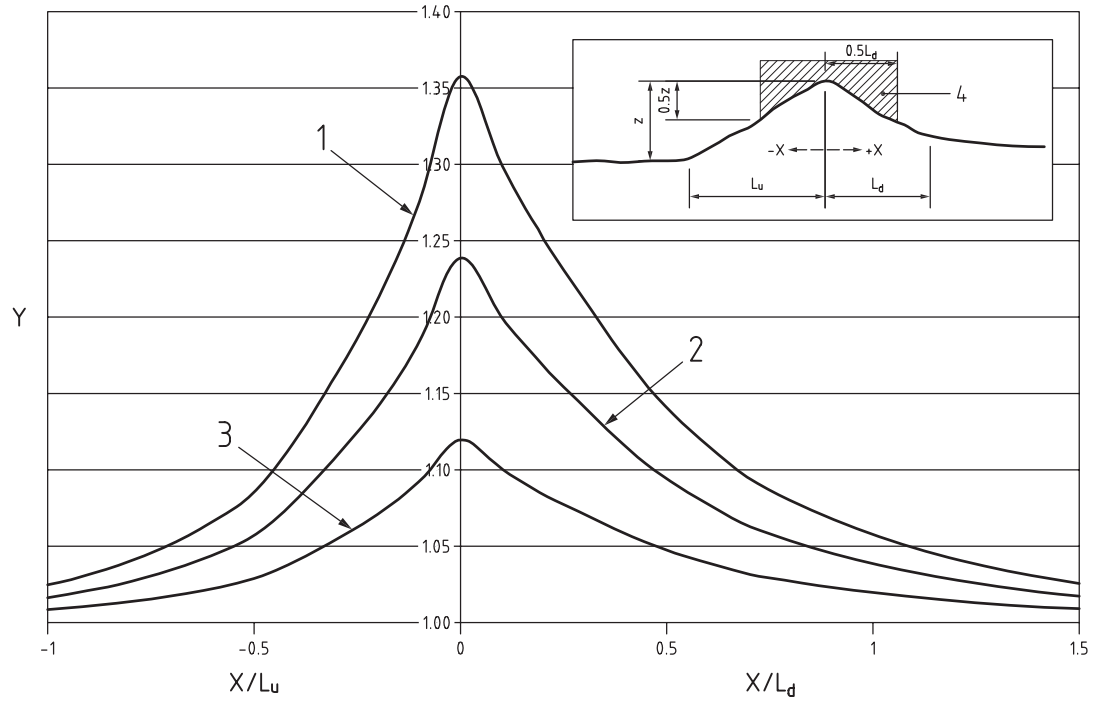


b) Orographic zones for factor O for cliffs and escarpments

Key

1 Zone 1
2 Zone 2
3 Zone 3
4 Alternative position for site altitude when orography is significant (see Note 1 to Table 1)

Figure 9 **Orography factor O for hills and ridges**

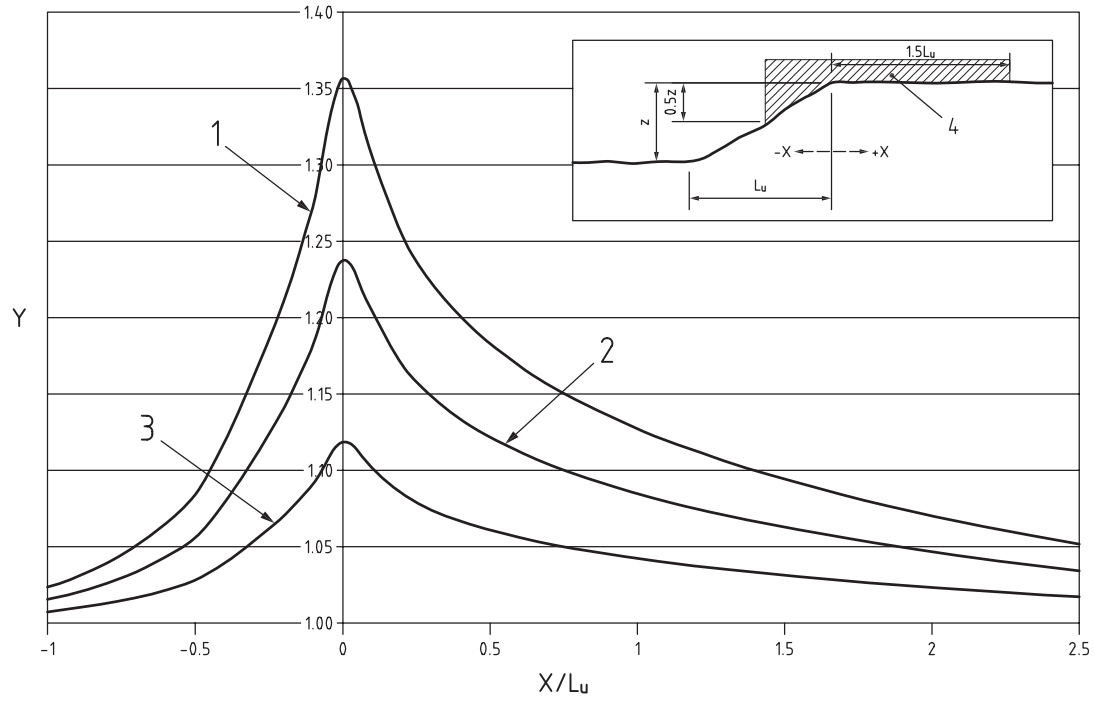


Key

1	Steep slope <1/3.3	3	Shallow slope ≤1/10
2	Moderate slope = 1/5	4	Orography significant in shaded area

NOTE Interpolation between curves may be used.

Figure 10 **Orography factor O for cliffs and escarpments**



1	Steep slope <1/3.3	3	Shallow slope ≤1/10
2	Moderate slope = 1/5	4	Orography significant in shaded area

NOTE Interpolation between curves may be used.

Table 3 **Maximum allowable building height, m**

Factor S	Country sites			Town sites		
	Distance to the coast			Distance to the coast		
	<2 km	2 to 20 km	>20 km	<2 km	2 to 20 km	>20 km
≤ 25	15	15	15	15	15	15
26	11.5	13.5	15	15	15	15
27	8	11	14.5	15	15	15
28	5.5	8	11	15	15	15
29	4	6.5	8.5	12.5	15	15
30	3	5	6.5	10	12.5	15
31	—	4	5.5	8.5	11	13.5
32	—	3.5	4.5	7	9.5	11.5
33	—	3	3.5	6	8	10
34	—	—	3	5.5	7	8.5
35	—	—	—	4.5	6.5	7.5
36	—	—	—	4	5.5	6.5
37	—	—	—	3.5	5	6
38	—	—	—	3	4.5	5.5
39	—	—	—	—	4	5
40	—	—	—	—	3.5	4.5
41	—	—	—	—	3	4
42	—	—	—	—	—	3.5
43	—	—	—	—	—	3.5
44	—	—	—	—	—	3

NOTE 1 Sites in towns less than 300 m from the edge of the town are assumed to be in country terrain.

NOTE 2 Where a site is closer than 1 km to an inland area of water which extends more than 1 km in the wind direction, the distance to the coast is taken as <2 km.

NOTE 3 Interpolation may be used.

4.4 Connections between structural elements

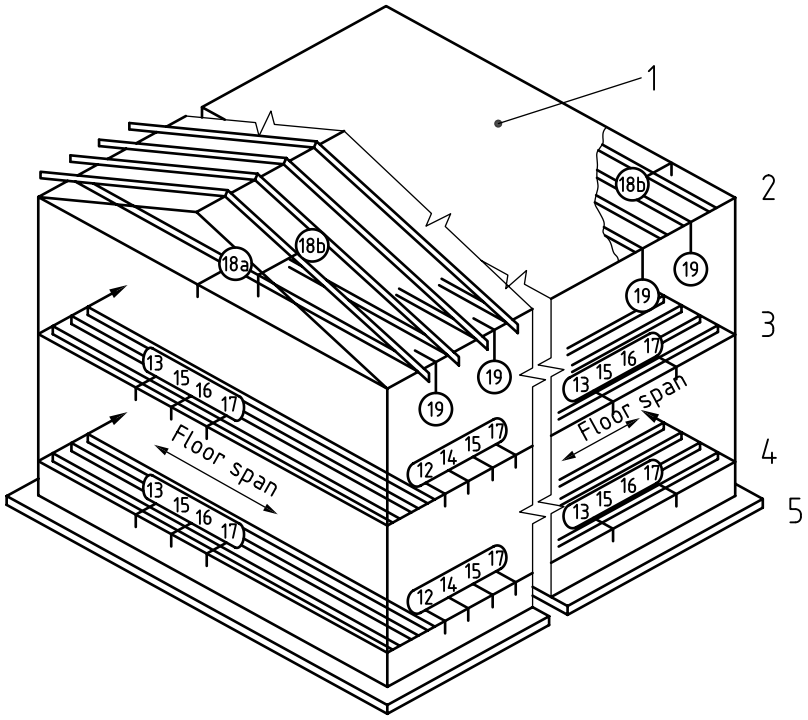
4.4.1 General

*NOTE The details of connections of floor- or roof-to-wall given in **4.4.2** provide for the tying together of elements recommended by this standard to achieve overall stability and lateral restraint for walls.*

All rafters/roof joists should be fixed to the wall plate, e.g. by framing anchors, and other connections should be made at the positions shown in Figure 11 with the exception of the cases listed in items a) to f).

Connections, where provided, should be inserted throughout the length of the wall at that level. Depending on the roof or floor construction and the location of the connection, the relevant detail indicated in Figure 11 should be chosen from Figure 12 to Figure 19.

Figure 11 **Diagram of a house showing location and type of connections necessary between elements**



Key

1	Flat roof
2	Roof level
3	First or second floor level
4	Ground floor level
5	Foundation
	Indicates that a connection might be required. The number in the circle refers to the figure showing the detail. Where more than one type of restraint system is given at an element intersection, only one of the options is to be used.

Where the connections are metal restraint straps they should be fixed at centres not exceeding 2 m unless otherwise indicated on Figure 12 to Figure 19, as appropriate. Internal loadbearing walls should be laterally restrained at each level by the relevant detail shown in Figure 11 for external walls at that level.

Connections may be omitted in the following circumstances.

a) *Short lengths of wall.* Where a wall is less than 3 m long between buttressing walls.

b) *Openings adjacent to walls.* Where an opening occurs in a floor directly adjacent to a loadbearing wall, e.g. in a stairwell, the length of wall without lateral restraint should not exceed 3 m. Where metal restraint straps would have been necessary within the length of the opening to conform to this standard (see Figure 11), these should be distributed on both sides of the opening in addition to those already provided.

c) *Vertical restraint straps.* Straps for wall plates and roof to resist uplift forces due to wind are not required when the dead weight of the roof exceeds the uplift. In low-exposure situations, where on the basis of local experience there is low uplift risk from wind gusts, houses with a roof pitch greater than 15° and clad in slates or concrete or clay tiles having a laid mass per unit area greater than 50 kg/m^2 do not require vertical restraint straps.

d) *Lateral restraint at ground floor.* Where ground-supported floor slabs are

used or where the top of a suspended ground floor is not more than 1 m above the finished internal or external ground level.

e) *Lateral restraint at the ceiling level of the gable.* Straps are not necessary when the height to the midpoint of the triangular section of the gable from the underside of the floor immediately below is not greater than 16*t* where *t* is the overall thickness of a solid wall, or in the case of a cavity wall, the sum of the thicknesses of the two leaves plus 10 mm.

f) *Lateral restraint at party wall junctions.* Straps are not necessary where floors bear on to either solid 200 mm thick or tied cavity party walls from both sides at approximately the same level. This applies irrespective of the means of support, e.g. direct bearing or joist hangers. Floors spanning parallel to such walls should be strapped, however, to transmit forces from the front and rear walls.

4.4.2 Metal restraint straps

Metal restraint straps providing lateral restraint or restraint against uplift of roofs should conform to BS EN 845-1:2003+A1:2008 and be of material reference 14, 15 or 16.1 or 16.2 (galvanized steel) or other more resistant specifications including material references 1 or 3 (austenitic stainless steel) or other suitably strong and durable materials in accordance with PD 6697:2010, Table 2.

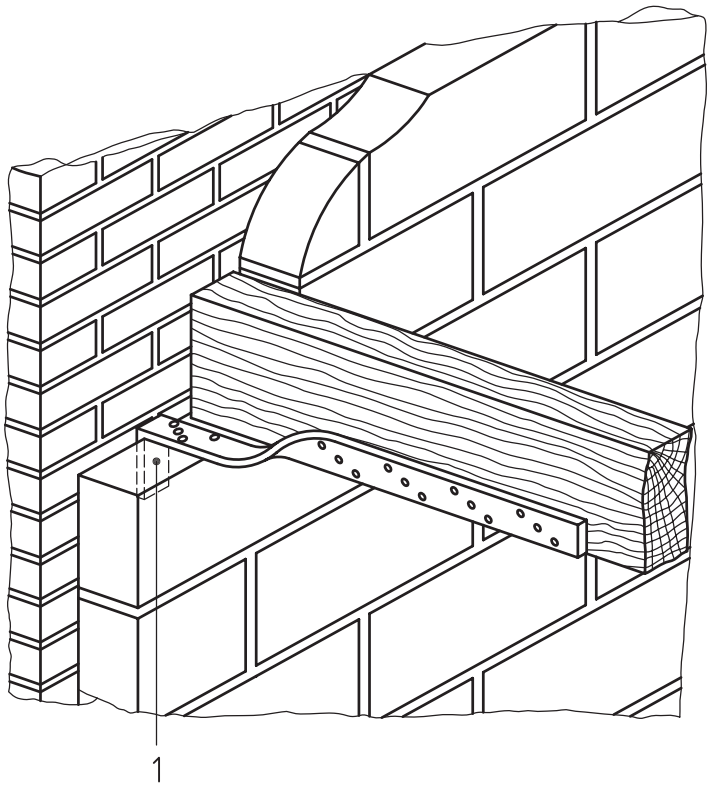
Horizontal straps providing lateral restraint should have a declared tensile strength of not less than 8 kN or, alternatively, have a nominal cross-sectional area of 150 mm^2 or greater, a minimum thickness of 5 mm, a minimum turn down length of 100 mm and a minimum straight length of 600 mm.

For timber members spanning parallel to the wall, sufficient straight length of strap should be provided to extend over three joists or rafters.

Horizontal straps should be fixed to timber members with steel 50 mm long × 5 mm diameter wood screws or by 100 mm × 4 mm (8 SWG) round nails at not less than 110 mm centres with a minimum of four fixings. The first connection should not be less than 112 mm from the end face of the timber member. Where timber members spanning parallel to a wall are to be restrained, the straps should be attached to binders or solid noggings fixed firmly to the joists. Additionally, there should be a packing piece between the wall and the nearest joist or rafter.

Vertical straps resisting uplift only, should have a nominal cross-sectional area of 75 mm^2; a minimum thickness of 2.5 mm; a minimum anchorage length of 100 mm beyond either a 90° bend, or a vertical twist (see Figure 19), and a minimum straight length of 1 000 mm. They should be face-fixed to masonry with a minimum of four fixings, one of which should be within 150 mm of the bottom end of the strap or, as an alternative to face-fixings, the strap may be "turned into" the masonry by incorporating an additional 100 mm anchorage length beyond a 90° bend at the bottom of the strap.

Figure 12 **Timber floor bearing on to wall**

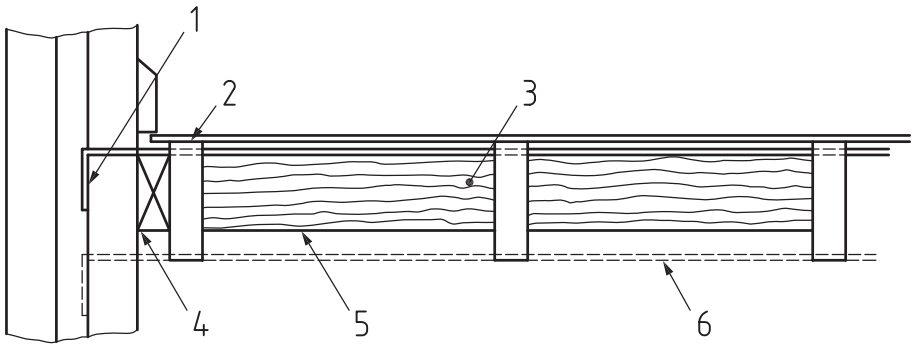


Key

1 Strap to turn down a minimum of 100 mm and be tight against the cavity face of the walling inner leaf

NOTE No strap is necessary, provided joists are at 1.2 m spacing or closer and bearing at least 90 mm into wall. Otherwise strap as shown; on top of joist with strap turned up or one side of joist with strap turned sideways. (Alternative positions are shown in PD 6697:2010, Figure 1.)

Figure 13 **Timber floor spanning parallel with a wall**



Key

1 Strap to turn down a minimum of 100 mm and be tight against the cavity face of the walling inner leaf

2 Strap to be rebated into top of joists to allow the floorboards to lay flat

3 Nogging should extend at least half the depth of the joist and be at least 38 mm thick

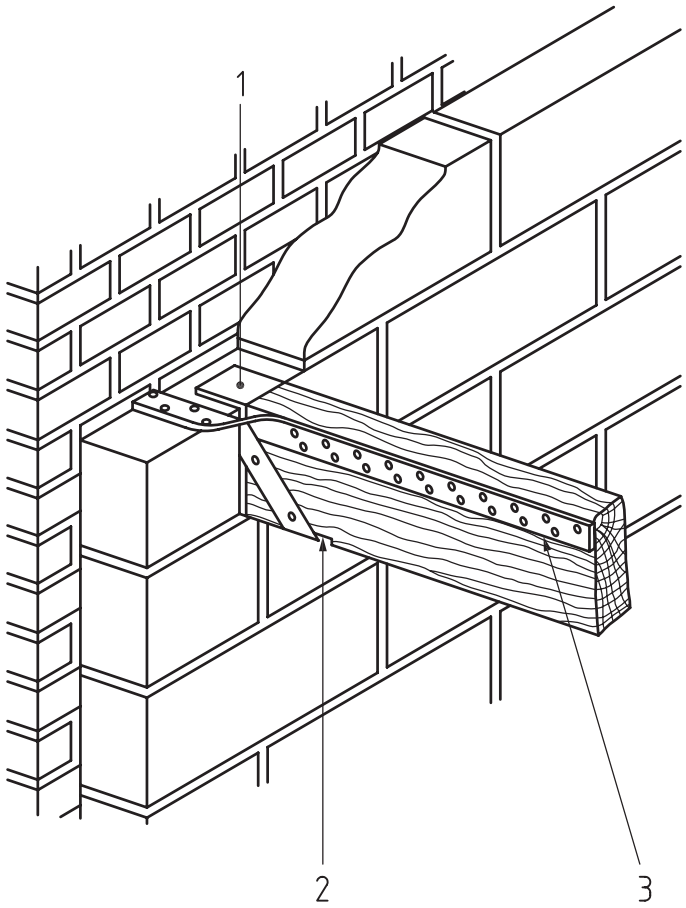
4 Gap between the wall and the first joist to be filled with a timber packing at strap positions

5 Solid noggin to be fixed between joists under the straps to take the fixings

6 Alternative strap location using full depth noggings

The strap should be carried over at least three joists and be secured with four fixings of which at least one should be in the third joist, or in a nogging beyond the third joint.

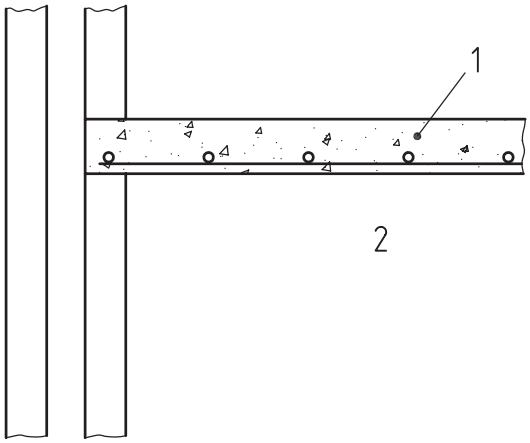
Figure 14 **Timber floor supported on standard joist hanger**



Key

1 Whenever possible, the tongue of the hanger to be located away from the perpend joint below
2 Underside of joist notched to provide a flat soffit for the ceiling
3 Strap skew-nailed to joist

Figure 15 **Concrete suspended floor bearing on to wall**



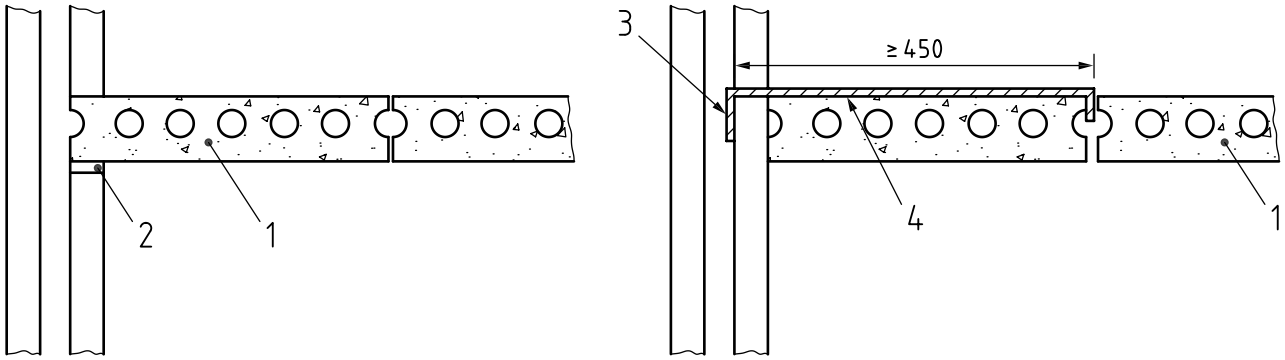
Key

1 Concrete suspended floor

2 No straps are necessary. 90 mm min bearing of the concrete floor on to the wall

Figure 16 **Concrete suspended floor abutting wall**

Dimensions in millimetres



Key

1 Concrete suspended floor

2 Mortar bed

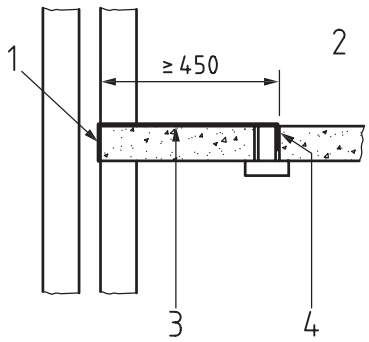
3 Strap to turn down a min of 100 mm and be tight against the face of the walling inner leaf

4 Strap position

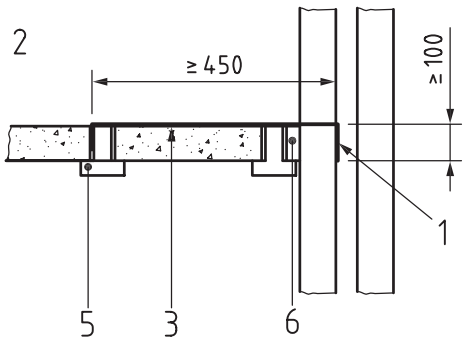
Where the floor is parallel with and abuts the wall, straps are necessary and should be built into or secured to the concrete floor.

Figure 17 **Precast concrete beam and block type floor abutting or spanning on to wall**

Dimensions in millimetres



a) Typical edge detail



b) *Alternative edge detail*

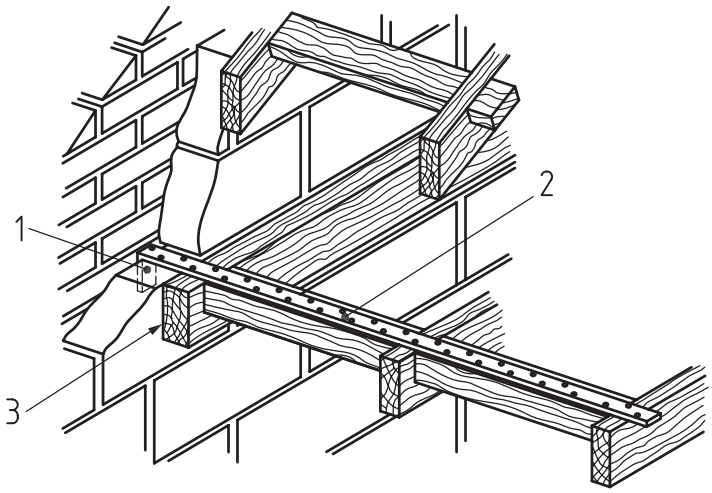
Key

1 Strap to turn down a min of 100 mm and be tight against the cavity face of the walling inner leaf
2 Precast concrete floor
3 Strap position
4 Strap securing point to concrete floor using turn down of the strap which is to be tight against precast beam face
5 Precast beam
6 Void solidly grouted

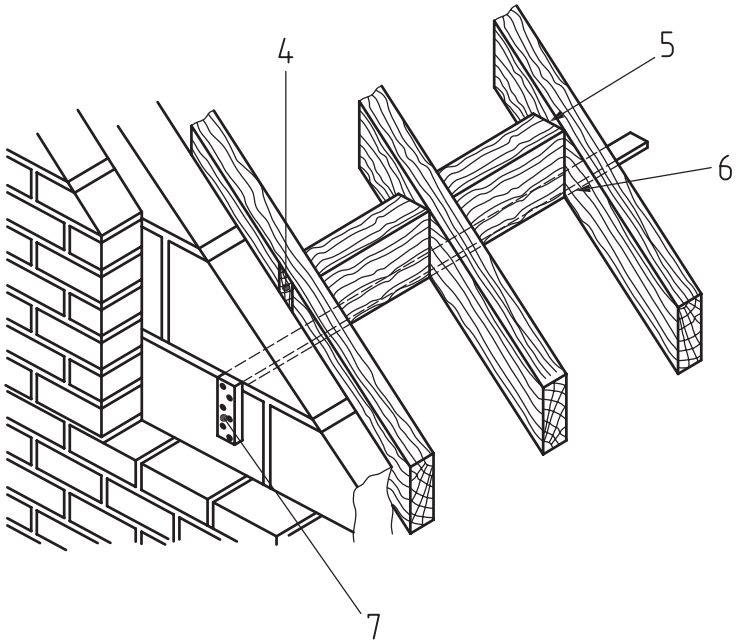
NOTE Where the floor beam spans directly onto the wall, no straps are necessary provided that there is a min 90 mm bearing of concrete beams on to the wall.

Where floor spans parallel with the wall, straps are necessary and should be built into the concrete floor.

Figure 18 **Tying of pitched roofs to gable walls**



a) Pitched roof: Strapping at ceiling where roof spans parallel with a wall (similar details for flat roof spanning parallel with wall)



b) Pitched roof: Connections at gable verge line

Key

1 Strap to turn down a min of 100 mm and be tight against the cavity face of the walling inner leaf

2 Strap fixed to solid noggings with a min of four fixings of which at least one should be in the third joist or in a nogging beyond the third joist

3 Packing at strap position

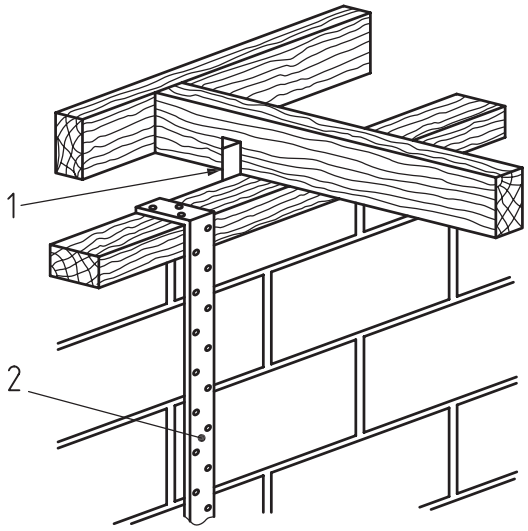
4 Packing piece between inner leaf and first rafter

5 Noggings to be provided and set horizontal unless the strap has a twist to line it up with the roof slope

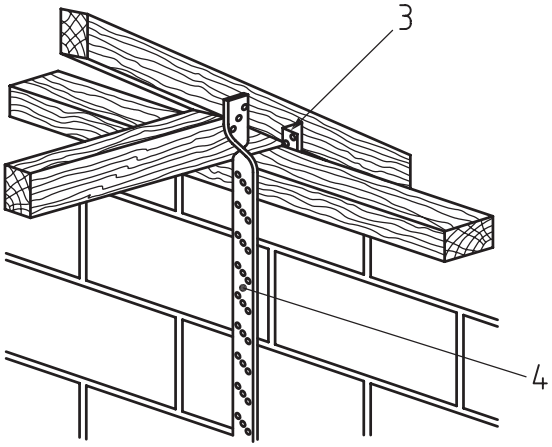
6 Strap fixed solid nogging with a min of four fixings of which at least one is to be in the third rafter or in a nogging beyond the third rafter

7 Strap bedded in the horizontal mortar joint under a cut block

Figure 19 **Pitched or flat roof bearing on to a wallplate**



a) Restraining roof joists against uplift by use of framing anchor and wallplate straps



b) Rafter strap

Key

1 Each rafter anchored to a wallplate with framing anchor

2 Strap to be at least 1 m long and either screwed to face of masonry or have a tail built into masonry bed joint. If screws are used, a min of four screws are necessary at least one of which is to be located within 150 mm of the bottom of the strap

3 Each joist anchored to a wall plate with framing anchor, clip or nail

4 Strap to have a straight length of at least 1 m and be either screwed to the face of the masonry, or have a tail built into a masonry bed joint. If screws are used a min of four screws are necessary at least one of which is to be located within 150 mm of the bottom of the strap

Vertical restraint straps as detailed in a) or b) should be provided at centres not exceeding 2 m, but each trussed rafter should be fixed to the wall plate [see **4.4.1**c)].

5 Site investigation

5.1 General

A site investigation should be undertaken at an early stage. The investigation should determine any features necessary to plan the siting of dwellings as well as determine soil properties and identify potential hazards which will affect the eventual design of the foundation.

NOTE Site investigation can be a complex exercise and some site conditions may be outside the scope of this standard.

If any of the hazards listed in **5.3** are located under or close to the site of the building, they could cause the ground to behave in an abnormal fashion, in which case a suitably qualified person should be employed to carry out the site investigation and foundation design.

5.2 Methods of site investigation

Site investigation should fall into the following two parts.

a) *Desk study.* A study of documents relating to the site such as maps, geological reports, aerial photographs and records held by the Local Authority and the Public Utilities. Where appropriate reference should also be made to the Coal Authority and other mining authorities.

NOTE 1 An online gazetteer, which provides an indication of places that may or may not require a mining search, can be found at http://coal.decc.gov.uk/en/coal/cms/services/reports/gazetteer/gazetteer.aspx

The electricity, gas and water authorities, telecommunications and also the British Pipeline Agency should be approached to provide information relating to existing mains or sewers on or near the site.

b) *Physical exploration of the site.* This should include a survey of ground levels and services as well as visual inspection and should be primarily concerned with identifying the nature of the ground and any hazardous features.

The ground should be examined using boreholes or trial pits which should be sufficient in number to show any likely variation over the site. They should be located taking account of the proposed layout of the site but not under or close to proposed foundation positions. The depth of trial pits should be at least 2 m.

The depth of the investigation should be such as to establish the characteristics of the ground that will be affected by the proposed foundation. The suitability of the ground should be assessed by a suitably qualified person in association with the field tests described in Table 8.

NOTE 2 More detailed information on site investigations can be found in BS 5930, BS EN 1997-2 and NA to BS EN 1997-2.

5.3 Hazardous ground conditions requiring special consideration

If, after investigation (see **5.2**), the following hazardous ground conditions are found then appropriate actions need to be taken in progressing the design or a suitably qualified person should be consulted.

a) Slopes subject to slip or creep which can occur on clay sites with slopes greater than 1 in 10

b) Areas liable to long-term consolidation of the ground, particularly where the ground is made-up or reclaimed or where layers of peat are encountered.

c) Areas such as old refuse tips or previous industrial sites containing material

that is subject to internal combustion, chemical change or bacteriological decay, or which includes volatile organic compounds or toxic wastes, or which includes methane or other hazardous gases.

d) Underground watercourses or buried water courses and ponds.

e) Existing services such as sewers, gas and water mains, electricity or telecommunication cables.

f) Pits, both natural such as swallow holes, or due to mining or quarrying; also bomb craters and soft spots where trees have been taken up.

g) Areas liable to subsidence caused by mining or mineral extraction below the site.

h) Wells, mine shafts, etc.

i) Old foundations or other concealed constructions.

j) On clay soils, the presence, introduction or recent removal of trees or heavy vegetation [2)].

k) Areas liable to flooding or where the watertable level is above the expected level of the foundations.

l) Areas where past experience has shown the presence of high sulfate concentrations or other naturally occurring potentially deleterious substances mainly in clay soils, in sufficient concentrations at relevant depths, or in circumstances that would cause damage.

m) Areas where radon exists in sufficient quantity to provide a health hazard to the occupants of houses.

6 Foundations

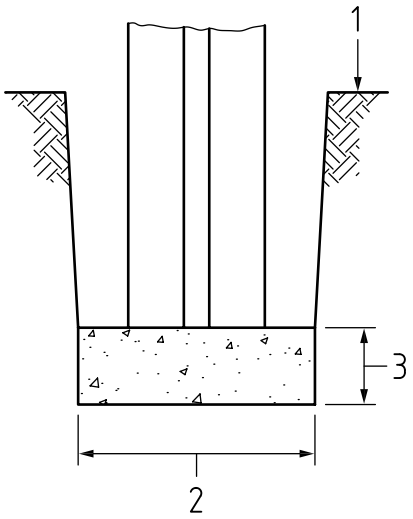
6.1 Types of foundation

This standard covers the design and construction of foundations only in normal ground, i.e. for which the use of strip footings or trench fill foundations using unreinforced concrete, as shown in Figure 20, are sufficient. For sites where hazardous conditions exist as described in **5.3** and which might require reinforced strip footings, rafts or piled foundations, a suitably qualified person should be consulted.

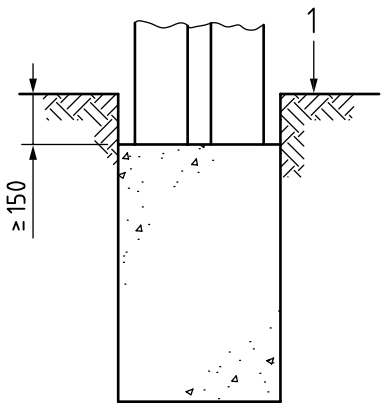
[2)] Further guidance on precautions to take when building near trees can be obtained from NHBC Standards, Chapter 4.2: Building near trees [2]; and from BS 5837.

Figure 20 **Types of foundation**

Dimensions in millimetres



a) Strip footing



b) Trench fill

Key

1 Finished external ground level
2 Width
3 Thickness being less than width

6.2 Foundation materials

Concrete used in foundations in non-aggressive soils should be either a GEN 1 designated concrete conforming to BS 8500-2:2006, or, if the concrete is to be batched at the site, an ST 2 standardized prescribed concrete to the material specifications and mix proportions given in BS 8500-2:2006. Concretes for use in strip footings should be consistence class S3 while those used in trench fill foundations should be consistence class S4.

Where aggressive chemical conditions are present in the ground or groundwater in sufficient quantities to be damaging, the guidance given in BS 8500-1 and BRE Special Digest 1 [N1] should be followed to determine a DC class and a concrete appropriate to the conditions should be used.

NOTE Table 4 provides simplified guidance on suitable concretes.

6.3 Foundation design for sites without hazardous conditions

6.3.1 General

Where no hazards have been identified during a site investigation, foundation design should proceed in accordance with **6.3.2** to **6.3.8**. If unforeseen hazardous conditions are found during construction the design should be amended.

6.3.2 Minimum width of foundations

NOTE For the purposes of this standard, foundation loads are subdivided into nine load categories A to J representing line loads at the base of the wall.

Load categories for the different forms of wall construction should be determined using Table 5, Table 6 and Table 7. The minimum widths of foundations should be obtained from Table 8 using the appropriate soil classification and load category.

Where necessary, foundation widths in excess of the design minimum should be used. For the purposes of allowing for setting out and construction tolerances, a foundation 150 mm wider than the wall thickness is a practical minimum dimension.

Table 4 **Concretes suitable for unreinforced concrete in strip and trench fill foundations subject to aggressive chemical conditions in the ground or groundwater**

Application [1]	**Designated concrete** [2), 3)]	**Standardized prescribed class**	**Recommended consistence**
Unreinforced foundations requiring DC-1 concrete [4]			
Strip footings	GEN1	ST2	S3
Trench fill foundations	GEN1	ST2	S4
Unreinforced foundations requiring DC-2 to DC4m concrete			
DC-2	FND2	N/A	S3/S4 [5]
DC-2z	FND2Z	N/A	S3/S4 [5]
DC-3	FND3	N/A	S3/S4 [5]
DC-3z	FND3Z	N/A	S3/S4 [5]
DC-4	FND4	N/A	S3/S4 [5]
DC-4z	FND4Z	N/A	S3/S4 [5]
DC-4m	FND4M	N/A	S3/S4 [5]

[1] DC class is determined in accordance with BS 8500-1 taking into account any additional protective measures. For further guidance see BRE Special Digest 1 [N1].

[2] GEN 1 and the FND series are designated concretes conforming to BS 8500-2:2006.

[3] ST2 is a standardized prescribed concrete, which can be produced on site, in accordance with BS 8500-2.

[4] Concretes for DC-1 conditions are those given in **6.2** for normal ground and the design guidance is the same.

[5] The recommended consistence class is S3 for strip footings and S4 for trench fill.

Table 5 **Wall load categories for 4.5 m floors and 9 m roofs**

No. of storeys	Upper floor	Ground floor construction	Front/rear walls			Separating walls			Gable walls		
	Type	Type (see Note)	Load arrangement on walls			Load arrangement on walls			Load arrangement on walls		
			Floors and roof	Floor only	Ground Floor and roof	Floors and roof	Floor only	Ground Floor and roof	Floors and roof	Floor only	Ground Floor and roof
1	N/A	GS slab	A	A	A	B	A	B	B	A	B
1	N/A	Timber	B	A	B	C	B	C	B	A	B
1	N/A	Precast	C	B	C	E	D	E	C	B	C
1	N/A	In situ	C	C	C	F	F	F	D	C	D
2	Timber	GS slab	B	B	B	D	C	C	C	B	C
2	Timber	Timber	C	B	B	E	D	D	D	C	C
2	Timber	Precast	D	C	D	G	F	F	E	D	D
2	Timber	In situ	E	D	D	J	H	H	E	D	E
2	Precast	GS slab	C	B	B	E	D	C	D	C	C
2	Precast	Precast	E	D	D	H	H	F	E	D	D
2	Precast	In situ	E	D	D	[1)]	J	H	F	E	E
3	Timber	GS slab	D	C	C	F	E	D	E	D	D
3	Timber	Timber	D	C	C	G	F	E	E	D	D
3	Timber	Precast	E	D	D	J	J	G	F	E	E
3	Timber	In situ	F	E	E	[1)]	[1)]	J	G	F	F
3	Precast	GS slab	E	D	C	J	H	D	F	E	D
3	Precast	Precast	G	F	D	[1)]	[1)]	G	G	F	E
3	Precast	In situ	G	F	E	[1)]	[1)]	J	G	F	E

NOTE GS = Ground Supported.

To be used in conjunction with Table 8.

[1)] Loading outside the scope of this standard.

Table 6 **Wall load categories for 6 m floors and 12 m roofs**

No. of storeys	Upper floor	Ground floor construction	Front/rear walls			Separating walls			Gable walls		
	Type	Type (see Note)	Load arrangement on walls			Load arrangement on walls			Load arrangement on walls		
			Floors and roof	Floor only	Ground Floor and roof	Floors and roof	Floor only	Ground Floor and roof	Floors and roof	Floor only	Ground Floor and roof
1	N/A	GS slab	A	A	A	B	A	B	B	A	B
1	N/A	Timber	B	A	B	D	B	D	C	B	C
1	N/A	Precast	D	B	D	G	E	G	D	C	D
1	N/A	In situ	E	D	E	J	H	J	F	E	F
2	Timber	GS slab	C	B	B	E	D	D	D	C	C
2	Timber	Timber	C	B	C	F	E	E	D	C	C
2	Timber	Precast	E	D	D	J	H	H	F	E	F
2	Timber	In situ	F	E	F	[1)]	[1)]	[1)]	G	F	G
2	Precast	GS slab	D	C	B	G	E	D	E	C	C
2	Precast	Precast	F	E	D	[1)]	J	H	G	F	E
2	Precast	In situ	G	F	F	[1)]	[1)]	[1)]	H	G	G
3	Timber	GS slab	D	C	C	G	F	E	E	D	D
3	Timber	Timber	E	D	D	H	G	F	F	E	E
3	Timber	Precast	F	E	E	[1)]	[1)]	J	G	F	F
3	Timber	In situ	H	G	G	[1)]	[1)]	[1)]	J	H	H
3	Precast	GS slab	F	E	C	[1)]	[1)]	[1)]	G	F	D
3	Precast	Precast	H	G	E	[1)]	[1)]	J	J	H	F
3	Precast	In situ	J	H	G	[1)]	[1)]	[1)]	[1)]	J	H

NOTE GS = Ground Supported.

To be used in conjunction with Table 8.

[1)] Loading outside the scope of this standard.

Table 7 **Wall load categories for internal wall foundations**

Number of storeys	Roof load	Upper floor	Ground floor	Total floor span [1] m			
		Type	Type (see Note)	4.5	6	9	12
				Load category			
1	Timber	NONE	GS slab	A	A	A	A
1	Timber	NONE	Timber	A	A	B	B
1	Timber	NONE	Precast	B	C	D	E
1	Timber	NONE	In situ	C	D	F	H
2	Timber	Timber	GS slab	A	A	B	C
2	Timber	Timber	Timber	B	B	C	D
2	Timber	Timber	Precast	C	C	E	G
2	Timber	Timber	In situ	D	E	G	[2]
2	Timber	Precast	GS slab	B	B	C	D
2	Timber	Precast	Precast	C	D	G	J
2	Timber	Precast	In situ	E	F	J	B
2	Timber	NONE	GS Slab	A	A	A	A
2	Timber	NONE	Timber	A	A	B	C
2	Timber	NONE	Precast	B	C	D	F
2	Timber	NONE	In situ	C	D	G	J
2	NONE	Timber	GS slab	A	A	A	A
2	NONE	Timber	Timber	A	A	B	C
2	NONE	Timber	Precast	B	C	D	F
2	NONE	Timber	In situ	C	D	G	J
2	NONE	Precast	GS Slab	A	B	C	C
2	NONE	Precast	Precast	C	D	F	G
2	NONE	Precast	In situ	D	E	H	B
3	Timber	Timber	GS slab	B	B	B	C
3	Timber	Timber	Timber	B	B	C	D
3	Timber	Timber	Precast	C	D	F	G
3	Timber	Timber	In situ	D	E	H	B
3	Timber	Precast	GS slab	B	C	D	E
3	Timber	Precast	Precast	D	E	G	J
3	Timber	Precast	In situ	E	F	J	B
3	Timber	NONE	GS slab	A	A	B	B
3	Timber	NONE	Timber	B	B	B	C
3	Timber	NONE	Precast	C	C	E	F
3	Timber	NONE	In situ	D	E	G	J
3	NONE	Timber	GS slab	A	A	B	B
3	NONE	Timber	Timber	B	B	B	C
3	NONE	Timber	Precast	C	C	E	F
3	NONE	Timber	In situ	D	E	G	J
3	NONE	Precast	GS slab	B	B	C	D
3	NONE	Precast	Precast	C	D	F	H
3	NONE	Precast	In situ	E	F	H	B

NOTE GS = Ground Supported.

To be used in conjunction with Table 8.

[1] The total span is the sum of the spans on each side of the wall in question at each level. The greatest total span combination at any supported floor level should be taken when using this Table.

[2] Loading outside the scope of this standard.

Table 8 **Identification of ground material and minimum foundation widths for wall load categories**

Rock or soil		Simple field test	Minimum foundation width[A], in mm, for load category (kN per metre run)								
Type	**Condition**		**A (20)**	**B (30)**	**C (40)**	**D (50)**	**E (60)**	**F (70)**	**G (80)**	**H (90)**	**J (100)**
Rock	Hard	Requires at least a pneumatic or other mechanically operated pick for excavation	Equal to width of wall								
Gravel Sand	Compact	Requires pick for excavation. Wooden peg 50 mm square hard to drive more than 150 mm	250	300	400	500	600	650	800	900	1 000
Clay Sandy clay	Stiff	Cannot be moulded in the fingers. Requires pick or pneumatically operated spade for excavation	250	300	400	500	600	650	800	900	1 000
	Firm	Can be moulded with substantial pressure with the fingers and excavated with a spade	300	350	450	600	750	850	950	Refer to specialist advice	
Sand Silty sand Clayey sand	Loose	Dry lumps may have slight cohesion but easily breaks up in fingers. Readily excavated with spade. 50 mm peg can be easily driven.	400	600	Refer to specialist advice						
Silt Clay Sandy clay Silty clay	Soft	Easily moulded in the fingers and readily excavated	450	650	Refer to specialist advice						
Silt Clay Sandy clay Silty clay	Very soft	Exudes between fingers when squeezed in fist	600	850	Refer to specialist advice						
Peat	—		Refer to specialist advice								
Made ground	—		Refer to specialist advice								

[A] In no case should the foundation width be less than the width of the wall nor should the wall oversail the foundation (see **6.3.2**).

6.3.3 Minimum depth of foundations

The minimum depth of foundations should be determined as the greatest of the following.

a) A depth to the selected bearing stratum.

b) In clays subject to seasonal moisture movement, a depth not less than 1.0 m. (See also BS 5837.)

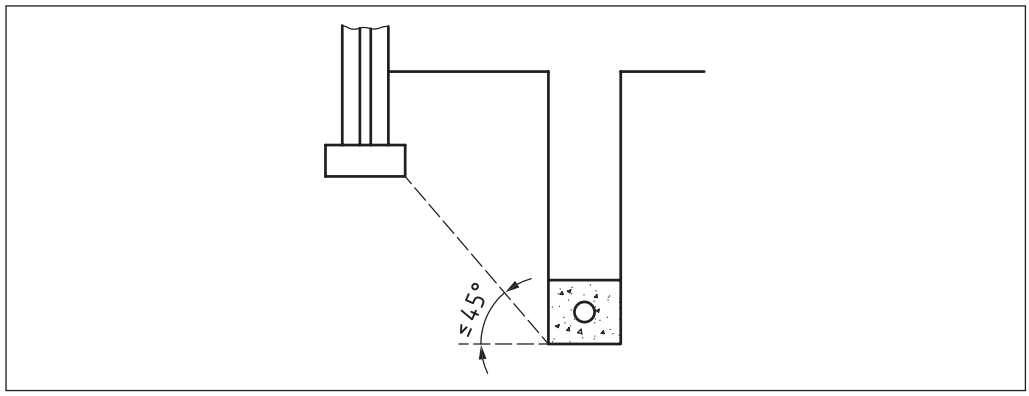
NOTE Greater depths are needed where trees remain, have been felled, or are to be planted. For further guidance see NHBC Standards, Chapter 4.2: Building near trees [2].

c) In sands, chalk and other frost-susceptible soils, a depth below the zone of

frost action, which can normally be taken as a minimum of 450 mm. In upland areas and other areas known to be subject to long periods of frost an increase in depth is advisable.

d) Where foundation adjoins a service trench, the layout shown in Figure 21 should be followed.

Figure 21 **Foundation adjoining a trench**



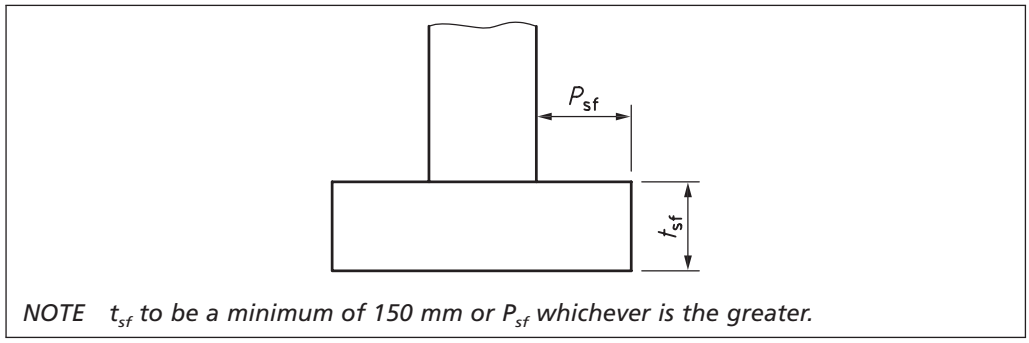
The susceptibility of soils to moisture movement, the action of frost or changes in water table varies widely and the advice of the approving authority should always be sought.

Except as indicated in **6.3.5**, the underside of foundations should be maintained at a uniform level.

6.3.4 Minimum thickness of foundations

The minimum thickness of foundations should be the greater of 150 mm or the projection from the face of the substructure wall to the adjoining edge of the foundation as shown in Figure 22.

Figure 22 **Thickness of foundations**



NOTE t_{sf} *to be a minimum of 150 mm or* P_{sf} *whichever is the greater.*

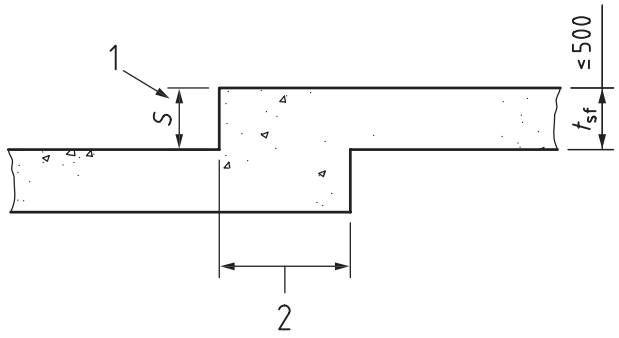
6.3.5 Stepped foundations

NOTE On sloping sites, or where the bearing stratum slopes or where local proximity to a service trench requires a greater depth, foundations may be stepped.

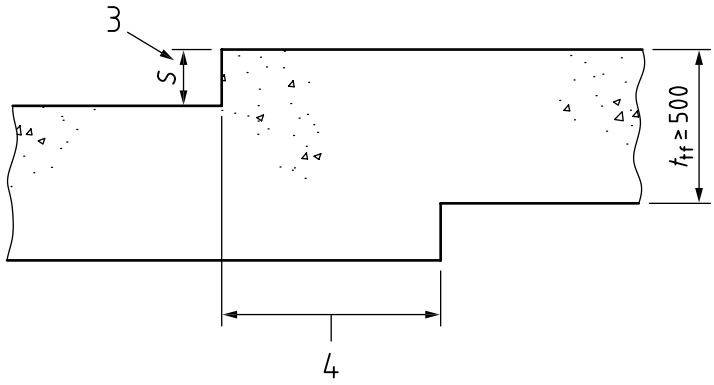
Each length of foundation between steps should be horizontal and the height of steps should not exceed the thickness of the foundation. The face of the step in the soil should be as near vertical as possible. The minimum length of the overlap and the maximum step height should be as shown in Figure 23.

Figure 23 **Stepped foundations**

Dimensions in millimetres unless otherwise stated



a) Strip footing



b) Trench fill

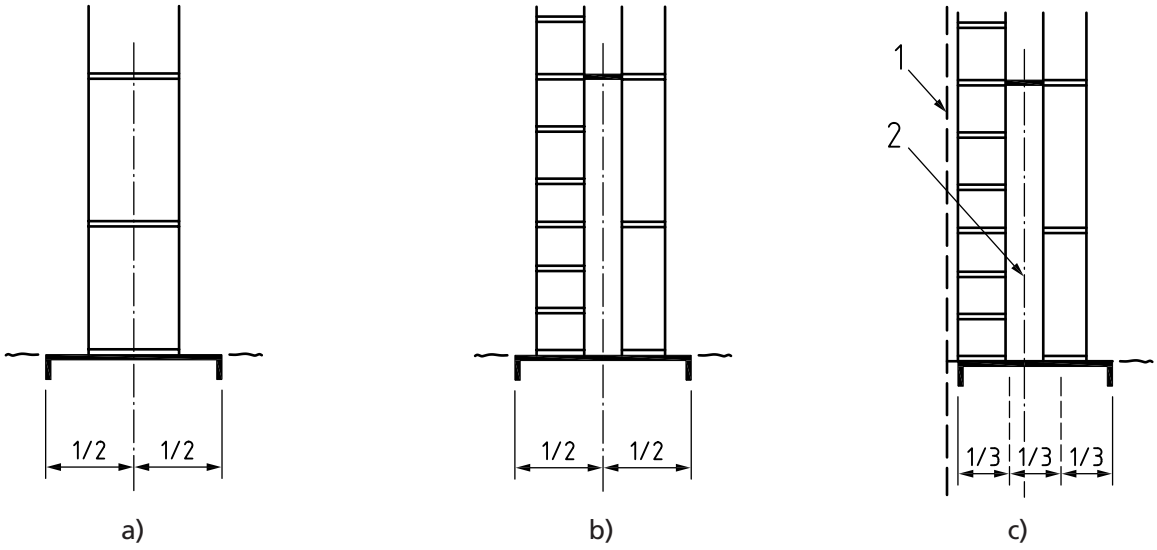
Key

1 Step height S to be equal to or less than t_{sf}
2 Overlap length to be t_{sf} or 2S or 300 mm whichever is the greatest
3 Step height S to be equal to or less than t_{tf}
4 Overlap length to be 2S or 1 m whichever is the greatest

6.3.6 Position of walls on foundations

In general, walls should be positioned so that the vertical centre line of the wall aligns with the vertical centre line of the foundation [see a) or b) in Figure 24]. Where the external face of a wall is at or near the edge of the foundation, for example where the foundation position is determined by a boundary to an adjacent property, [see Figure 24c)] it is sufficient to ensure that the vertical centre line of the wall is within the middle third of the foundation width as recommended in **6.3.2**.

Figure 24 **Position of walls on foundations**

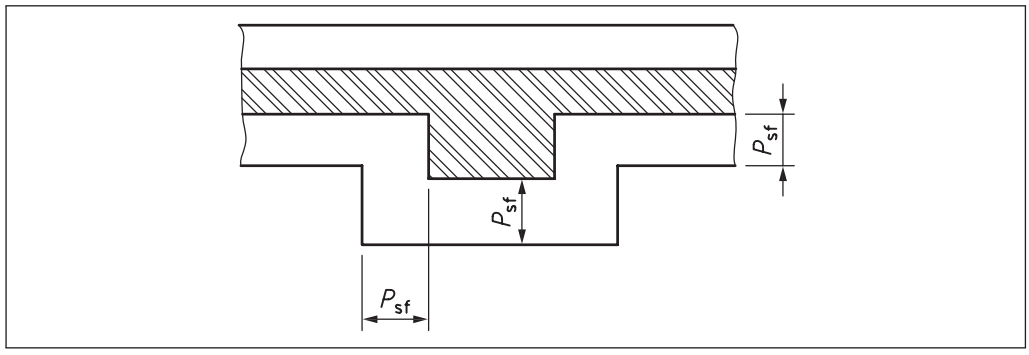


Key
1 Boundary
2 Centre line of wall

6.3.7 Foundations to walls with projections

Foundation widths should be increased where piers or chimneys project beyond the general line of the wall. The foundation should be widened so that the distance from the edge of the concrete to the face of masonry remains constant as shown in Figure 25.

Figure 25 **Foundations to walls with projections**



6.3.8 Foundations on clay soils close to trees

NOTE 1 Damage can occur to foundations on clay soils in proximity to trees or where trees have been removed.

To avoid damage, foundations should be located a distance further from a tree than the tree's mature height. Where a row of trees is concerned, this distance should be increased to 1.5 times the tree's height. In all other cases the site should be considered as hazardous.

NOTE 2 Attention is drawn to NHBC Standards, Chapter 4.2 Buildings near trees [2].

7 Ground floor slabs

NOTE 1 In situ concrete ground-supported slabs can be used in the majority of sites except where the depth of fill exceeds 600 mm or other circumstances dictate the use of suspended construction.

7.1 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:

a) 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;

b) where the depth of the oversite fill is greater than 600 mm;

c) where chemically aggressive ground conditions would be deleterious to the concrete floor, e.g. presence of sulfates, chlorides, acids, etc.;

d) where, due to the presence of radon, methane or other potentially dangerous gases, a ventilated void is required beneath the slab.

7.2 Ground supported slabs

The minimum thickness of a concrete ground-supported slab should be 100 mm. The slab should be constructed on a minimum of 100 mm of inert well-graded fill material, such as hoggin or other suitable fill and blinded with fine material (see Figure 26). Fill material should be compacted in layers not greater than 225 mm thick and should not contain any pieces that will not pass through a 75 mm diameter ring.

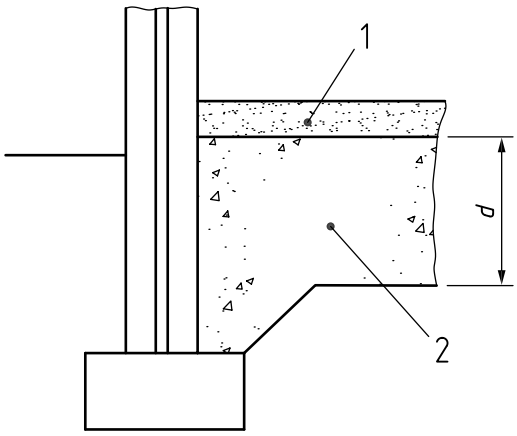
Any material containing sulfates sufficiently soluble in ground water, which are potentially damaging to the construction, should not be regarded as inert.

The required finish and the presence of reinforcement should be taken into account when designing the concrete for a ground floor slab.

NOTE Table 9 provides simplified guidance on suitable concretes for ground floor slabs.

For sites where hazardous conditions exist as described in **5.3** which, for example, may require the provision of suspended slabs or the use of concrete materials that are resistant to sulfate attack, a suitably qualified person should be consulted. Loadbearing internal partitions or walls should have separate foundations independent of the floor slabs.

Figure 26 **In situ concrete ground-supported slab**



Key

1 Ground-supported slab 100 mm min thick 2 Compacted fill

If depth of fill *d* exceeds 600 mm a suspended ground floor construction should be used.

Table 9 **Concretes suitable for ground floor slabs**

Application	Designated concrete [1), 2)]	Standardized prescribed concrete	Recommended consistence class
House floors with no embedded metal:			
permanent finish to be added	GEN1 [3)]	ST2	S2
no permanent finish	GEN2	ST3	S2
garage floors	GEN3	ST4	S2
House and garage floors fully or nominally reinforced:			
ground bearing or suspended	RC28/35	N/A	S2

[1)] GEN1, GEN2, GEN3 AND RC28/35 are designated concretes conforming to BS 8500-2:2006.

[2)] ST2, ST3 and ST4 are standardized prescribed concretes. The specification of constituent materials and mix proportions are given in BS 8500-2.

[3)] GEN concrete with relatively low cement or combination content might not be suitable for obtaining satisfactory cast and direct finished surfaces, nor for methods of placing, such as pumping. The suitability of such concrete should be discussed with the producer.

7.3 Suspended cast in situ concrete floors at ground level

7.3.1 Design

The design of suspended cast in situ concrete ground floor slabs should be undertaken by an appropriately qualified person in accordance with the recommendations of BS EN 1992-1-1 and the NA to BS EN 1992-1-1.

NOTE Alternatively, for buildings falling within the scope of this standard, the simplified design rules given in Annex A may be followed.

7.3.2 Site preparation

Unless a void is required below the ground floor, the slab should 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 might 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.

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 μm (1 000 gauge) polythene.

7.3.3 Support for cast in situ concrete slabs

When determining the bearing of a cast in situ concrete floor onto a wall, the need to provide vertical support to the floor and, possibly, lateral restraint to the wall should be taken into account.

The bearing width of supports should be at least 90 mm. Unless special provisions are made in the design, all perimeter edges of the slab should be continuously supported.

7.3.4 Site practice

Concrete and reinforcement should conform to the design specification.

The reinforcement should be fixed to provide the specified concrete cover and lap lengths.

Precautions should be taken to ensure that the temperature of the concrete is not higher than 30 °C at any time during placing and compacting. Concrete should not be placed on frozen ground or on ice and snow covered surfaces.

Prior to placing the concrete, all rubbish, debris and free water should be cleared from all surfaces.

All loose scale and loose rust should be removed from the reinforcing steel. Sufficient supports should be provided to the reinforcement to ensure that the cover is maintained during the placing of the concrete; supports at 1 m centres in both directions are generally adequate.

Concrete should be placed in one continuous operation and discharged through the reinforcement with care so as to avoid dispersal, segregation or loss of ingredients. If, for any reason, concrete placing has to be stopped for any period such that the concrete will not remain plastic, a proper construction joint should be formed.

The concrete should be well compacted after placing.

Curing should start immediately after the finishing operations and maintained for 7 days, except when the average air temperature is 7 °C or less, when this period should be extended to 10 days. If necessary, the concrete should be artificially heated to keep its temperature above 5 °C for 3 days after casting.

The slab should not be subjected to traffic or loaded during the curing period.

8 Suspended precast concrete floors

8.1 Design

The floor should be designed in accordance with BS EN 1992-1-1 and NA to BS EN 1992-1-1. Materials and products (e.g. infill units for beam and block floors) should conform to relevant British Standards.

When used for garages, proprietary floor systems comprising beams and infill blocks should incorporate a reinforced concrete topping.

Where a floor is built into a wall the strength of that part of the floor should be not less than the required strength of the wall.

8.2 Information to be supplied to the designer regarding the type of construction and durability

The following details should be supplied:

a) type of floor system;

NOTE 1 For generic types see Figure 27.

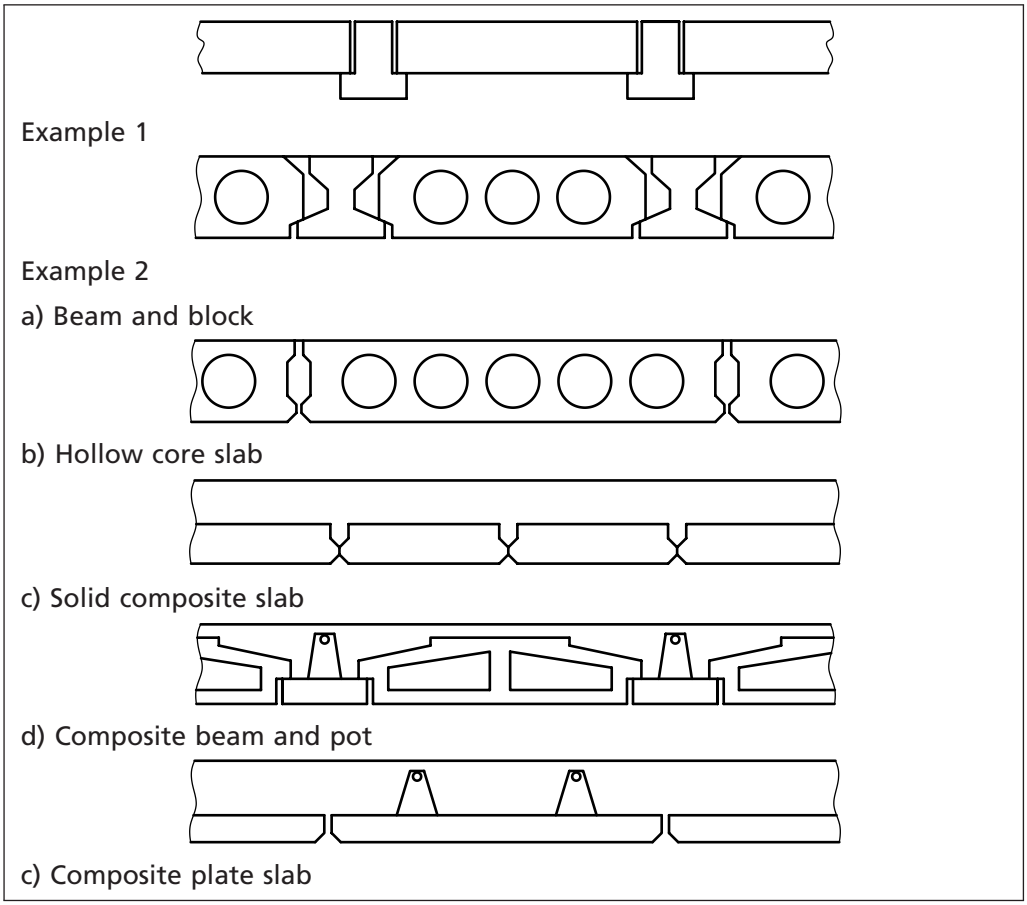
b) location, exposure class and intended use (see Table 10).

NOTE 2 The recommendations for the cover to steel reinforcement and for concrete quality to suit these conditions for reinforced concrete and for prestressed concrete are given in BS 8500-1.

Table 10 **Exposure class for intended use**

Intended use	Exposure class
Internal upper floor	XC1
Ground floor	XC3/4
Garage floor	XD3

Figure 27 **Generic types of precast floor systems**



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

The following details should be supplied:

a) the construction and location of all loadbearing walls;

b) the construction and location of all non-loadbearing internal walls;

c) the construction of floor finishes, applied screed, tiles, etc.;

d) 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;

e) the position and size of any openings in the floor slabs required for ducts, etc.;

f) the form and location of any tying requirements between the floor and wall elements, as recommended in **4.4**.

8.4 Information to be supplied to the designer regarding self-weight and imposed loads

Floors should be adequate to support the loadings in accordance with BS EN 1991-1-1 and the NA to BS EN 1991-1-1.

For a self-contained dwelling unit, the recommended minimum imposed load (see NA to BS EN 1991-1-1:2002, Table NA.2, Category A1) is 1.5 kN/m^2 or a concentrated load of 2.0 kN, whichever provides the greater stresses.

For a domestic garage the recommended minimum imposed load (see NA to BS EN 1991-1-1:2002, Table NA.6, Category F) is 2.5 kN/m^2 or a concentrated load of 10 kN, whichever provides the greater stresses.

8.5 Construction loads

Floors should be guarded against overloading 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.

8.6 Voids below ground floors

A void of at least 150 mm in depth should be provided between the underside of the floor and the ground surface. The void should be ventilated. For those sites susceptible to heave, the depth of void should be increased to at least 300 mm.

8.7 Support for precast concrete floors

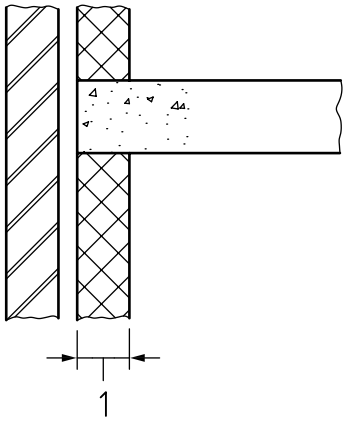
When determining the bearing of a precast concrete floor onto a wall, the need to provide vertical support to the floor and, possibly, lateral restraint to the wall should be taken into account.

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.

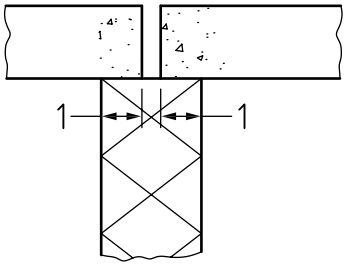
NOTE Only when the bearing is level and clear of debris precast concrete floor units may be laid directly on bricks or blocks without any form of mortar or resilient bedding material. Typical bearing details are shown in Figure 28.

Figure 28 **Typical bearing details for precast floors**

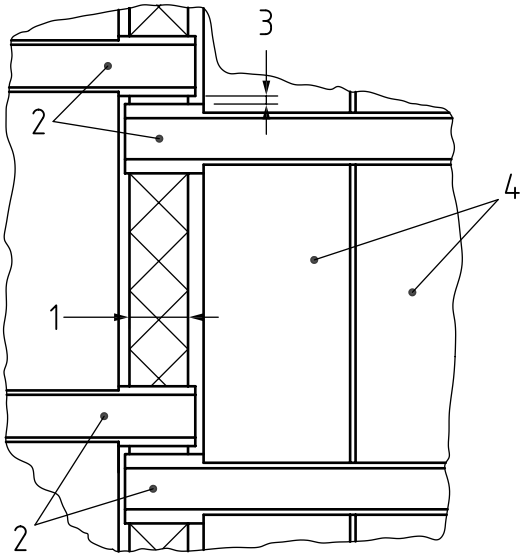
Dimensions in millimetres



a) Bearing of precast slabs or beams onto external cavity wall



b) Bearing of precast slabs or beams from adjacent floors onto solid internal wall



c) Bearing of precast beams from adjacent floors onto solid internal wall (plan view)

Key

1 90 min. bearing
2 Precast concrete beams
3 Precast concrete beams from adjacent floors may be spaced apart
4 Infill blocks

8.8 Installation of precast floors

When handling, stacking and installing precast elements the manufacturer's recommendations should be followed. The recommendations of BS 8000-2.2:1990, Clause **5**, and BS EN 13670:2009, Clause **4** and Clause **9**, should be followed, as applicable to the precast flooring system.

8.9 Jointing

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

Annex A (informative) Tabular method for the design of suspended cast in situ concrete ground floors

A.1 General

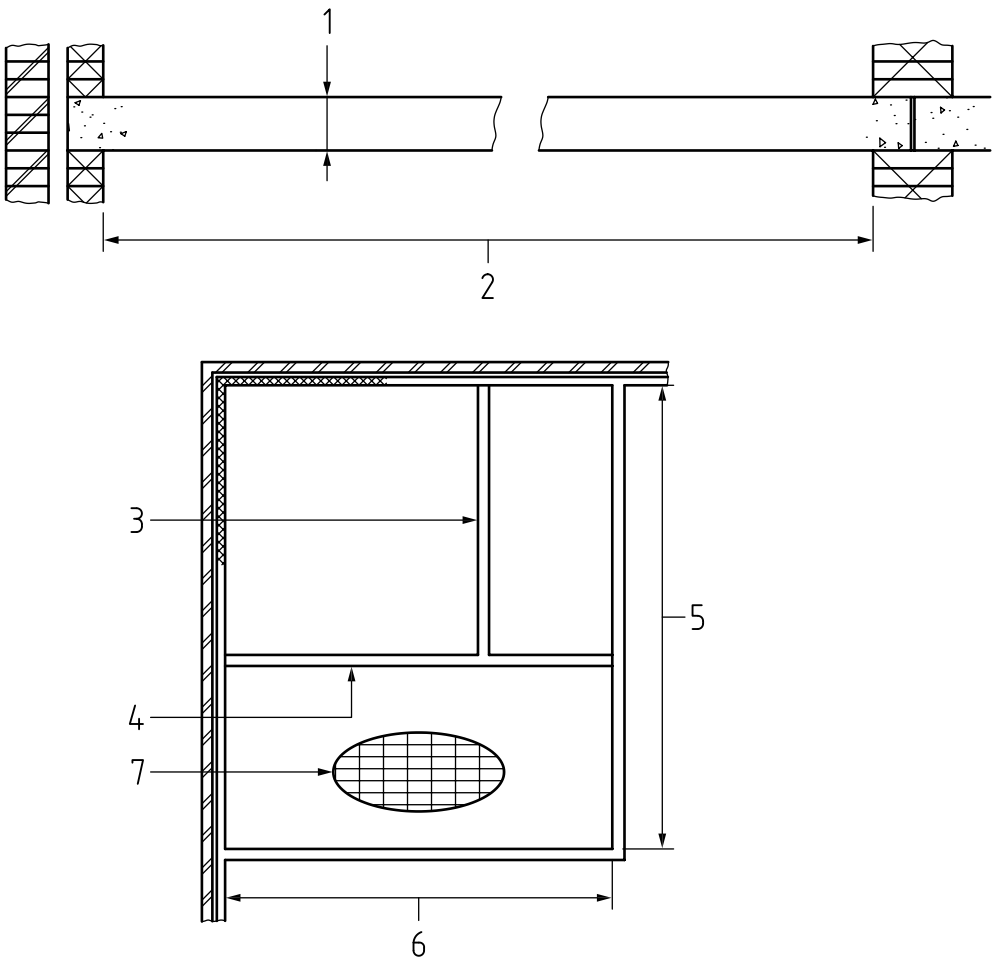
The design method given in this Annex has been developed for rectangular floor slabs supported on all four sides, except for slabs to garages (see Table A.13) which may be supported on two opposite sides. Holes for services may be provided up to 150 mm × 150 mm. Where larger service holes are required, it is advisable to consult an appropriately qualified person. The recommendations included in Table A.1 to Table A.13 are appropriate only for slabs comprising the following materials and construction:

a) an RC28/35 designated concrete;

b) grade 500 fabric reinforcement placed in the bottom of the slab with the main longitudinal wires extending across the shorter span and lying beneath the transverse, secondary wires;

c) 50 mm nominal concrete cover provided from the reinforcement to the bottom of the slab.

Figure A.1 **Definitions**



Key

1	Slab depth
2	Clear span
3	Perpendicular partition
4	Parallel partition
5	Longer span
6	Shorter span
7	Fabric reinforcement main longitudinal wires extending across the shorter span

Table A.1 **Weights of partitions – non-loadbearing partitions**

Construction	**Thickness** mm	**Weight** kN/m² of partition	**Floor to ceiling height** m							
			Less than 2.4				**2.4 to 2.7**			
			Weight kN per linear m	**Equivalent allowance** kN/m² of floor area			**Weight** kN per linear m	**Equivalent allowance** kN/m² of floor area		
				Shorter span m				**0 to 3**	**3 to 4**	**4 to 6**
				0 to 3	**3 to 4**	**4 to 6**				
Laminated plasterboard jointed	50	0.40	0.96	0.53	0.40	0.32	1.08	0.60	0.45	0.36
9.5 mm plasterboard on 50 mm × 75 mm timber studs at 600 mm centres	100	0.35	0.84	0.47	0.35	0.28	0.95	0.53	0.40	0.32
12.7 mm plasterboard on 50 mm × 75 mm timber studs at 600 mm centres	100	0.45	1.08	0.60	0.45	0.36	1.22	0.68	0.51	0.41
Concrete blockwork, aerated, solid, walling density 8.0 kN/m³ or block density approximately 6.5 kN/m³)[A)]	75	1.00	2.40	1.33	1.00	0.80	2.70	1.50	1.12	0.90
	100	1.20	2.88	1.60	1.20	0.96	3.24	1.80	1.35	1.08
Concrete blockwork lightweight aggregate, solid[A)]	75	1.40	3.36	1.87	1.40	1.12	3.78	2.10	1.58	1.26
	100	1.70	4.08	2.27	1.70	1.36	4.86	2.70	2.02	1.62
Concrete blockwork, stone aggregate, solid[A)]	100	2.47	5.93	3.29	2.47	1.98	6.67	3.70	2.78	2.22
Concrete blockwork, stone aggregate, hollow[A)]	100	1.80	4.32	2.40	1.80	1.44	4.86	2.70	2.02	1.62
Brickwork, clay, perforated (25 % voids) medium density[A)]	102	2.10	5.04	2.80	2.10	1.68	5.67	3.15	2.36	1.89
Brickwork, clay solid medium density[A)]	102	2.60	6.24	3.47	2.60	2.08	7.02	3.90	2.92	2.34

[A)] Includes 13 mm dense plaster on each side.

A.2 Weights of non-loadbearing partitions

The loads applied by parallel partitions are assessed as equivalent loads in kilonewtons per square metre while the loads from perpendicular partitions are assessed as kilonewtons per linear metre. The equivalent load allowance for a parallel partition is assessed by assuming that the partition load is spread over a width of slab not exceeding 0.6 times the shorter span length. The recommended weights per linear metre and equivalent load allowance for common forms of partition are given in Table A.1.

Where parallel partitions are further apart than 0.6 times the shorter span, only the heaviest partition need be taken into account. Where parallel partitions are closer together than 0.6 times the shorter span, the equivalent allowances for the two partitions obtained from Table A.1 should be added together.

Where more than one perpendicular partition is present, the sum of their weights assessed from Table A.1 may be used.

The weights of common forms of floor finishes are given in Table A.2.

Table A.2 **Weights of floor finishes**

Finish	**Approximate weight** kN/m^2
Asphalt flooring, 13 mm thick	0.268
Chipboard, 22 mm thick, on timber battens with 25 mm thick mineral wool quilt insulation	0.20
Flexible PVC (polyvinylchloride) tiles, 3.2 mm thick	0.049
Hardwood floor blocks, 10 mm thick	0.079
Lightweight floor screed per 25 mm thickness	0.35
PVC fibre reinforced tiles, 4.8 mm thick	0.103
Sand-cement screed per 25 mm thickness	0.585

A.3 Use of design tables

Table A.3 to Table A.12 are design tables for suspended in situ concrete floors. When using these design tables the procedures are as follows.

a) Establish whether the slab is supported on all four sides. If not, use the procedure given in Figure A.2 but assume an aspect ratio greater than 1.8.

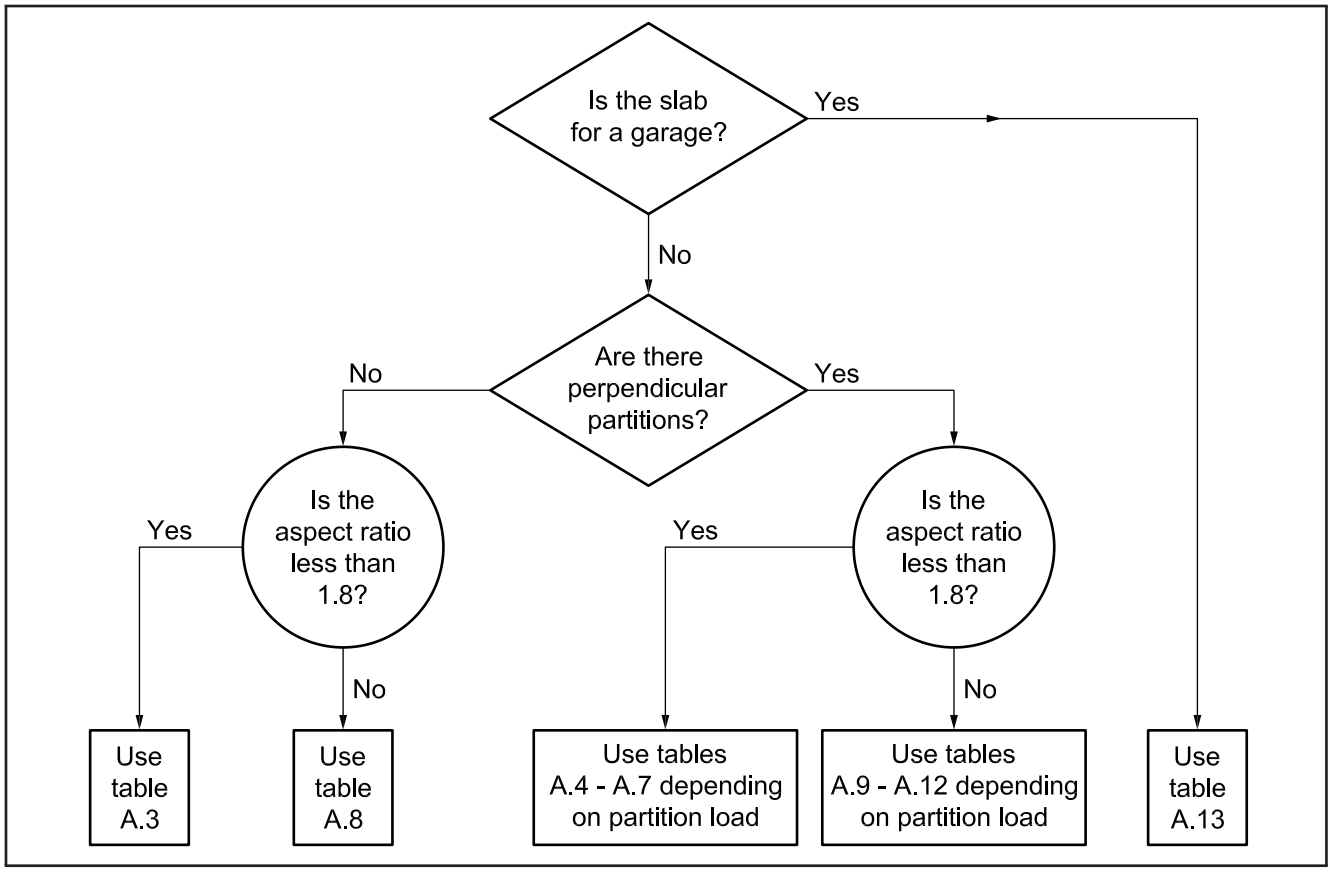
b) Establish the shorter and longer span and the aspect ratio. For garages determine the clear span.

c) Establish the loading for finishes and partitions.

d) Select the appropriate table from the procedure given in Figure A.2.

The appropriate table gives the overall slab depth and the fabric size.

Figure A.2 **Tables selection procedure**



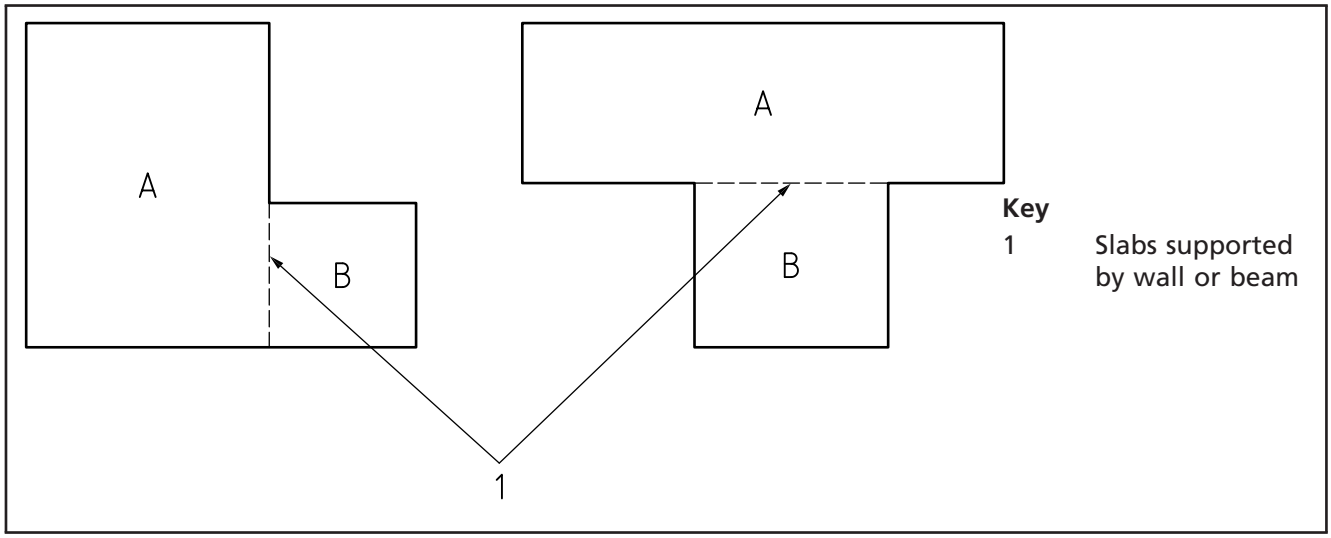
A.4 Slab subdivision

Slabs of non-rectangular plan form may be designed using the tables by dividing the plan into rectangular areas (A, B, etc.) and designing these areas as separate slabs. Figure A.3 illustrates how this is undertaken for L and T shaped slabs.

A vertical joint is provided through the depth of the slab at the junction of such subdivisions designed by an appropriately qualified person is installed at the junction.

Edges of slabs resulting from such subdivision are supported on a wall or, if desired, a beam designed by an appropriately qualified person.

Figure A.3 **L and T shaped slabs**



A.5 Example of use of tables

The following is an example of the use of the tables.

Example

storey height	2.3 m
shorter span:	3.3 m
longer span:	5.9 m
parallel partition:	100 mm solid lightweight aggregate concrete blockwork plastered both sides
perpendicular partition:	12.7 mm plasterboard each side of 50 mm × 75 mm timber studs at 600 mm centres
floor finish:	PVC fibre reinforced tiles 4.8 mm thick

Follow the procedure given in Figure A.2 (the slab is not required for a garage).

Aspect ratio

Aspect ratio = 5.9/3.3 = 1.79, i.e. less than 1.8

Perpendicular partition load

From Table A.1 for the storey height

perpendicular partition 1.08 kN/linear m

Equivalent distributed load due to finishes and parallel partitions

From Table A.1 and Table A.2

parallel partition:	1.70 kN/m^2
floor finish:	0.103 kN/m^2
total equivalent uniformly distributed load	1.803 kN/m^2

For equivalent uniformly distributed load of 2.0 kN/m^2 (next value greater than 1.803 kN/m^2), and a shorter span of 3.5 m (next value greater than 3.3 m), Table A.5 gives:

overall slab depth = 160 mm

fabric reinforcement type = B785

Table A.3 **Design table for suspended in situ concrete floors – No perpendicular partition load; aspect ratio not greater than 1.8**

Shorter span m	Equivalent distributed load due to finishes and parallel partitions kN/m²						
	Steel size and slab depth	1.0	1.5	2.0	2.5	3.0	3.5
2.5	FT	B 283	B 385	B 385	B 385	B 385	B 503
	SD	130	130	130	130	130	130
2.75	FT	B 385	B 385	B 503	B 503	B 503	B 503
	SD	130	130	130	130	130	130
3	FT	B 503	B 503	B 503	B 785	B 785	B 785
	SD	130	130	130	130	130	130
3.25	FT	B 503	B 785	B 785	B 785	B 785	B 785
	SD	130	130	130	130	130	130
3.5	FT	B 785	B 785	B 785	B 785	B 785	B 785
	SD	130	130	130	150	160	160
3.75	FT	B 785	B 785	B 785	B 785	B 785	B 785
	SD	150	160	160	160	170	170
4	FT	B 785	B 785	B 785	B 785	B 785	B 785
	SD	160	170	170	170	180	180
4.25	FT	B 785	B 785	B 785	B 1131	B 1131	B 1131
	SD	170	180	180	180	180	190
4.5	FT	B 785	B 113	B 1131	B 1131	B 1131	B 1131
	SD	180	180	180	190	190	190
4.75	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	190	190	200	200	210	210
5	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	200	200	210	210	220	220
5.25	FT	B 1131	B 1131	B 1131			
	SD	210	220	220			
5.5	FT	B 1131					
	SD	220					

Key

FT Steel fabric size conforming to BS 4483.

SD Slab depth in millimetres.

Table A.4 **Design table for suspended in situ concrete floors – Perpendicular partition load = 0.75 kN/linear m; aspect ratio not greater than 1.8**

Shorter span m	Equivalent distributed load due to finishes and parallel partitions kN/m²						
	Steel size and slab depth	1.0	1.5	2.0	2.5	3.0	3.5
2.5	FT	B 385	B 385	B 385	B 385	B 503	B 503
	SD	130	130	130	130	130	130
2.75	FT	B 385	B 503	B 503	B 503	B 503	B 785
	SD	130	130	130	130	130	130
3	FT	B 503	B 503	B 785	B 785	B 785	B 785
	SD	130	130	130	130	130	130
3.25	FT	B 785	B 785	B 785	B 785	B 785	B 785
	SD	130	130	130	130	130	150
3.5	FT	B 785	B 785	B 785	B 785	B 785	B 785
	SD	130	130	130	160	160	160
3.75	FT	B 785	B 785	B 785	B 785	B 785	B 785
	SD	150	160	160	170	170	170
4	FT	B 785	B 785	B 785	B 785	B 785	B 1131
	SD	160	170	170	180	180	180
4.25	FT	B 785	B 785	B 785	B 1131	B 1131	B 1131
	SD	170	180	180	180	180	190
4.5	FT	B 785	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	180	180	190	190	200	200
4.75	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	190	190	200	200	210	210
5	FT	B 1131	B 1131	B 1131	B 1131	B 1131	
	SD	200	210	210	220	220	
5.25	FT	B 1131	B 1131	B 1131			
	SD	210	220	220			
5.5	FT	B 1131					
	SD	220					

Key

FT Steel fabric size conforming to BS 4483.

SD Slab depth in millimetres.

Table A.5 **Design table for suspended in situ concrete floors – Perpendicular partition load = 2.0 kN/linear m; aspect ratio not greater than 1.8**

Shorter span m	Equivalent distributed load due to finishes and parallel partitions kN/m²						
	Steel size and slab depth	1.0	1.5	2.0	2.5	3.0	3.5
2.5	FT	B 385	B 385	B 503	B 503	B 503	B 503
	SD	130	130	130	130	130	130
2.75	FT	B 503	B 503	B 503	B 785	B 785	B 785
	SD	130	130	130	130	130	130
3	FT	B 503	B 785	B 785	B 785	B 785	B 785
	SD	130	130	130	130	130	130
3.25	FT	B 785	B 785	B 785	B 785	B 785	B 785
	SD	130	130	130	130	150	160
3.5	FT	B 785	B 785	B 785	B 785	B 785	B 785
	SD	130	130	160	160	160	170
3.75	FT	B 785	B 785	B 785	B 785	B 785	B 785
	SD	160	160	170	170	170	180
4	FT	B 785	B 785	B 785	B 785	B 1131	B 1131
	SD	170	170	180	180	180	180
4.25	FT	B 785	B 785	B 1131	B 1131	B 1131	B 1131
	SD	180	180	180	180	190	190
4.5	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	180	190	190	200	200	200
4.75	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	190	200	200	210	210	220
5	FT	B 1131	B 1131	B 1131	B 1131		
	SD	200	210	220	220		
5.25	FT	B 1131	B 1131				
	SD	220	220				

Key

FT Steel fabric size conforming to BS 4483.

SD Slab depth in millimetres.

Table A.6 **Design table for suspended in situ concrete floors – Perpendicular partition load = 3.75 kN/linear m; aspect ratio not greater than 1.8**

Shorter span m	Equivalent distributed load due to finishes and parallel partitions kN/m²						
	Steel size and slab depth	1.0	1.5	2.0	2.5	3.0	3.5
2.5	FT	B 503	B 503	B 503	B 503	B 785	B 785
	SD	130	130	130	130	130	130
2.75	FT	B 503	B 785	B 785	B 785	B 785	B 785
	SD	130	130	130	130	130	130
3	FT	B 785	B 785	B 785	B 785	B 785	B 785
	SD	150	150	150	150	150	150
3.25	FT	B 785	B 785	B 785	B 785	B 785	B 785
	SD	130	130	150	150	160	160
3.5	FT	B 785	B 785	B 785	B 785	B 785	B 785
	SD	150	160	160	170	170	170
3.75	FT	B 785	B 785	B 785	B 785	B 785	B 785
	SD	160	170	170	180	180	180
4	FT	B 785	B 785	B 785	B 1131	B 1131	B 1131
	SD	170	180	180	180	180	190
4.25	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	180	180	190	190	190	200
4.5	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	190	190	200	200	200	210
4.75	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	200	200	210	210	220	220
5	FT	B 1131	B 1131	B 1131			
	SD	210	220	220			
5.25	FT	B 1131					
	SD	220					

Key

FT Steel fabric size conforming to BS 4483.

SD Slab depth in millimetres.

Table A.7 **Design table for suspended in situ concrete floors – Perpendicular partition load = 7.0 kN/linear m; aspect ratio not greater than 1.8**

Shorter span m	Equivalent distributed load due to finishes and parallel partitions kN/m²						
	Steel size and slab depth	1.0	1.5	2.0	2.5	3.0	3.5
2.5	FT	B 785	B 785	B 785	B 785	B 785	B 785
	SD	130	130	130	130	130	130
2.75	FT	B 785	B 785	B 785	B 785	B 785	B 785
	SD	130	130	130	140	140	150
3	FT	B 785	B 785	B 785	B 785	B 785	B 785
	SD	140	150	150	150	160	160
3.25	FT	B 785	B 785	B 785	B 785	B 785	B 785
	SD	160	160	160	160	170	170
3.5	FT	B 785	B 785	B 785	B 785	B 785	B 1131
	SD	160	170	170	170	180	180
3.75	FT	B 785	B 785	B 1131	B 1131	B 1131	B 1131
	SD	170	180	180	180	180	180
4	FT	B 785	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	180	180	180	190	190	190
4.25	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	190	190	190	200	200	200
4.5	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	200	200	210	210	210	220
4.75	FT	B 1131	B 1131	B 1131	B 1131		
	SD	210	210	220	220		
5	FT	B 1131					
	SD	220					

Key

FT Steel fabric size conforming to BS 4483.

SD Slab depth in millimetres.

Table A.8 **Design table for suspended in situ concrete floors – No perpendicular partition load; aspect ratio greater than 1.8**

Shorter span m	Equivalent distributed load due to finishes and parallel partitions kN/m²						
	Steel size and slab depth	1.0	1.5	2.0	2.5	3.0	3.5
2.5	FT	B 385	B 385	B 385	B 385	B 385	B 503
	SD	130	130	130	130	130	130
2.75	FT	B 385	B 385	B 503	B 503	B 503	B 503
	SD	130	130	130	130	130	150
3	FT	B 503	B 503	B 503	B 785	B 785	B 785
	SD	130	130	130	130	130	130
3.25	FT	B 503	B 785	B 785	B 785	B 1131	B 1131
	SD	130	130	130	130	150	155
3.5	FT	B 785	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	130	150	155	160	160	165
3.75	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	155	160	165	170	175	175
4	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	165	170	175	180	185	190
4.25	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	180	185	185	190	195	200
4.5	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	190	195	200	205	210	215
4.75	FT	B 1131	B 1131	B 1131	B 1131	B 1131	
	SD	200	210	215	220	225	
5	FT	B 1131	B 1131				
	SD	215	220				

Key

FT Steel fabric size conforming to BS 4483.

SD Slab depth in millimetres.

Table A.9 **Design table for suspended in situ concrete floors – Perpendicular partition load = 0.75 kN/linear m; aspect ratio greater than 1.8**

Shorter span m	Equivalent distributed load due to finishes and parallel partitions kN/m²						
	Steel size and slab depth	1.0	1.5	2.0	2.5	3.0	3.5
2.5	FT	B 385	B 385	B 385	B 385	B 503	B 503
	SD	130	130	130	130	130	130
2.75	FT	B 385	B 503	B 503	B 503	B 503	B 785
	SD	130	130	130	130	130	130
3	FT	B 503	B 503	B 785	B 785	B 785	B 785
	SD	130	130	130	130	130	130
3.25	FT	B 785	B 785	B 785	B 1131	B 1131	B 1131
	SD	130	130	130	150	160	160
3.5	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	150	160	160	165	165	170
3.75	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	160	165	170	170	175	180
4	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	175	180	180	185	190	190
4.25	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	180	185	195	200	200	205
4.5	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	195	200	205	215	220	235
4.75	FT	B 1131	B 1131	B 1131	B 1131	B 1131	
	SD	210	215	220	225	225	
5	FT	B 1131					
	SD	225					

Key

FT Steel fabric size conforming to BS 4483.

SD Slab depth in millimetres.

Table A.10 **Design table for suspended in situ concrete floors – Perpendicular partition load = 2.0 kN/linear m; aspect ratio greater than 1. 8**

Shorter span m	Equivalent distributed load due to finishes and parallel partitions kN/m²						
	Steel size and slab depth	1.0	1.5	2.0	2.5	3.0	3.5
2.5	FT	B 385	B 385	B 503	B 503	B 503	B 503
	SD	130	130	130	130	130	130
2.75	FT	B 503	B 503	B 503	B 785	B 785	B 785
	SD	130	130	130	130	130	130
3	FT	B 503	B 785	B 785	B 785	B 1131	B 1131
	SD	130	130	130	130	150	150
3.25	FT	B 785	B 785	B 1131	B 1131	B 1131	B 1131
	SD	130	130	130	160	165	165
3.5	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	160	160	165	165	170	170
3.75	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	165	170	170	175	180	180
4	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	180	185	185	190	190	195
4.25	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	185	190	200	205	210	210
4.5	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	200	205	215	215	215	220
4.75	FT	B 1131	B 1131	B 1131	B 1131		
	SD	215	220	225	225		

Key

FT Steel fabric size conforming to BS 4483.

SD Slab depth in millimetres.

Table A.11 **Design table for suspended in situ concrete floors – Perpendicular partition load = 3.75 kN/linear m; aspect ratio greater than 1.8**

Shorter span m	Equivalent distributed load due to finishes and parallel partitions kN/m²						
	Steel size and slab depth	1.0	1.5	2.0	2.5	3.0	3.5
2.5	FT	B 503	B 503	B 503	B 785	B 785	B 785
	SD	130	130	130	130	130	130
2.75	FT	B 503	B 785	B 785	B 785	B 785	B 785
	SD	130	130	130	130	130	130
3	FT	B 785	B 785	B 1131	B 1131	B 1131	B 1131
	SD	130	130	150	150	155	155
3.25	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	150	155	155	160	160	170
3.5	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	165	165	170	170	175	175
3.75	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	170	175	175	180	185	185
4	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	185	190	190	195	195	200
4.25	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	190	195	205	210	210	215
4.5	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	205	210	220	220	220	225
4.75	FT	B 1131	B 1131				
	SD	220	225				

Key

FT Steel fabric size conforming to BS 4483.

SD Slab depth in millimetres.

Table A.12 **Design table for suspended in situ concrete floors – Perpendicular partition load = 7.0 kN/linear m; aspect ratio greater than 1. 8**

Shorter span m	Equivalent distributed load due to finishes and parallel partitions kN/m²						
	Steel size and slab depth	1.0	1.5	2.0	2.5	3.0	3.5
2.5	FT	B 785	B 785	B 785	B 785	B 785	B 1131
	SD	130	130	130	130	130	140
2.75	FT	B 785	B 785	B 1131	B 1131	B 1131	B 1131
	SD	130	130	145	150	150	150
3	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	150	150	155	160	160	160
3.25	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	160	160	165	165	170	170
3.5	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	175	175	175	180	180	185
3.75	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	180	180	185	190	190	200
4	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	190	195	200	200	205	215
4.25	FT	B 1131	B 1131	B 1131	B 1131	B 1131	B 1131
	SD	200	210	215	220	220	220
4.5	FT	B 1131	B 1131	B 1131			
	SD	215	220	225			

Key

FT Steel fabric size conforming to BS 4483.

SD Slab depth in millimetres.

Table A.13 **Design table for suspended in situ concrete garage floors**

Clear span m	Slab thicknesses for floors m
3	175
4	225

NOTE The above thicknesses are for an equivalent distributed load due to finishes and parallel partitions up to 5.5 kN/m².

NOTE 2 Steel fabric size B 1131 conforming to BS 4483 should be used in all situations.

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