

# Building Regulations

## Approved Document A

September 2017

The current Approved Document A, for England and Wales, came into effect from December 2004. The overall objective of the changes in the Approved Document is to improve standards of safety for persons in or around buildings. It also gives guidance on loading and ground movement.

### INTRODUCTION

The guidance given in this document gives clear advice on the measures which may be taken to meet the following requirement:

#### Requirement A3: Disproportionate collapse

“The building shall be constructed so that in the event of an accident the building will not suffer collapse to an extent disproportionate to the cause.”

The guidance deals with the means of reducing the sensitivity of a building to disproportionate collapse in the event of an accident. The structures are divided into categories depending on the risk factor and the consequences of an accidental failure. These parameters depend on the type of the building, the likelihood of accidents and the number of people that may be affected. These are categorised by consequence class as shown in Table 1.

Table 1 - Building consequence classes  
(extract taken from Table 11 of Part A)

Class	Building type and occupancy	Action required
1	<ul style="list-style-type: none"><li>Houses not exceeding 4 storeys</li><li>Agricultural buildings</li><li>Buildings into which people rarely go, provided no part of the building is closer to another building, or area where people do go, than a distance of 1.5 times the building height</li></ul>	No additional measures
2A	<ul style="list-style-type: none"><li>5 storey single occupancy houses</li><li>Hotels not exceeding 4 storeys</li><li>Flats, apartments and other residential buildings not exceeding 4 storeys</li><li>Offices not exceeding 4 storeys</li><li>Industrial buildings not exceeding 3 storeys</li><li>Retailing premises not exceeding 3 storeys of less than 2000m<sup>2</sup> floor area in each storey</li><li>Single storey educational buildings</li><li>All buildings not exceeding 2 storeys to which members of the public are admitted and which contain floor areas not exceeding 2000m<sup>2</sup> at each storey</li></ul>	Effective anchorage of floors to supports in accordance with NHBC guidance <sup>(1)</sup> and BS EN 1996-1-1 or horizontal ties

Table 1 (continued)

Class	Building type and occupancy	Action required
2B	<ul style="list-style-type: none"> <li>Hotels, flats, apartments and other residential buildings greater than 4 storeys but not exceeding 15 storeys</li> <li>Educational buildings greater than 1 storey but not exceeding 15 storeys</li> <li>Retailing premises greater than 3 storeys but not exceeding 15 storeys</li> <li>Hospitals not exceeding 3 storeys</li> <li>Offices greater than 4 storeys but not exceeding 15 storeys</li> <li>All buildings to which members of the public are admitted and which contain floor areas exceeding 2000m<sup>2</sup> but less than 5000m<sup>2</sup> at each storey</li> <li>Car parking not exceeding 6 storeys</li> </ul>	Horizontal ties to be provided together with either vertical ties or allowance made for the notional removal of support
3	<ul style="list-style-type: none"> <li>All buildings defined above as consequence Class 2A and 2B that exceed the limits on area and/or number of storeys</li> <li>All buildings containing hazardous substances and/or processes</li> <li>Grandstands accommodating more than 5000 spectators</li> </ul>	Specific consideration to take account of the likely hazards

Notes:

(1) Refer to NHBC Standards 2016 which states that effective anchorage is achieved where the floor is built into a masonry wall.

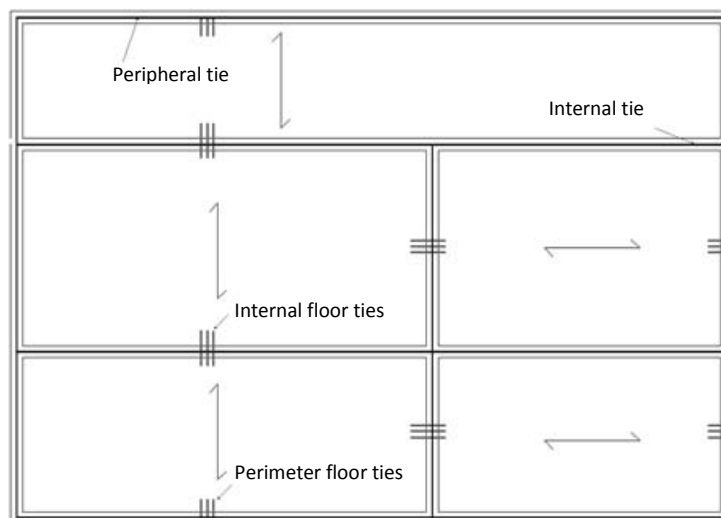
Go to Superstructure (excluding roofs) - Part 6:

<http://www.nhbc.co.uk/Builders/ProductsandServices/Standardsplus2016/#131>

## DESIGN ASPECTS

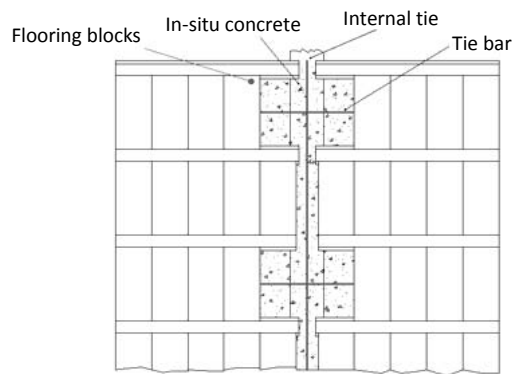
The specific requirements relating to ties in precast concrete structures are given in Part 1-1 of Eurocode 2: Design of concrete structures. These are satisfied either by using individual continuous ties provided explicitly for this purpose in in-situ concrete strips, or using ties partly in the in-situ and partly in the precast components. The structural model is as follows. In the event of the complete loss of a supporting column or beam at a floor level, the floor at this level and the level above must resist total collapse.

### Definition of Floor Ties

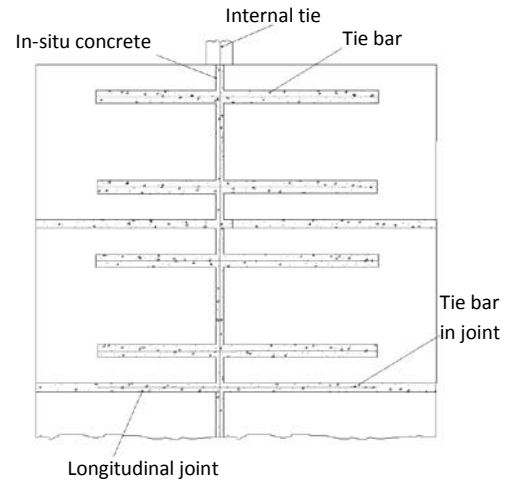


- Peripheral ties: ties over a peripheral support.
- Internal ties: ties over an intermediate support perpendicular to the span of the floor.
- Floor ties: ties connecting floors over an internal support.
- Perimeter floor ties: ties connecting floors to a perimeter support.
- Vertical ties: ties connecting vertical walls or columns to provide continuity.

#### Plan View for Beam And Block Floor



#### Plan View for Hollowcore Floor



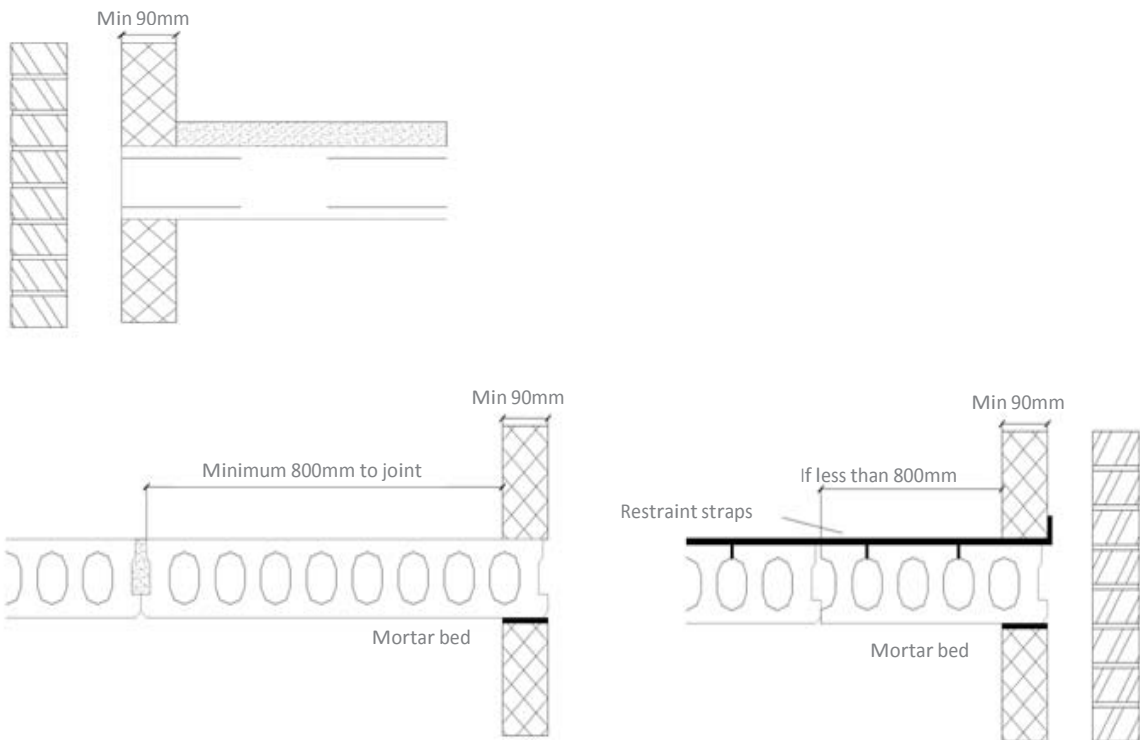
### TYPICAL DETAILS FOR HOLLOWCORE FLOORS

Where a structural concrete topping is used, opening of cores for tying purposes may not be required. The reinforcement in the topping is usually sufficient to comply with the tying requirements but the specific design must be checked by the building designer.

- Effective anchorage is provided where the hollowcore floor is built into one half of the wall width or at least 90mm.
- The minimum bearing of slabs should be in accordance with Part 1-1 of Eurocode 2: Design of concrete structures.
- The recommended maximum aggregate size in the in-situ concrete is 10mm.
- The recommended minimum compressive strength class of the in-situ concrete is C25/30.
- Opening of edge cores or two adjacent cores is not recommended.
- The recommended maximum length of an open core is 600mm.
- Notched and chamfered ends are in accordance with the manufacturer's details.
- Tying reinforcement may be placed in the joints provided there is sufficient gap.
- The design of all tying reinforcement is the responsibility of the building designer.
- Where longitudinal tying reinforcement is provided, no additional reinforcement is required at the slab edges.
- The details shown are typical for masonry construction. Tie details for floors used in steel/concrete frame constructions may be achieved using similar principles.
- All diagrams are not to scale and are indicative only.

## HOLLOWCORE FLOORS - CLASS 2A

### Effective anchorage



## HOLLOWCORE FLOORS - CLASS 2B

### Floor ties in longitudinal joints

Width at tie bar level  $\geq$  max of  $(\varnothing + 20)$  or  $(\varnothing + 2 d_g)$ , where  $d_g$  = max aggregate size



### Perimeter floor ties



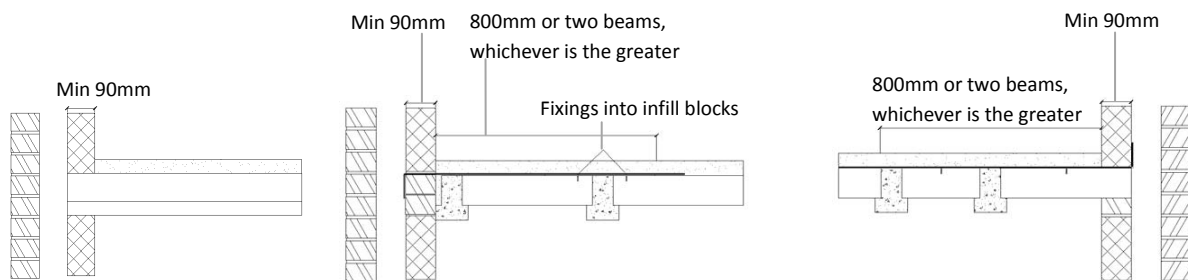
## TYPICAL DETAILS FOR BEAM AND BLOCK FLOORS

Where a structural concrete topping is used, removing blocks for tying purposes may not be required. The reinforcement in the topping is usually sufficient to comply with the tying requirements but the specific design must be checked by the building designer.

- Effective anchorage is provided where a beam and block spans onto a wall and has a bearing of one half of the width of the wall or at least 90mm.
- Where a beam and block floor spans parallel to a wall and abuts a wall, straps at 1.25m centres would be required.
- The minimum bearing of beams should be in accordance with Part 1-1 of Eurocode 2: Design of concrete structures.
- The design of all straps is the responsibility of the building designer and should be in accordance with BS EN 1996.
- The design of all tying reinforcement is the responsibility of the building designer.
- The details shown are indicative and should not be taken as Building Regulations Part E compliant. Please contact manufacturers for further guidance.
- All diagrams are not to scale and are indicative only.

### BEAM AND BLOCK FLOORS - CLASS 2A

#### Effective anchorage

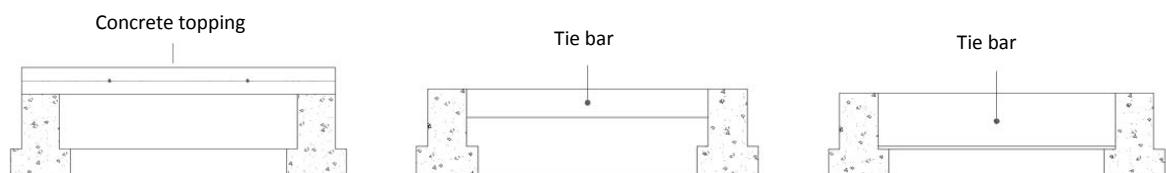


Anchorage where beams abut wall

Anchorage where infill blocks built into wall

### BEAM AND BLOCK FLOORS - CLASS 2B

#### How ties can be incorporated



Internal floor ties within concrete topping

In-situ concrete shuttered by a tray block

In-situ concrete shuttered traditionally

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