

# Hollowcore Floor Systems

August 2019

A hollowcore floor slab is a prestressed precast concrete element incorporating continuous voids to reduce self-weight whilst providing an efficient structural section manufactured by slipform, extrusion or wetcast

## THE BENEFITS OF HOLLOWCORE FLOORS

### Long Span

Hollowcore floors can achieve long spans, providing flexible open space with fewer beams, walls and supporting columns.

### Time Saving Construction

Time consuming site operations such as propping and shuttering wet concrete are virtually eliminated. Hollowcore slabs are cut to specified lengths prior to leaving the factory, resulting in safe and speedy construction, whilst also reducing costs.

### Design Flexibility

Prestressed hollowcore floors can be designed to suit a very wide range of buildings and meet most project criteria.

### No Formwork or Propping

In most cases propping is not required with hollowcore flooring, saving time and money. The area below the floor remains free from congestion allowing other trades to progress unhindered.

### Working Platform

Once in position and grouted, hollowcore slabs provide an immediate working platform for all follow-on trades. This reduces site delays to a minimum.

### Finishes

Hollowcore floor soffits generally have an 'Ordinary Finish' (BS EN 13670) which is suitable for exposed finishes in structures such as car parks and industrial buildings, and for a wide variety of applied finishes in other types of building. The top surface of hollowcore flooring is designed to receive a levelling screed or other approved flooring system.

### High Load Capacity

Hollowcore floors can be designed to support the heavy loads required in most factories, warehouses and storage buildings.

### Fire Resistance

All slabs have 1 hour fire resistance. This can however be enhanced up to 2 hours.

### Holes for Services

Holes to accommodate services can be pre-formed during manufacture dependent on size and location. Contact the manufacturer for further details.

## DESIGN OF HOLLOWCORE FLOORING

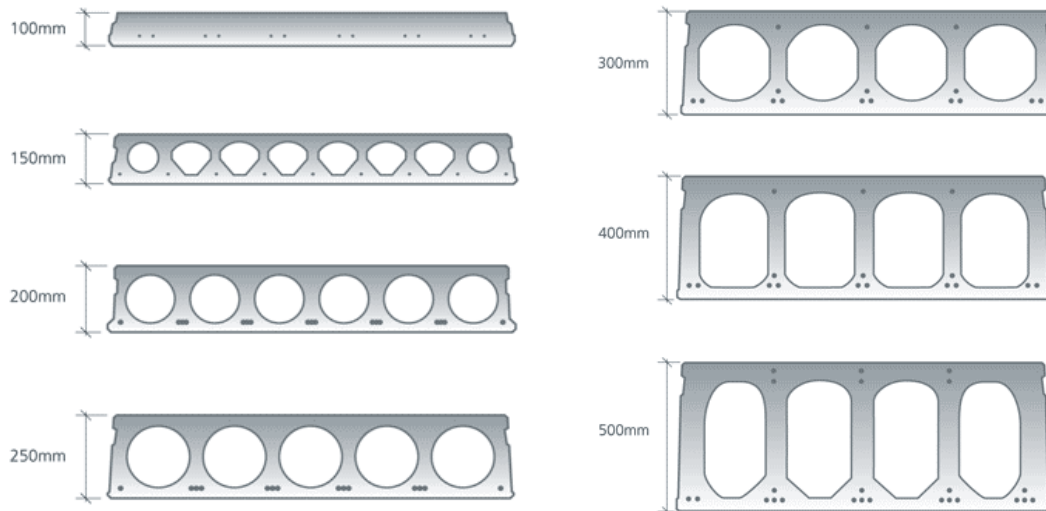
### Slab Widths

Hollowcore slabs are generally manufactured 1200mm wide, but can be cut narrower to suit particular applications.

### Slab Depths

Slab depths typically range from 100mm to 500mm as shown below.

### Slab Profiles



NOTE: Typical examples are shown; sections may vary in detail depending upon the manufacturer.

### Structural Performance

Table 1 gives general guidance on the performance characteristics of hollowcore flooring and allowable characteristic live loads. Spans are stated in linear metres with an allowance having been made for the self-weight of the unit plus a dead load of 1.5kN/m<sup>2</sup> for finishes.

Table 1 - Typical maximum spans in metres

Imposed Load (kN/m <sup>2</sup> )	Plank Depth (mm)						
	110	150	200	250	300	350	400
1.5	5.0	7.4	9.4	10.8	13.5	15.0	16.0
2.5	4.9	7.4	9.2	10.8	13.5	14.7	16.0
4.0	4.4	6.8	8.4	9.8	12.4	14.0	15.0
5.0	4.1	6.4	7.9	9.3	11.8	13.2	14.3
7.5	3.6	5.8	7.0	8.2	10.7	12.0	13.0

Domestic
  Office
  Storage

NOTE: Load/span capacity can vary between manufacturers. Consideration must also be given to the exposure conditions, location and size of openings, effects of camber, deflection and vibration. For loadings other than domestic, it is recommended that the reader consults the manufacturer.

## Structural Design

- Hollowcore slabs are designed in accordance with Part 1-1 (General rules and rules for buildings) and Part 1-2 (General rules - structural fire design) of Eurocode 2: Design of concrete structures. In addition, hollowcore slabs are manufactured to conform to BS EN 1168.
- Hollowcore slabs are designed to have effective shear key joints between adjacent slabs such that when installed and grouted the individual slabs become a system that behaves similarly to a monolithic slab.
- Prestressed hollowcore slabs will inherently exhibit an upward camber, the degree of which will depend upon the span and the amount of prestressing force applied. Due allowance must be made for this in determining finishes and overall floor thicknesses. Further guidance should be obtained from individual manufacturers where necessary.
- Diaphragm action is sometimes required from a floor slab in order to transmit horizontal force to the primary supporting structure. Hollowcore slabs may be used efficiently to produce a diaphragm either with or without a composite structural topping. Various connection details are available to provide the interaction between the floor and primary structure.
- Hollowcore slabs may be used in conjunction with a structural topping where enhanced performance is required e.g. heavy point loads, complex structural integration, heavy service penetration etc.

## **CONNECTION DETAILS**

Prestressed hollowcore floors are suitable for a range of construction types and are commonly used with steel, masonry or concrete beam supports in a variety of residential and commercial applications.

### Bearings

The amount of bearing required for a precast floor element is relative to a number of considerations including span, loading and type of support. Within the conventional range of designs the following general guidance is appropriate:

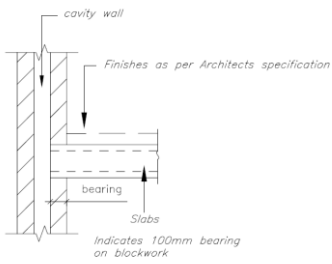
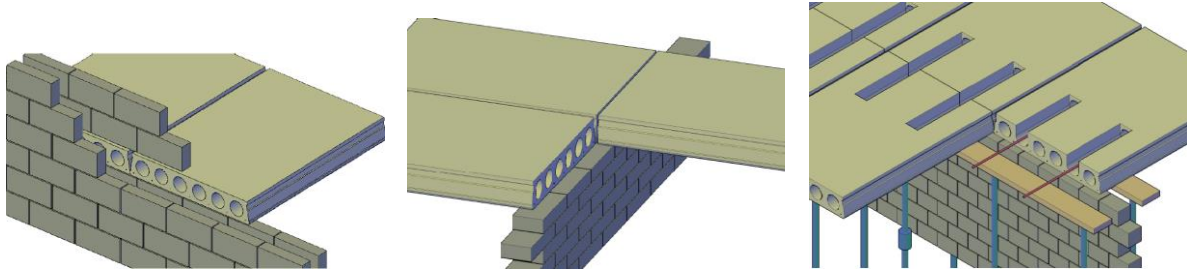
- 100mm nominal bearing on masonry supports
- 75mm nominal bearing on steel supports
- 75 mm nominal bearing on in-situ or precast concrete with minimum grade of C30

More detailed requirements of bearings for hollowcore slabs are contained in Clause 10.9.5 of Part 1-1 of Eurocode 2: Design of concrete structures.

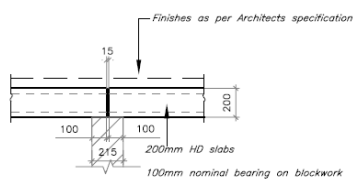
Where slabs span on to a wall from both sides a minimum wall thickness of 215mm is recommended. Where a wall thickness of 215mm cannot be achieved a tie should be provided at the support (N.B. the wall thickness should never be less than 140mm in this situation). In order to satisfy the tolerance for this situation a narrow support should only be used at one end of the slab.

Note: A shared bearing can be achieved by the use of a metal 'butt plate' as well as the tie detail shown.

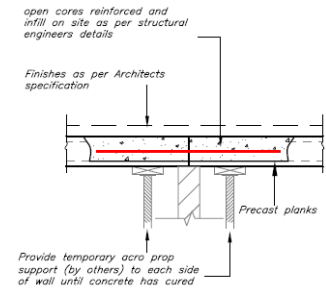
# Typical Bearing Details for Masonry Construction



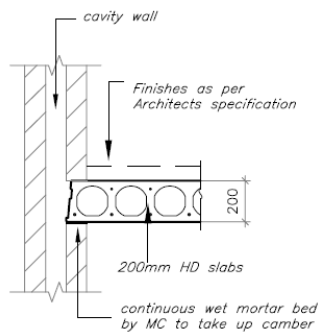
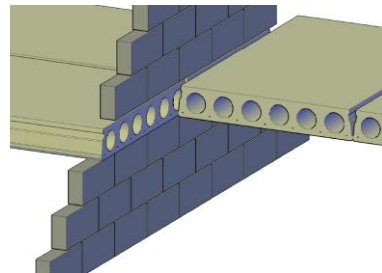
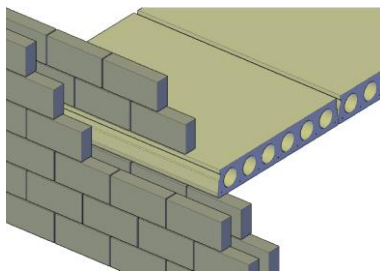
End bearing on block wall



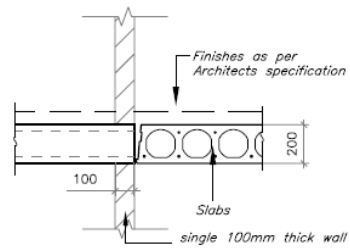
Dual end bearing on single block wall



Narrow end bearing on single block wall



Side bearing on block wall



End bearing on internal block wall

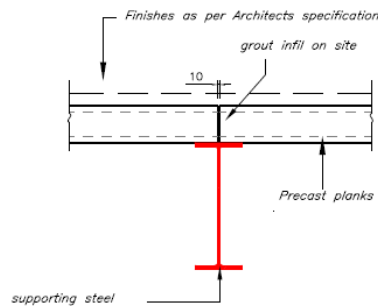
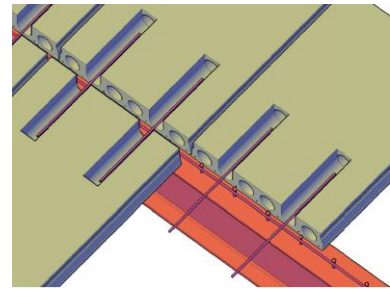
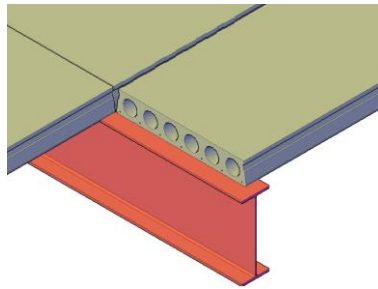
## Typical Bearing Details for Steel Frame Construction

### Simple Support

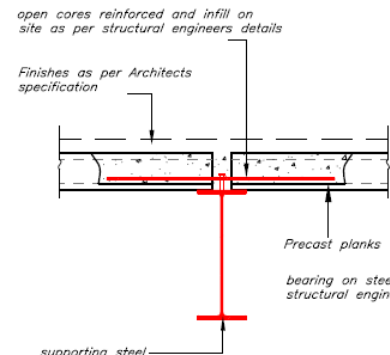
The slabs are designed simply supported and independent of the steel beams.

#### Advantages:

Ease of manufacture and construction.



Central Support on steel



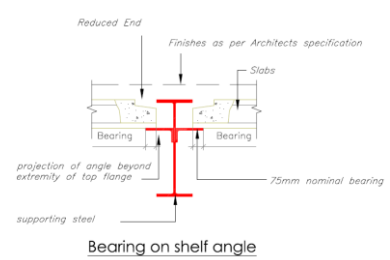
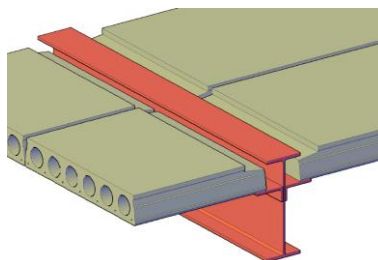
Central Support on steel

### Shelf Angle Support

The steel beam is not considered to be composite with the hollowcore slab.

#### Advantages:

A reduction in the overall construction depth plus increased fire resistance to the beam by virtue of containment of the top flange and the vertical leg of the shelf angle.



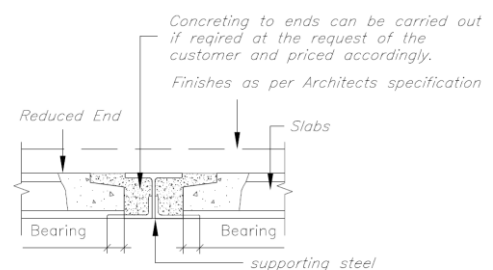
Bearing on shelf angle

### Slimfloor Construction

A steel beam is provided in a configuration which allows the precast floor slab to bear on the bottom flange of the beam.

#### Advantages:

Minimum overall structural depth achieving a virtually flush soffit line, providing an unobstructed route for services and a minimum floor to floor height. Additional reinforcement may be required depending on design conditions.



Infill concrete at reduced end