

Solid Prestressed Composite Floors

Floor consisting of a solid prestressed slab acting as fully participating formwork which may be propped or unpropped depending on design requirements and which acts compositely with an in-situ topping to form an efficient structural section. Units are manufactured on beds varying in length between 50m and 200m using slipform or extrusion techniques.

THE BENEFITS OF SOLID PRESTRESSED COMPOSITE FLOORS

Robust Construction

The prestressed precast element acts compositely with an in-situ structural topping, combining the benefits of precast and in-situ construction. A solid prestressed composite floor is ideally suited to buildings where progressive collapse is a consideration.

Design Efficient

Composite floors can be designed to act compositely with the structure of the building to reduce member sizes. The precast composite slabs can be designed as continuous in multi-span configurations to provide slender slab solutions.

Diaphragm Action

The precast slabs together with the in-situ topping can provide a structural deck with full diaphragm action where required in multi-storey structures.

Rapid Construction

Prestressed slabs are manufactured to the specific needs of the building, eliminating shuttering and adding to speed of construction, and in many cases require no propping.

Fire Resistance

All slabs have a 1hr minimum with up to 2hrs with a 100mm precast section. This however can be further enhanced by the addition of soffit finishes.

Sound

Meets the highest standards for resistance of sound transmission.

DESIGN OF SOLID PRESTRESSED COMPOSITE FLOORING

Precast Slab Widths

The slabs are usually manufactured to 600mm or 1200mm nominal size.

Precast Slab Lengths

Based on slenderness but can be agreed with the manufacturer.

Slab Depths

Slab depths range from 75mm to 240mm with upstands - giving overall depths between 150mm and 300mm.

Section Profiles

May vary in detail depending upon the manufacturer. Upstands may be provided which provide support for mesh reinforcement and enable units to be handled with a grab system, eliminating the use of chains and barring.

Structural Performance

Span/load capacities may vary slightly between manufacturers but the Tables 1 and 2 give general guidance on performance characteristics.

Table 1 - Typical maximum spans in metres for solid planks without upstands

Imposed Load (kN/m ²)	Overall Composite Depth (mm)			
	150		175	
	Precast Slab Thickness (mm)			
	75		100	
	Self Weight (kN/m ²)			
	3.6		4.2	
	Propped	Unpropped	Propped	Unpropped
0.75	7.3	3.8	8.1	5.0
1.5	6.8	3.8	7.7	5.0
2.0	6.6	3.8	7.4	5.0
2.5	6.4	3.8	7.2	5.0
3.0	6.2	3.8	7.0	5.0
4.0	5.8	3.8	6.6	5.0
5.0	5.5	3.8	6.3	5.0
10.0	4.5	3.8	5.1	5.0

Table 2 - Allowable imposed live load in kN/m² (service) for unpropped solid planks with upstands

Unpropped Clear Span (m)	Height of upstand (mm)					
	50	85	110	135	160	185
	Thickness of plate (mm)					
	55	55	55	55	55	55
	Composite depth (mm)					
	165	200	225	250	275	300
3.0	25	33	39	45	51	57
3.5	19	28	34	38	44	49
4.0	11	25	30	34	38	43
4.5	3	18	26	30	34	38
5.0		12	18	23	27	31
5.5		8	13	18	21	24
6.0			9	13	17	19
6.5			5	9	12	16
7.0				6	9	12
7.5					6	8
8.0						5

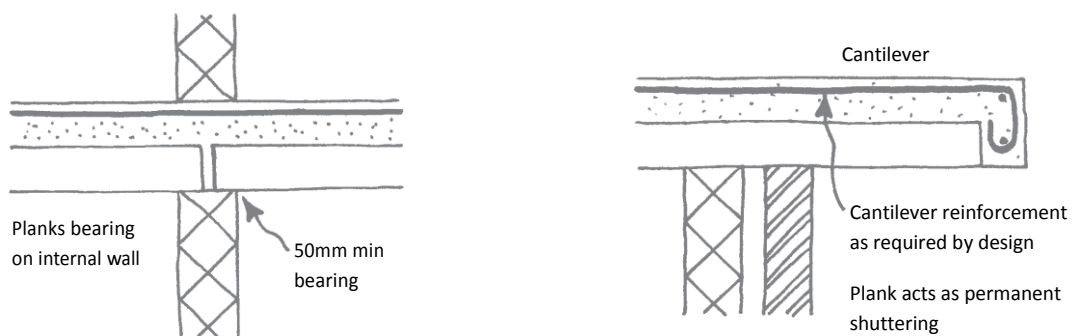
NOTE: Using a C25/30 normal weight concrete topping

Structural Design

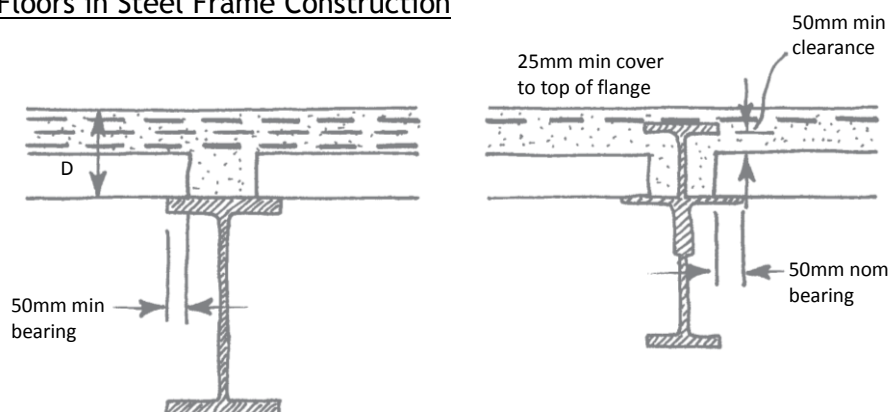
- Prestressed composite floors are designed in accordance with Part 1-1 (General rules and rules for buildings) and Part 1-2 (General rules - structural fire design) of Eurocode 2: Design of concrete structures.
- Solid prestressed slabs will exhibit a degree of upward camber, the extent of which will depend upon the span and the amount of prestress within the design. Due allowance must therefore be made for this in determining finishes and overall floor thickness. Further guidance should be obtained from individual manufacturers (see members' directory).
- The structural topping would usually be a C25/30 normal weight concrete reinforced with a structural mesh.
- The soffit of the solid prestressed slab is generally from a steel mould and is therefore suitable for an exposed finish in structures such as car parks, industrial buildings and for a wide variety of applied finishes in other types of buildings.

TYPICAL DETAILS FOR SOLID PRESTRESSED COMPOSITE FLOORING

Composite Floors in Masonry Construction

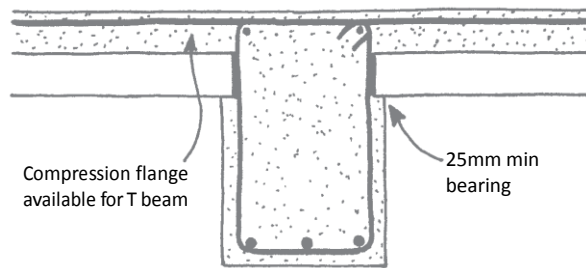


Composite Floors in Steel Frame Construction

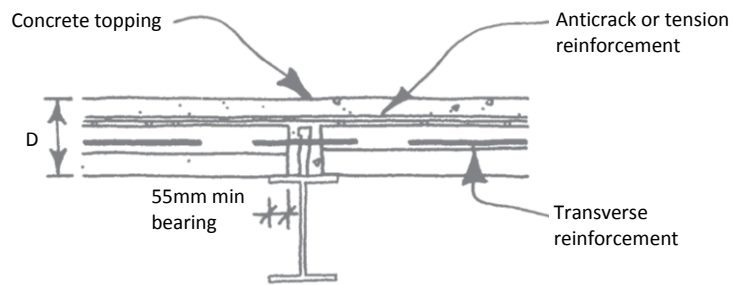


Temporary propping at the bearings will be required when less than 75mm (steel) or 100mm (masonry) is achieved.

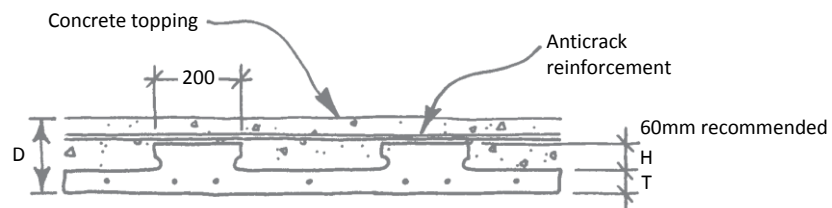
Composite Floors in Precast or In-situ Construction



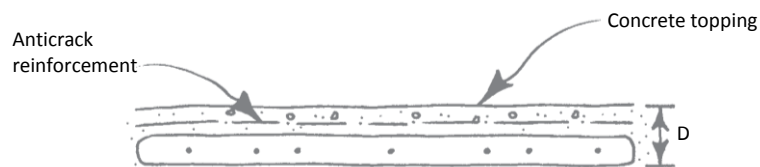
Composite steel beam design



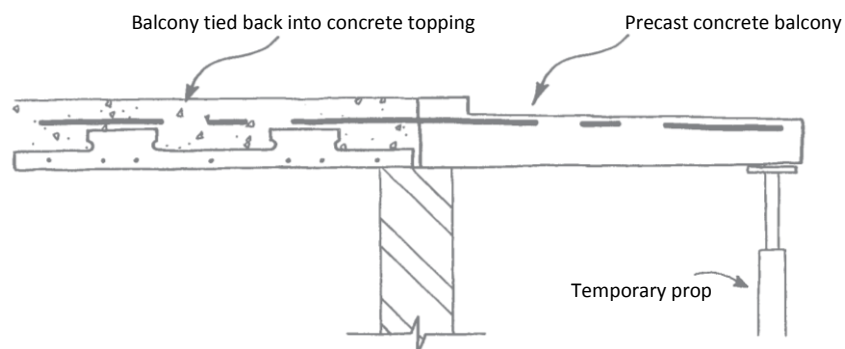
Standard composite section with upstands



Standard composite section without upstands



Precast concrete balcony



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