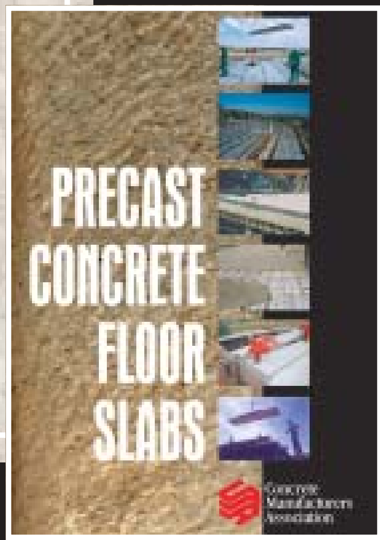
PRECAST CONCRETE FLOOR SLABS

Concrete
Manufacturers
Association

CONCRETE MANUFACTURERS ASSOCIATION – MEMBERSHIP LIST

Other Producer Members

Company Name	Telephone	Product
Bafokeng Brick & Tile	(014) 538-0842	MP
Bamburi Special Products Ltd	(09254) 2530504	P
* Brickcast Industries cc	(031) 507-7094	P
Cape Brick cc	(021) 511-2006	M
CEL	(021) 905-5998	P
*Columbia DCM (Pty) Ltd	(021) 946-3290	M
*Concor Technicrete (Pty) Ltd	(011) 495-2200	MPRT
*Corobrik (Pty) Ltd	(031) 560-3911	MPR
*Coverland Roof Tiles	(016) 421-4106	T
*Craig Concrete Products (Pty) Ltd	(011) 914-1730	T
DBL Concrete Products	(021) 905-1665	M
Eureka Brick & Block	(021) 887-4692	M
Fairmile Homes (Pty) Ltd	(021) 904-1620	M
False Bay Bricks	(021) 904-1620	P
Fanie Visser Concrete	(021) 904-1620	M
*Grinaker Precast (Pty) Ltd	(012) 652-0000	MPR
*Inca Masonry Products (Pty) Ltd	(043) 745-1215	MPRT
Klapmuts Concrete (Pty) Ltd	(021) 875-5151	R
*Lategan's Cement Works	(021) 873-1154	M
*Marley Roofing	(011) 316-2121	T
*Mimosa Brick (Pty) Ltd	(0163) 620507	P
*Morula Brick & Sand (Pty) Ltd	(012) 549-1727	M
Precast Concrete Industries	(09264) 61-280-4103	MP
*Stanger Brick & Tile (Pty) Ltd	(032) 4570237	MP
* Vanstone	(012) 5412056	PR
*Vibro Bricks (Pty) Ltd	(012) 374-2032	P
*Watson Tile & Concrete (Pty) Ltd	(011) 740-0910	MRT
Zimtile (Pvt) Limited	(09263) 4663511/5	T



* Companies which hold the SABS Mark
P = Paving M = Masonry R = Retaining Blocks T = Roof Tiles

Non-Producer Members

Ash Resources (Pty) Ltd	(011) 886-6200
Bayer (Pty) Ltd	(011) 921-5911
Besser Company	(091) 517-354-4508
Birkenmayer H (Pty) Ltd	(011) 970-3880
Brick King & Associates	(021) 948-6218
Cementex	(041)515-206
Chryso	(021) 933-5953
Friction Retaining Structures	(011) 622-2704
Inca (Cape)	(021) 904-1620
Kalode Construction (Pty) Ltd	(011) 781-3814
Natal Pavings (Pty) Ltd	(031) 209-3115
Pan Mixers SA Ltd	(011) 397-3754
Pave Show cc	(012) 346-6958
PPC Cement (Pty) Ltd	(021) 550-2100
Rampf Formen GmbH	(0949) 7 391-505-132
Randpave Industrial Contracts	(011) 805-1894
SA Paving (Pty) Ltd	(011) 483-1350
Siliseal Waterproofing Systems	(011) 464-1409
Slagment (Pty) Ltd	(011) 864-9900
Terraforce (Pty) Ltd	(021) 45-1907
Wates, Meiring & Barnard	(011) 315-0316
W R Grace (Pty) Ltd	(011) 923-4600

Emerging Manufacturers

Sabteca Concrete Products	(011) 424-7542	M

Cement Producer Members

Alpha Cement	(011) 780-1000
cement & concrete institute	(011) 315-0300
Lafarge South Africa	(011) 447-8360
NPC Natal Portland Cement	(031) 450-4411
PPC Cement	(011) 488-1700

CONTENTS

Concrete Manufacturers Association

INTRODUCTION

Part one of this booklet is intended as a quick and general guide to precast concrete floor slabs. In this book we will cover the features and benefits of precast concrete floor slabs, the general applications, some design guidelines, on-site considerations and some general information. Part two contains the more technical information.

For more detailed information specifically regarding design, you are referred to the "Precast concrete floor slabs-design manual" also published by the Concrete Manufacturers Association.

PART ONE

1. FEATURES AND BENEFITS

Figure 1: Erection of hollow core slabs

1.1 Speed of erection

Precast slabs can be erected a lot quicker than *in situ* slabs. Precast slabs can typically be erected in one or two days.

1.2 Technical support

The experience and expertise of the precast flooring supplier is readily available to you and they will also prepare designs and drawings for any project undertaken. The supplier will provide you with an engineer's certificate for submission to the municipality with your plans.

1.4 Thermal properties

Hollow core slabs and beam and block systems incorporating hollow blocks provide superior insulation, although it is recommended that an insulating screed is applied on top of the precast units when they are used as roofs.

Figure 2: Prestressed beam and block slab under construction

1.3 Pricing

Precast flooring is more economical than cast *in situ* concrete, due to the lower mass and better span to depth ratios possible. These savings in dead weight can lead to further economies in the supporting structure and foundations. Very little or no shuttering is required for precast slabs.

1.5 Quality

CMA member companies supplying precast floors either have ISO 9002 quality certification or they are busy installing the necessary quality systems.

2. APPLICATIONS

All flooring applications can be executed using precast components, from domestic housing to bridge decks. However, each system has its own specific area of usefulness, where its advantages are best utilized.

For floors in buildings of cellular construction, up to four storeys, if speed and absence of propping are paramount, then hollow core slabs with finished soffits are probably the best choice.

For long, uninterrupted spans the prestressed systems are appropriate; beam and block, panel and topping, hollow core. The latter is particularly effective for car parks, hospitals and supermarkets. For suspended ground floors, where finished soffits are unnecessary, then beam and block is difficult to beat.

The panel and topping and beam and block solution is particularly useful if the building is irregular or has multiple cantilevers.

Sites where craneage is not possible lend themselves to a beam and block solution, though the narrow hollow core might be possible with short spans.

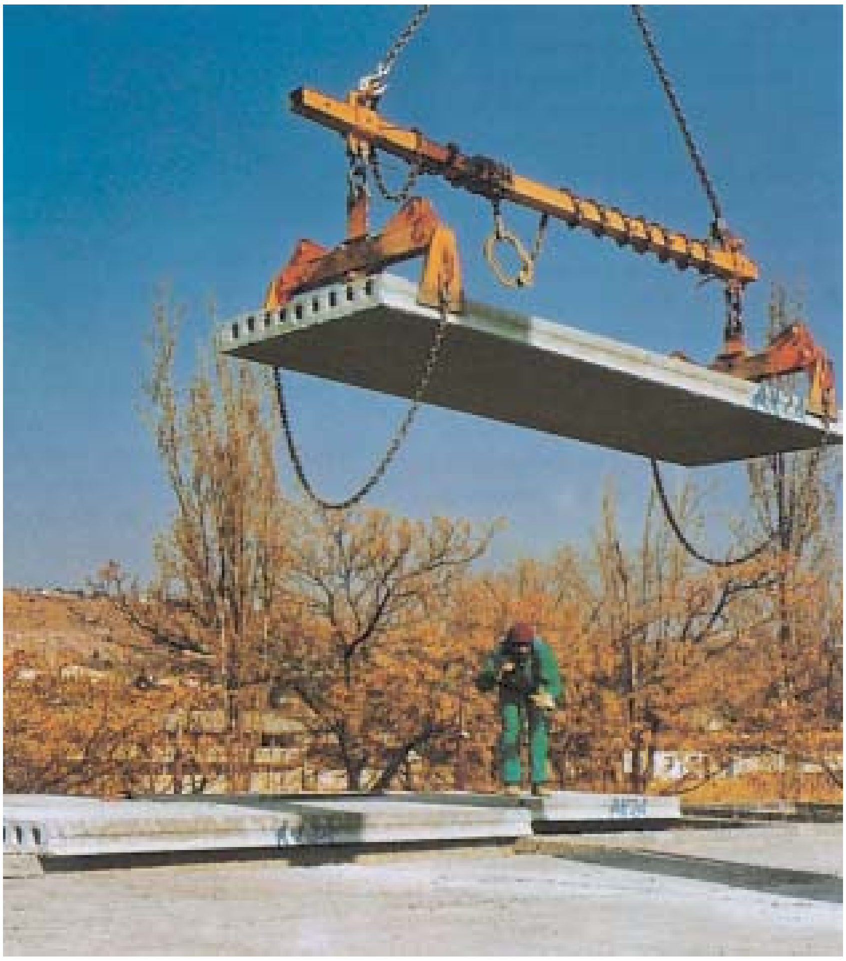


Fig 3: Hollow core slab being hoisted into position

Figure 4: Beam and block slab on irregular-shaped building

Figure 5: Use of hollow core slab on steel frame.

Table 1: Applications of precast slab systems

Building Types
Housing
Educational
Offices & Commercial
Industrial
Warehouses
Hospitals
Roofs
Car parks
Suspended ground slabs (heaving clays)
Hotels

Concrete Manufacturers Association

3. PRICING COMPARISON FOR DIFFERENT SLABS

Precast slab systems have a number of advantages over conventional cast *in situ* concrete. Table 2 summarises areas where costs are generated on site for a particular item. Naturally the most important cost saving is that of time. The use of precast concrete allows for immediate access to the floor below.

Figure 6: Use of hollow core slab on concrete framed building.

Table 2: Pricing items for comparing different flooring systems

Activity	In situ	Beam & Block	Hollow Core Reinforced	Hollow Core Prestressed	Panel & topping
Time related costs (P&G)	★				
Hire of shuttering	★				
Hire of support formwork	★				
Precast material delivery to site		(★)	★★	★★	★★
Erection of material	★	★	incl. above	incl. above	incl. above
Propping	incl. above	(★)	(★)		★
Reinforcing steel	★	(★)	(★)		(★)
Concrete (incl. placing)	★	★	(★)		★
Screed	(★)	(★)	★	★	
Power float/steel float	★	★			★
Plastering soffit	★	★			
Textured paint/Tyrolean finish	★	(★)	(★)		

★ Item needs pricing. ★★ Price normally includes supply and erection. (★) This item may need pricing

PART TWO

Figure 7: Daily testing of cubes ensures quality concrete

4. QUALITY

In a controlled factory environment, quality checks are not only much easier to do, but also much easier to control, with the result that the product may be expected to be of a more uniform or consistent standard. Cubes are taken from concrete mixes on a daily basis and on prestress lines it is normal to take cubes from each line and check for transfer strength before release of prestress. Some manufacturers cure the cubes on the line with the precast units. After release or de-moulding the remaining cubes are transferred to a normal curing tank.

Records of concrete strengths are kept so that any possible future problem can be traced back to a particular casting. Units are regularly inspected as they are demoulded or lifted off the casting-bed. Materials from suppliers are constantly monitored.

Checks are carried out on a regular basis on all weigh batchers, prestressing jacks and cube crushing equipment.

Where dimensional accuracy is important, checks of "as built" site dimensions are performed. This applies to hollow core slabs. Quality control is easier to maintain in a factory environment than on a site, so that the product will be of a more consistent standard and perform more uniformly.

5. SYSTEMS AVAILABLE

There are three basic systems available in South Africa
* **Hollow core**
* **Beam and block**
* **Panel and topping**

5.1 Hollow core

a) Description

Cores are typically either circular or elliptical. Slabs may be reinforced or prestressed and are designed as ribbed slabs. The hollow cores afford a reduction in selfweight of 30% or more, compared with a solid slab of the same depth. For most applications, no propping is necessary during construction, but crane access is essential. An erection rate of up to 600 m^2 per day is possible.

Alternative methods of casting slabs are:

- Cast in conventional moulds with core-formers cast-in or removed.
- Cast on a long prestressing line being extrusion or slipform methods.

The cast-in-mould method is used for reinforced concrete and longitudinal cantilever reinforcement may be incorporated if required.

The extrusion or slipform methods are suitable for a pretensioned prestressed long-line system of manufacture, without transverse or shear steel.

Manufacturing beds are typically 100 - 150 m long and the slab is sawn to required lengths before lifting. The longitudinal edges of the precast units are designed and profiled to receive grout in the joints and create a shear interlock which provides load transfer and prevents differential deflection. The top surface is generally prepared to receive a screed or structural topping. Because they are cast against a steel surface, the soffits are smooth and ready to receive a decorating finish direct without the need for plastering.

Reinforced hollow core slabs are manufactured as wide (900 mm) units, 150 mm deep, incorporating a number of 72 mm cores. Units are made in a range of lengths up to about 7,8 m, and are either taken from stock or manufactured for a specific contract.

Figure 8: Manufacturing facility for prestressed hollow core slabs.

Figure 9: Manufacture of reinforced hollow core slabs.

Figure 10: Manufacturing hollow core slabs.

The wide units need a crane for erection, but spans up to 5 m (depending on the loading) do not necessarily need structural topping or temporary propping, although a levelling screed is required. Structural topping and temporary props are sometimes employed to increase the effective depth used in the design calculation.

Prestressed hollow core slabs are manufactured in units 1200 mm wide with depths of 120,150, 200 and 250 mm. Units are made to order in lengths up to 12 m. The number and disposition of prestressing tendons varies according to span and loading.

Occasionally, structural topping is applied to increase the effective depth for superimposed loads. Propping is not generally specified except when the slab is required to act compositely with the structure above, eg. where heavy walls are carried on the edge of the slab.

b) Design guidelines

Reinforced hollow core slabs are designed as simply supported ribbed slabs in the conventional manner. However they are more versatile than the prestressed slab, since longitudinal top reinforcement can be cast-in for cantilever action.

Prestressed hollow core slabs are designed as simply supported pretensioned ribbed slabs, in accordance with the requirements of SABS 0100-l or the appropriate National Code. The prestressing force opposes the tendency to downward deflection and causes an upward camber in the units under no-load conditions. Hence, together with the high-strength concrete employed, larger span/depth ratios can be achieved than with reinforced concrete. In lightly loaded roof slabs, for instance, span/depth ratios around 50 are not uncommon.

Limited cantilever capacity to resist negative moments may be achieved in slipformed (or extruded) slabs by opening the tops of a number of cores for the required length, inserting the reinforcement and filling with concrete. This is normally done immediately after casting. Because the prestress force tends to increase the cantilever moment and deflection, cantilevers are generally limited to seven times the overall depth of slab.

Figure 11: Hollow core slab being hoisted into position direct from the delivery vehicle by mobile crane.

Figure 12: Prestressed hollow core used as a suspended ground floor slab

c) Service holes

Small holes (up to the core width) can be made on site in the core area of the slabs. Holes should be formed from the underside of the slab to prevent spalling of soffit concrete. Larger holes, requiring ribs to be cut, can be formed during manufacture, depending on the system and the size and position of the hole. If holes need to be formed on site and reinforcement needs to be cut, this must be referred to the manufacturer, preferably at the design stage. In the wide slab systems, holes up to 400 mm wide (in the slab centre) or 250 mm wide (at the slab edge) can be accommodated easily without the need to add trimming steel. Cut-outs at the end of a slab may often be wider. Very large holes for rooflights or stairs can be accommodated at the design stage. In this case the slabs interrupted by the hole are supported by a steel bracket supplied by the manufacturer and carried to the edge of adjacent units. This should always be shown on the manufacturer's working drawings.

Figure 13: Hollow core slab

Figure 14: Hollow core slab for an hotel

d) Finishes

Hollow core slabs cast on steel soffits are suitable for decoration direct. The joints are featured unless the whole surface is plastered with a thin-coat plaster. Before plastering, a bonding agent should be applied to the slab surface and a light mesh must be placed in the levelling screed on top of the slab.

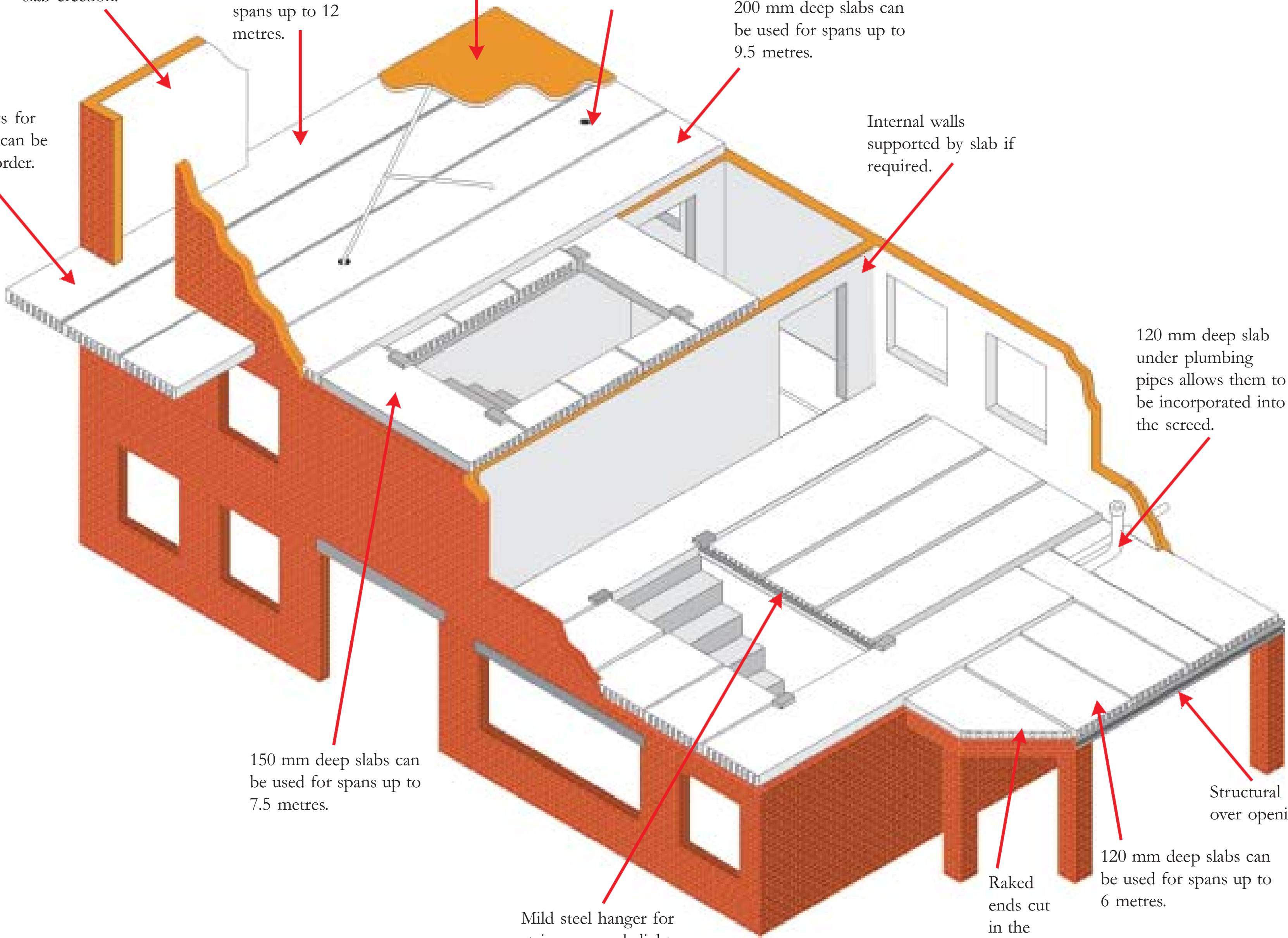
Whenever hollow core slabs are used on an exposed balcony or walkway, or on a roof, a light mesh reinforcement should be incorporated in the finishing screed or topping over all joints. The same applies in any situation where ceramic tiles are to be used. Regular expansion joints must be allowed for large areas (greater than 20 m^2 of ceramic tiles). As with all concrete roofs, the finished roof surface should be lightcoloured and reflective, with thermal insulation provided to reduce slab movement (eg a layer of coarse aggregate on top of the waterproofing membrane or a foam concrete finishing screed).

Figure 15: Hollow core slab, for a townhouse complex.

Figure 16: Hollow core slab on steel frame. Note omission of purlins for crane access.

Figure 17: Hollow core slabs used on seating areas of the Wanderers grandstand.

Figure 18: Erection of hollow core slab on masonry structure


External walls can be built immediately after slab erection.
250 mm deep slabs can be used for spans up to 12 metres.
Levelling screed only required to finish.
Holes for downlights can be cut on site.
200 mm deep slabs can be used for spans up to 9.5 metres.
Cantilevers for balconies can be made to order.
Internal walls supported by slab if required.
120 mm deep slab under plumbing pipes allows them to be incorporated into the screed.
150 mm deep slabs can be used for spans up to 7.5 metres.
Structural steel over openings.
120 mm deep slabs can be used for spans up to 6 metres.
Raked ends cut in the factory.
Mild steel hanger for staircases or skylight openings.

5.2 Beam and block

a) Description

Beam and block slabs are made up of precast concrete rectangular shaped beams. The most common beam spacings being 560, 600 and 650 mm. A non-structural hollow concrete rebated filler block is placed between these beams. The size of the block determines the beam spacing and provides a flush soffit.

A structural concrete topping should have a minimum strength of 25 MPa at 28 days and a minimum thickness of 40 mm, or $^{1}/_{10}$ x clear distance between the beams. Welded mesh reinforcement is placed in this topping to control possible shrinkage cracks. The filler blocks are available in different heights ranging from 60 mm to 350 mm which produces an overall depth of slab from 110 mm to 400 mm, or more if double blocks are used. This type of slab requires temporary supports at approximately 1,5 m centres, but certain systems can also be designed to eliminate the need for props.

Figure 19: End filler blocks placed to determine correct beam spacing.

Figure 20: Prestressed beams in place with support.

The advantages of this type of slab are as follows:

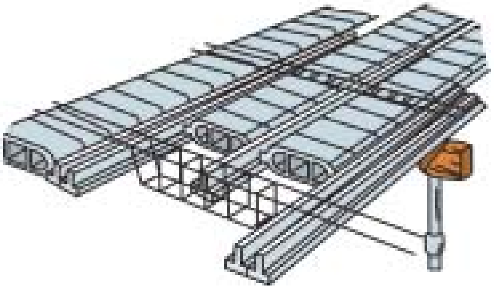
- It provides an economical, versatile lightweight monolithic slab system. Components are relatively light and no mechanical handling is necessary.
- Slabs may be designed as either simply supported or fully continuous.
- They are ideal for soffit plaster but fixing of suspended ceilings is also easy and simple.
- Electrical and plumbing services are readily catered for by omitting hollow blocks at specific locations.

b) Design guidelines

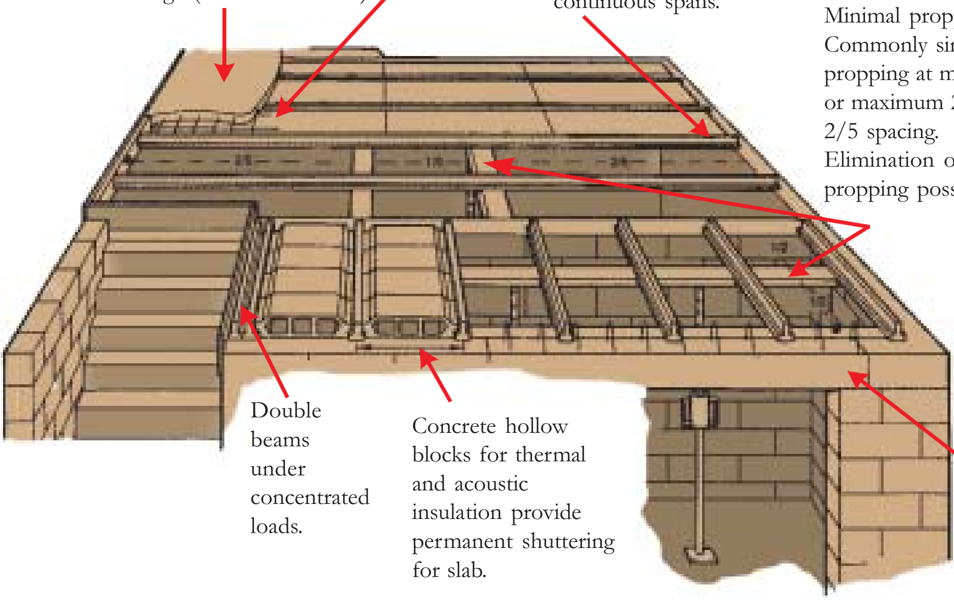
Beam and block system slabs are designed as a series of 'T' sections with the *in situ* cast concrete providing the compression flange and the precast beam the tension reinforcement. The beams and the composite slab are designed for specific spans and loads and are reinforced accordingly, (complying with the relevant Code of Practice.) Two or more beams may be placed together to accommodate concentrated line loads parallel to the span. If necessary, blocks may be omitted over the support to increase the shear capacity.

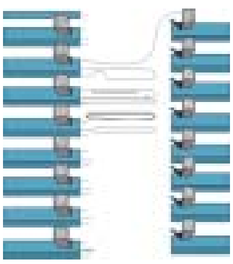
Figure 21: The soffit of a beam and block slab.

Typical construction details for beam and block slabs.

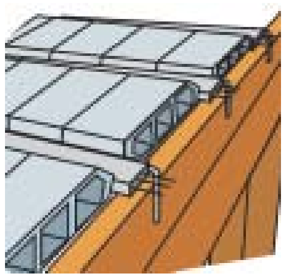


Beam within slab supported by twin floor beams to distribute the load at openings.





Beams stacked on bearers vertically aligned and placed at less than 200 mm from ends.



Bearing 35mm minimum or use tie bars

Figure 22: Placing blocks into position.

c) Service holes

Holes can be made on site in the blocks between beams to accommodate horizontal services. For larger holes, whole blocks can be omitted with shuttering fixed to adjacent blocks to restrain the concrete topping at the time of pouring. Holes larger than a single block must be referred to the manufacturer for approval, preferably at the initial design stage.

d) Finishes

Beam and block floors have a good key on the soffit for plastering.

5.3 Panel and topping

The panel consists of a precast reinforced or prestressed slab utilised essentially as a permanent shutter with tensile reinforcement included, acting compositely with an *in situ* structural topping. The panels may be produced in relatively narrow widths to facilitate manual erection or in a wide configuration (up to 2,4 metres) offering greater speed but requiring mechanical handling. In some situations, reinforcement in the form of a lattice girder may be incorporated to provide stiffness during handling. Reinforcement is placed in the topping over supports and over the joints between precast units.

By varying the tensile reinforcement in the panel and/or the strength and thickness of the topping concrete, different loadings and spans can be accommodated. Projecting steel is not normally required at the precast /*in situ* concrete interface in solid composite construction. Designs can be simply supported or fully continuous.

Depending on the system, selected treatment to the soffit may or may not be required.

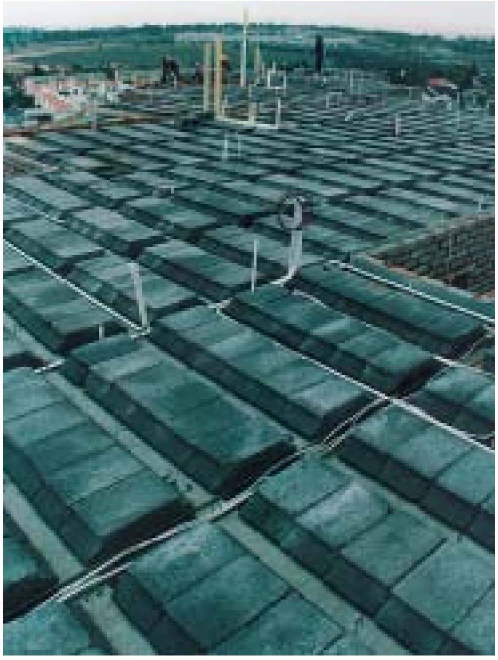


Figure 23: Fixing of services.

Figure 24: Casting concrete topping to beam and block slabs.

Figure 25: Wide panel being hoisted into position.

6. DESIGN GUIDELINES FOR PRECAST SLABS

This is intended as a quick guide only and should detailed information be required it can be obtained by consulting the **precast concrete floor slabs[1] design manual** published by the Concrete Manufacturers Association or by approaching individual manufacturers.

All suppliers provide a full design service for their products. If necessary "Engineer certificates" can be supplied for submission to municipalities to obtain approval for submission of plan.

Areas which require particular attention are:

a) Shear stress at interface

Where a structural concrete topping is intended to act compositely with a precast element, the horizontal shear stress at the interface needs to be checked. Where the contact area is small compared to the flange width, it will be found that properly anchored links are required. Where the loading is very light or independent test evidence can be provided, projecting steel will not be required.

b) Punching shear

This may be a problem if there is an inadequate depth of structural concrete over wide hollow cores or hollow blocks. A screed may be assumed to assist in load dispersion to the loadbearing ribs.

c) Bearings

Simple bearings should comply with the requirements of SABS 0100-1[2]. The maximum possible bearing area should be provided. Factors influencing bearing design include bearing area, bearing material, the presence of continuity steel, site tolerances and severe loading conditions.

Figure 26: Preparing and casting of a precast beam and block slab in progress.

7. COMPOSITE CONSTRUCTION

Figure 27 and 28: Tops of cores in hollow core slab opened up for reinforcement to form moment connection with beam.

Figure 29: Precast hollow core slabs and precast beams erected on in situ *columns.*

The term "composite" refers to structures where precast concrete and *in situ* concrete work together to form an integral structural component. The precast slabs can be made composite with the supporting beams to increase the structural depth of the supporting beams.

Advantages of composite structures

Composite structures can be used in building frames, for offices, parking levels, shopping centres and even bridges. In buildings this structure is most economic in intermediate floors when the structural depth should be minimized. The two main advantages of a composite structure over a non-composite structure are:

1. Reduced material expenditure.
2. Less structural depth for a given load bearing capacity.

In the first case this means lighter structures are achieved which often results in more slender vertical structures with savings in columns and foundations.

The materials that are used to link the beam and slabs together are *in situ* concrete and reinforcing steel. This steel and *in situ* concrete must be designed to transfer the horizontal shear between the beam and the slabs. In precast concrete beams this shear is transferred by vertical shear links protruding from the top of the precast beam coupled with the horizontal reinforcing bars.

Where the beam is structural steel the shear transfer can be achieved with either purpose made proprietary shear studs, or small channel pieces, in either case it will be necessary to place the horizontal reinforcing bars.

The steel or precast concrete beam must be designed to take the self load of the beam, the dead load of the slab, and infill *in situ* concrete, and any construction live load allowed.

The composite beam is designed to carry the final full design load of the structure. It may be economic in designs where the live load is low and the spans are significant to prop the beams to reduce the design loads on the beam in its temporary state.

8. SUPPORT OVER OPENINGS IN LOAD BEARING WALLS

Hollow core slabs require support over openings. The amount of support will depend on the width of the opening and the span of the slabs. As a rule of thumb, two lintels plus five courses of masonry above are sufficient to support hollow core slabs over an opening up to two metres wide. For openings larger than two metres, some form of structural steelwork will normally be required. Flooring suppliers will be able to advise on the necessary support requirements.

Beam and block systems may, in most circumstances, be viewed in the same way as *in situ* construction. Thus window openings, etc., may be taken right up to the slab soffit, if there is adequate topping depth or an *in situ* beam may be incorporated in the slab depth.

Figure 30 and 31: Steel beams used over large openings

9. ON SITE CONSIDERATIONS

9.1 Hollow core slabs

Hollow core slabs are manufactured to suit the as built dimensions of the building. They are delivered to the site on the day that they are required to be erected onto the building.

Masonry

The client should ensure that the last four courses of masonry have brickforce between each course and that they are laid with a fishline to ensure a level bearing surface for the hollow core slabs.

Figure 32: Placing of hollow core slabs directly onto masonry.

Access

The client must provide suitable access for delivery vehicles and cranes up to the building on which the slabs are to be erected. No site storage is required as the slabs are lifted by the flooring manufacturer's crane from the delivery vehicle onto the building where they are required.

Grouting

The client should have river sand and cement available close to the building on which the slabs are to be erected so that the floor manufacturer's grouting team can mix up a suitable grout mix and lay it in the joints between the flooring units.

Continuity of work

Slabs should not be loaded for two days after grouting, but the outer leaf of masonry can proceed as soon as the slab grouting operation has been completed by the manufacturer.

Figure 33: Grouting joint between hollow core slabs.

Figure 34 & 35: Hoisting slabs into position.

9.2 Beam and block slabs

Handling Protection and Storage

On delivery it is the contractor's responsibility to inspect the blocks and beams for any breakages. Material should be off-loaded in a safe place and on level ground. The blocks are not to be placed on top of the beams during storing. Do not stack the blocks more than two pallets high. Beams must be supported at 1,5 m centres.

Placing

Place beams from setting out point as indicated on the drawing at approximate centres. Space accurately by placing one closed- end hollow block at each end of span. In accordance with SABS 0100, minimum bearing of 35mm onto load bearing masonry.

Erect suitable temporary propping under indicated position of stiffener ribs (maximum 1800mm centres) and level to specified camber.

Prop (if required) before placing balance of hollow blocks as detailed. Leave out blocks for stiffener ribs as per drawings.

Place stiffener rib (cross-rib) reinforcement. Install services over blocks and not on top of beams, then place mesh over blocks.

Remove excess rubble from beams and blocks and thoroughly wet slab before casting concrete.

Inspection

Before placing any concrete all slabs are to be inspected by the supervising engineer or appointed representative.

Concreting

Use a minimum 25 MPa strength concrete at 28 days as the structural topping. Casting must be continuous to create monolithic slab. Heaping of concrete must be avoided. Concrete is to be mechanically vibrated.

Curing

Keep slab wet for 3 to 4 days after concreting.

Stripping

Temporary propping may be removed when the *in situ* concrete has reached a crushing strength of 17 MPa, or according to supervising Engineers instructions.

Note: No heaping of building materials on slab during construction.

Figure 36: Setting out of beams.

Figure 37: Propping under indicated positions.

Figure 38: Mesh placed over blocks.

Figure 39: Casting concrete.

Concrete Manufacturers Association

10. CONSTRUCTION REQUIREMENTS

10.1 Hollow core slabs

The following details are recommended for use with hollow core precast concrete floor slabs.

Bearing

100mm end bearing is recommended. This bearing can vary between 40mm and 110mm at the Design Engineer's discretion and subject to site conditions.

Where Ref. 100 mesh is detailed in the screed, this should be laid directly on top of the slab for screeds up to 50mm thick. For thicker screeds the mesh should be laid in the screed with a 30mm top cover.

Panels in most instances are laid directly onto the masonry. It is important to level the last four rows of masonry under the slab with a fishline to ensure a level top row of bricks. While erectors will level the slabs after erection, the better the level of the last course of masonry the better the finished underside level of the slab.

It is good practice to put brickforce in the mortar bedding of the last four courses of masonry under the slab around the perimeter of the building.

A minimum screed depth of 35mm is recommended with a minimum compressive strength of 5MPa or 1 part cement to 6 parts river sand by volume.

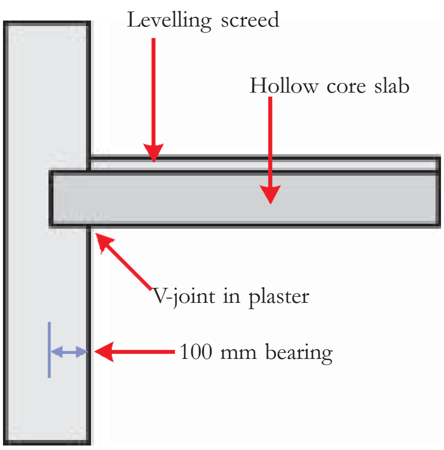
It is important for the Engineer to consider the implications of thermal movements on areas of slab that are exposed to the elements such as roofs, balconies and walkways.

Consideration by the Engineer should be given to creep, shrinkage and bending of the slab in tiled areas. Ref. 100 mesh should be placed in the screed in tiled areas and movement or control joints should be placed in the tiles every 5 metres maximum and at points where the tile cross section changes.

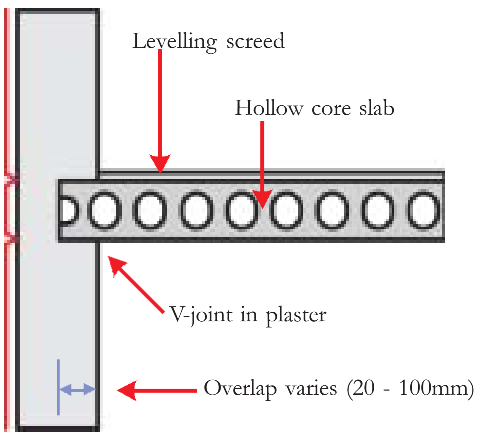
There must be no horizontal chasing or electrical distribution boxes in loadbearing masonry.

On 230 Masonry

First floor level



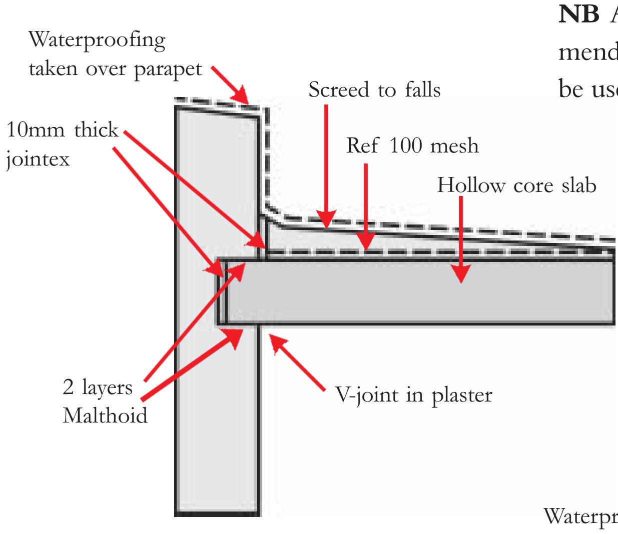
End of slab at first floor level.



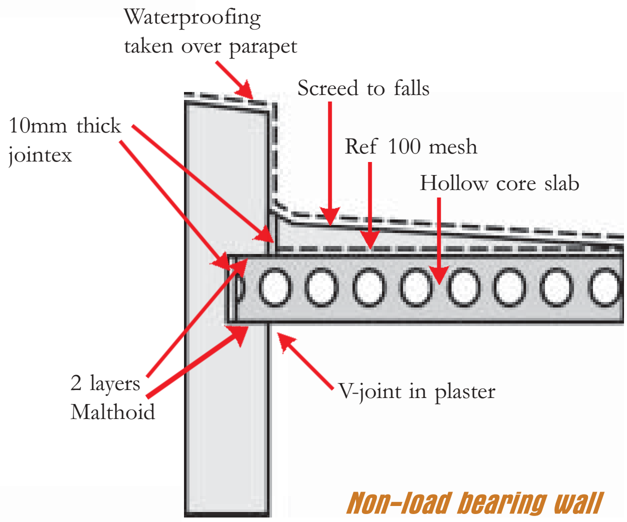
Side of slab at first floor level.

Roof level

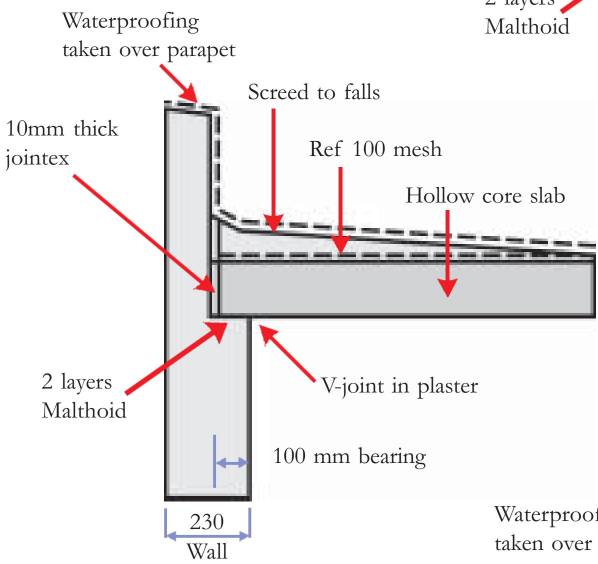
NB A 110mm wide parapet wall is recommended, but a 230mm wide parapet wall can be used on the height of the parapet wall.



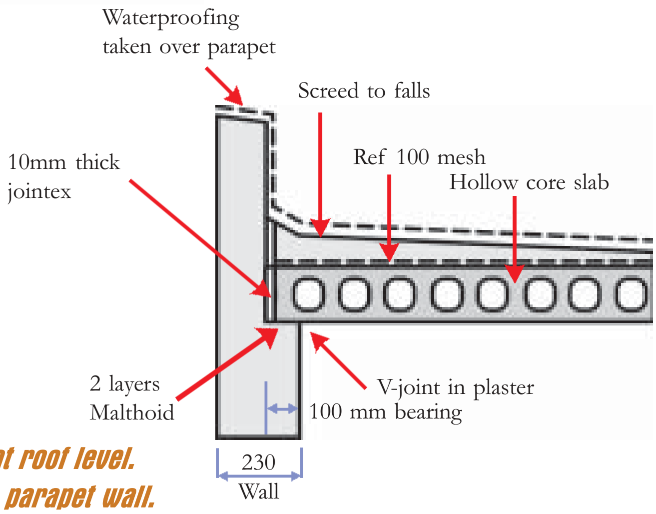
Load bearing wall
End of slab at roof level – 230mm wide parapet wall.



Non-load bearing wall
Side of slab at roof level– 230mm wide parapet wall.



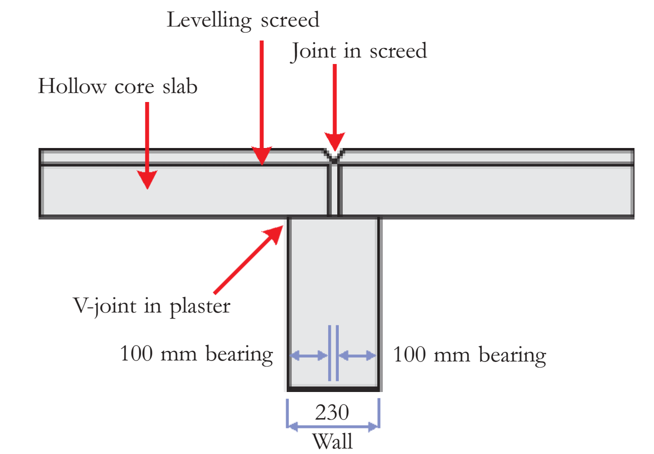
End of slab at roof level.
–110mm wide parapet wall.

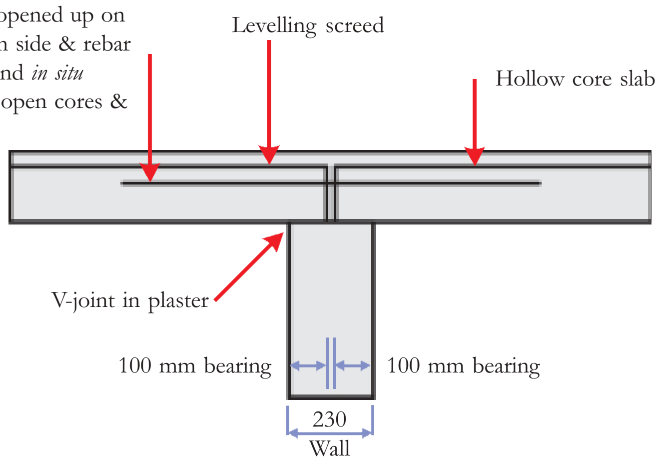


Side of slab at roof level.
–110mm wide parapet wall.

Joints on internal wall

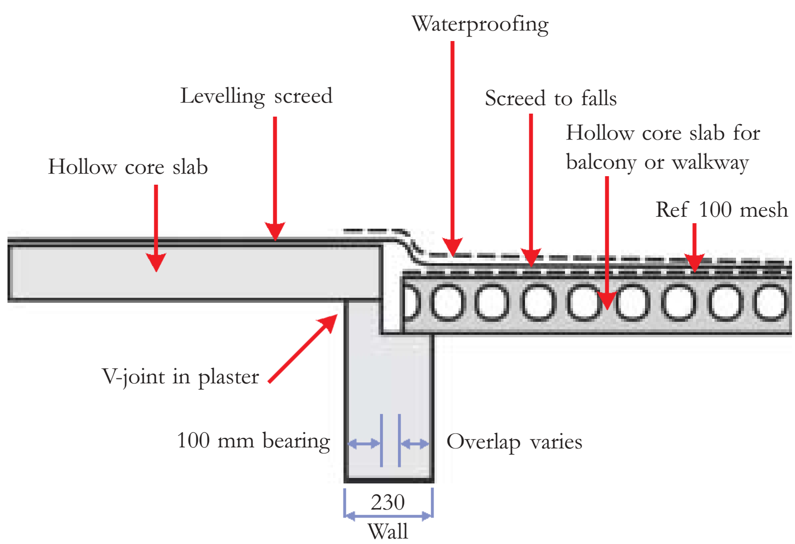
Where two slabs rest on a 230 wall, two details are available. With the first detail a joint should be formed in the screed at the point where the two slabs join. This detail is normally used where a wall is to be placed at first floor level above the wall below or where the floor is to be carpeted.





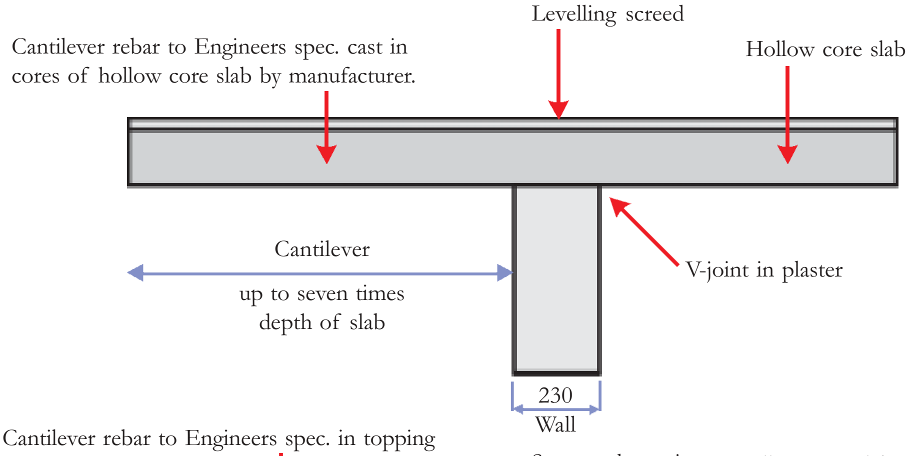
Balcony

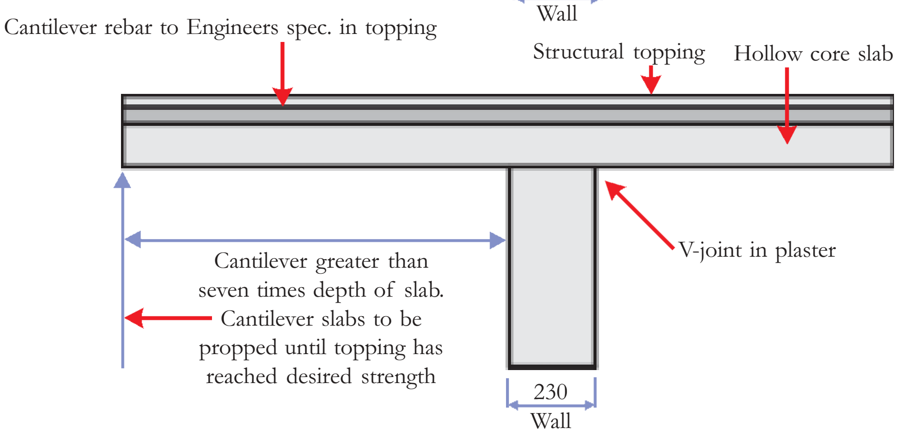
At balconies or walkways a step in the slab should be provided to prevent water penetration. This is achieved by placing the outer slab one course lower than the inner slab. The direction of span of the slabs may vary to that shown to suit the position of the loadbearing walls.



Cantilevers

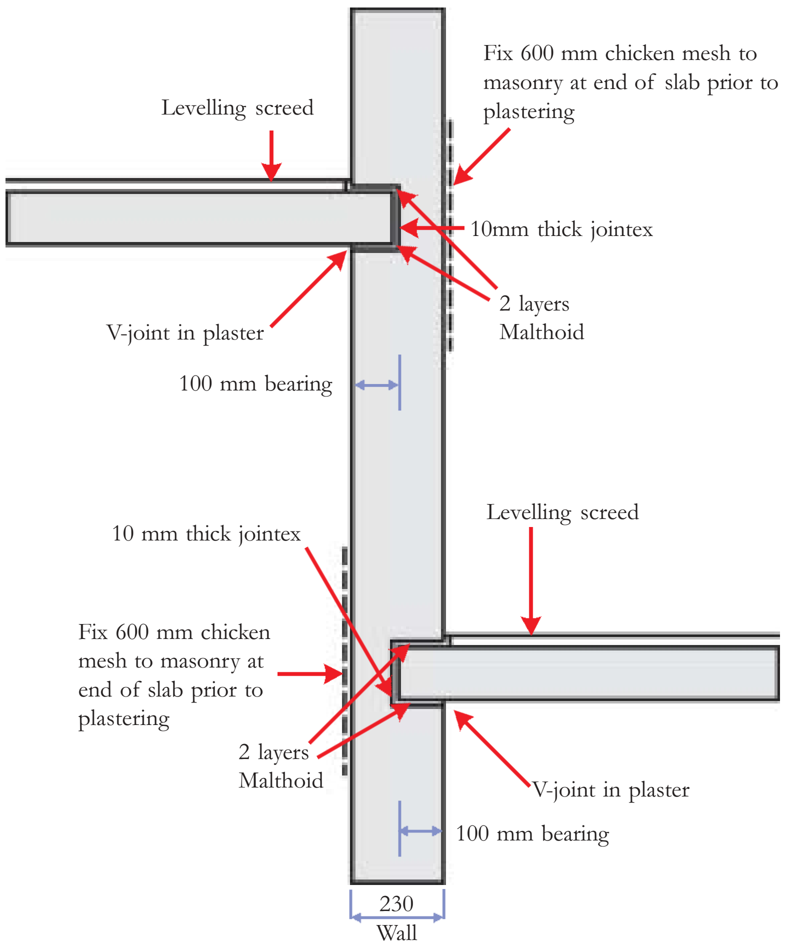
For a short cantilever up to seven times the slab depth, rebar can be cast into the cores. For cantilevers larger than seven times the slab depth rebar can be placed in a structural concrete topping applied to the top of the hollow core slabs.





Step in building with common wall

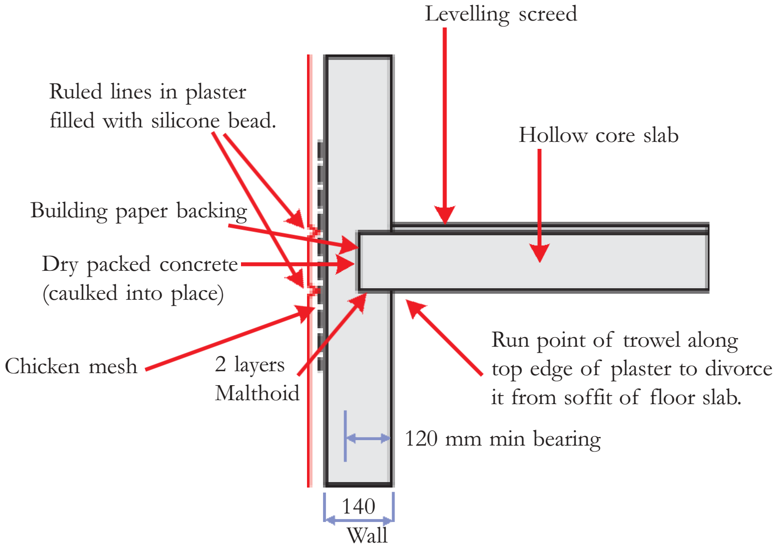
The following section is used where slabs of differing height bear on the same wall.



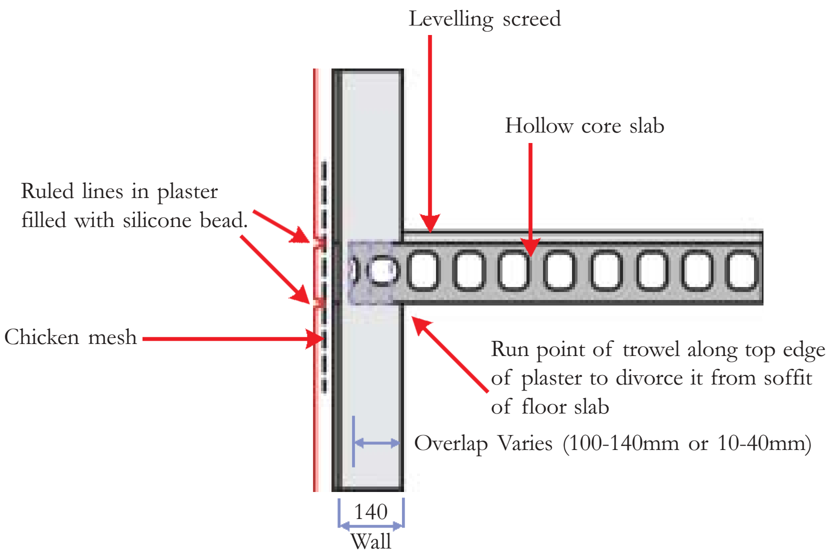
140mm Masonry

NB: Great care must be taken when erecting floor slabs on 140 masonry as available tolerances are a lot smaller than when using 230 masonry. Some useful tips on the use of slabs on 140 masonry are:

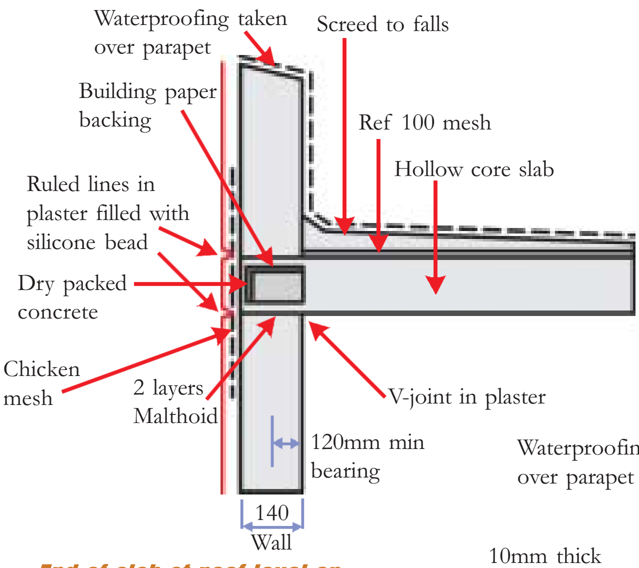
- All buildings must be site measured and slabs manufactured to suit as built dimensions.
- Fix 600mm wide chicken mesh to masonry at end of slabs prior to plastering.
- Rule joints in the plaster at the top and bottom of slabs. To locate the ruled line positions correctly, place a nail between the bottom of the slab and the top of the masonry prior to plastering.
- No horizontal chasing or DB boards shall be built into structural walls supporting slabs.



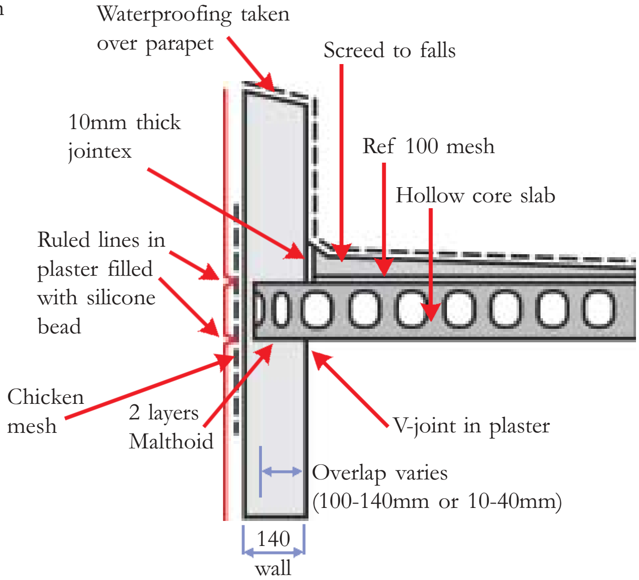
End of slab at first floor level – loadbearing wall



Side of slab at first floor level – non-loadbearing wall.

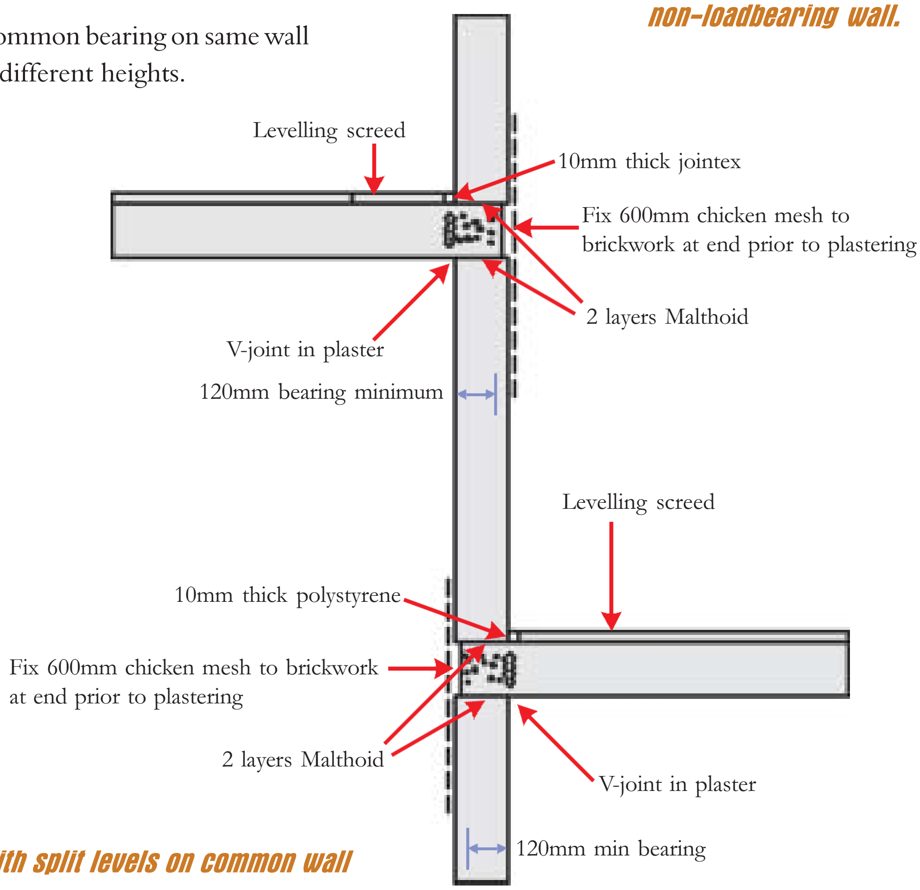


End of slab at roof level on loadbearing wall

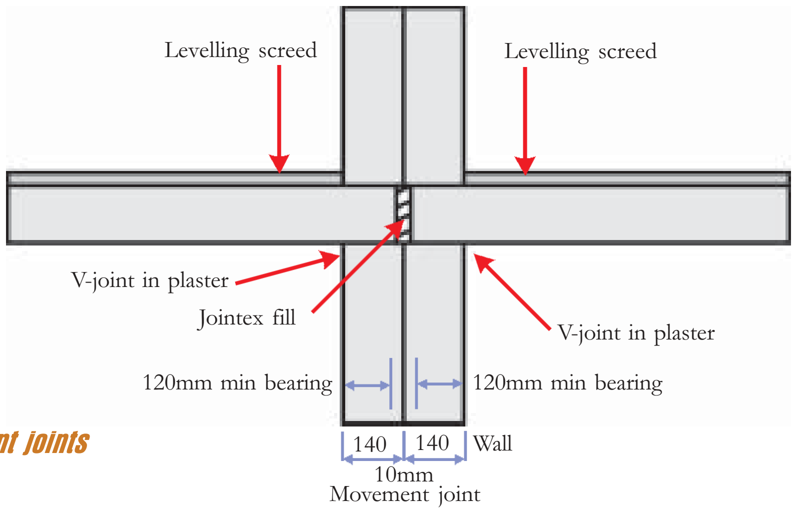


Side of slab at roof level on a non-loadbearing wall.

Common bearing on same wall at different heights.



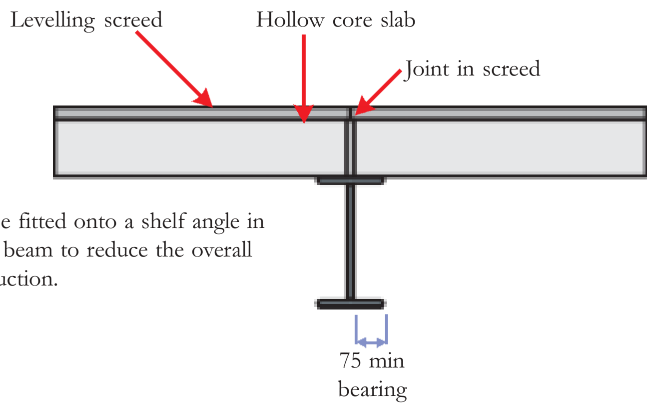
With split levels on common wall



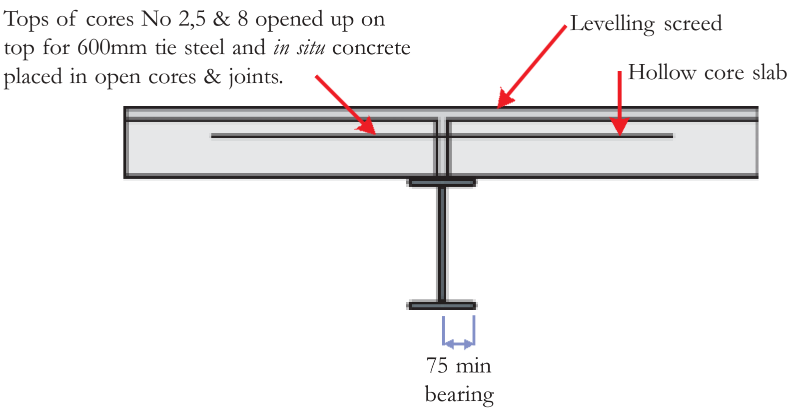
Movement joints

Structural steel

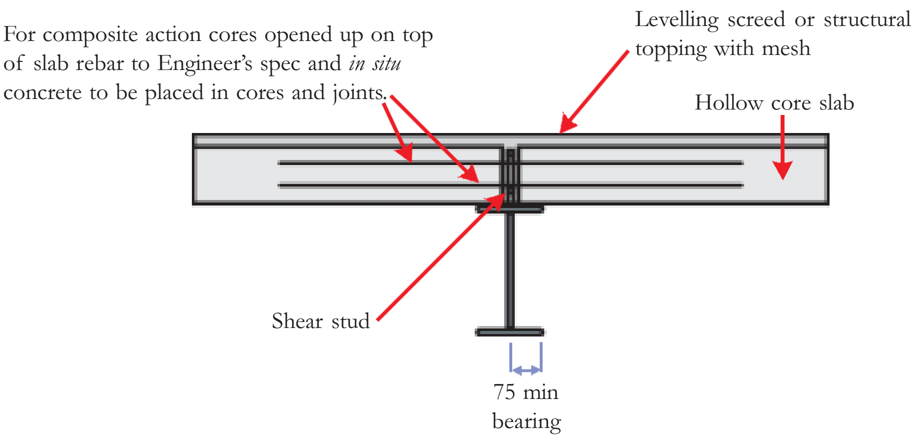
Slabs simply supported on top of steel section.



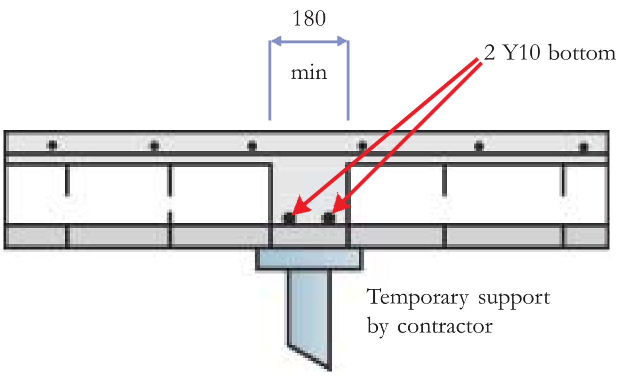
NB - Slabs can be fitted onto a shelf angle in the depth of the beam to reduce the overall height of construction.



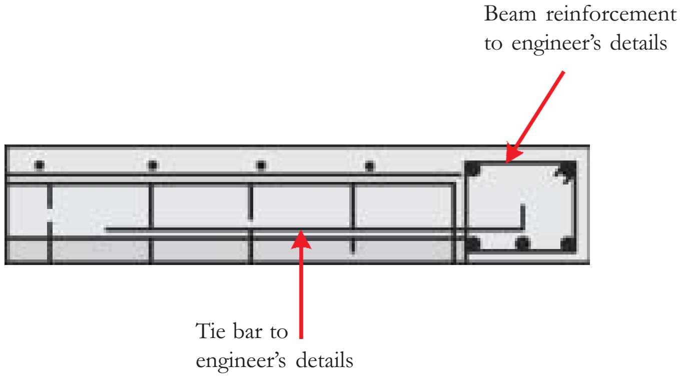
Slabs in full composite action with the beam.



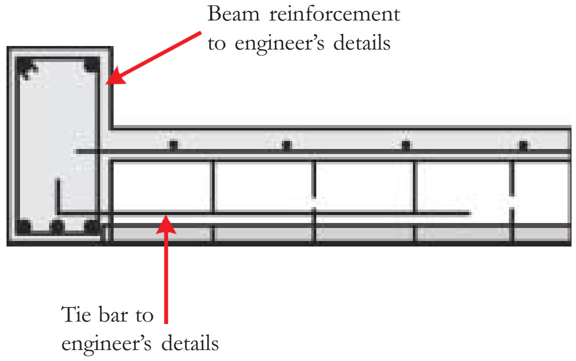
10.2 Beam and Block Slabs



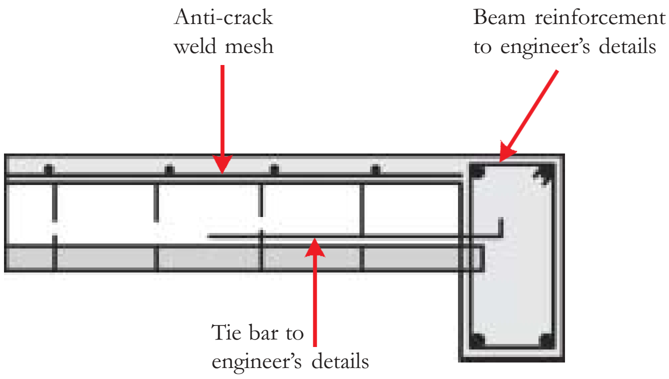
Stiffener rib



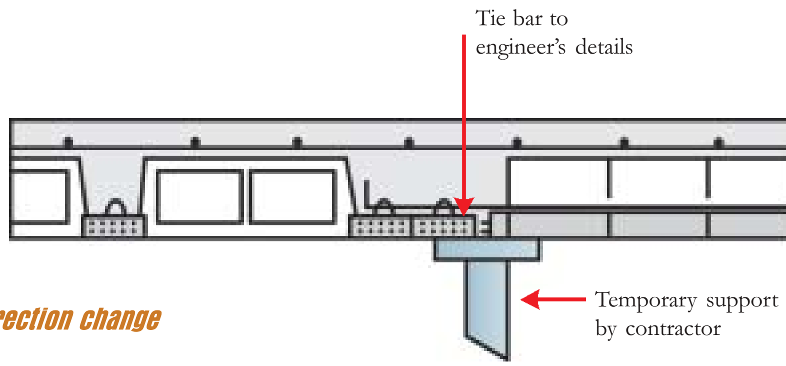
Strip beam



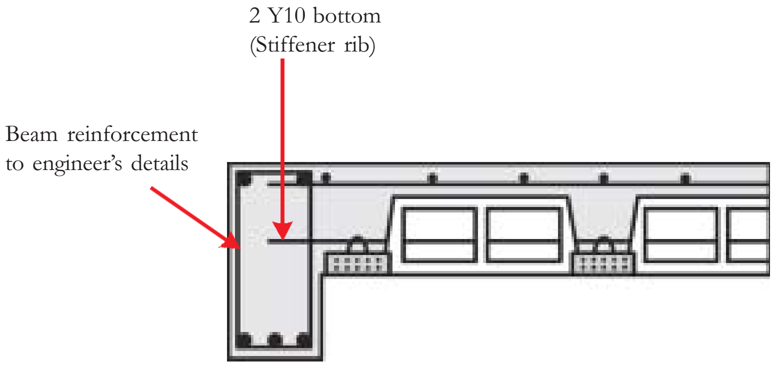
Upstand beam



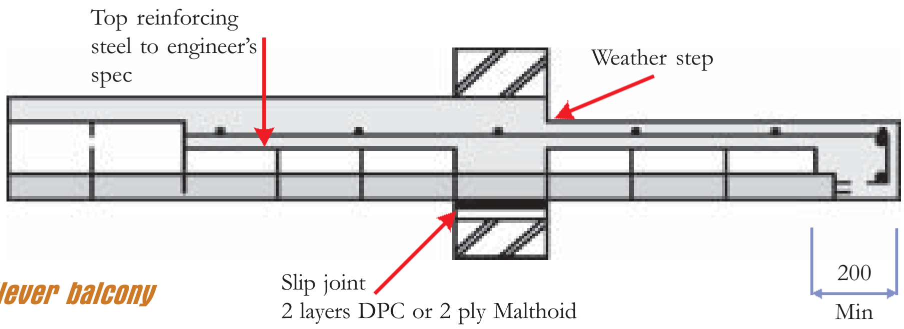
Downstand beam



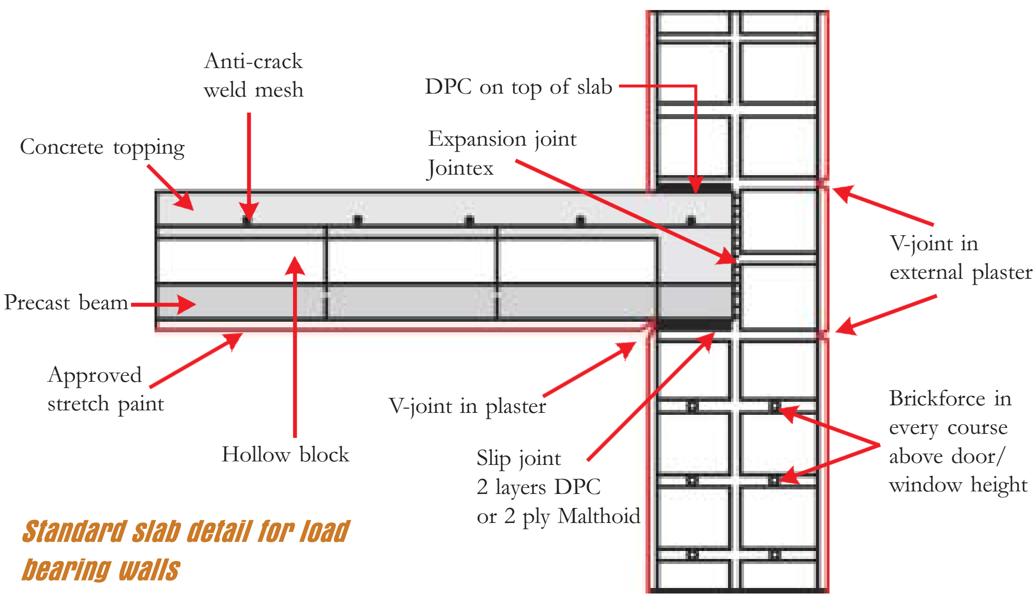
Span direction change



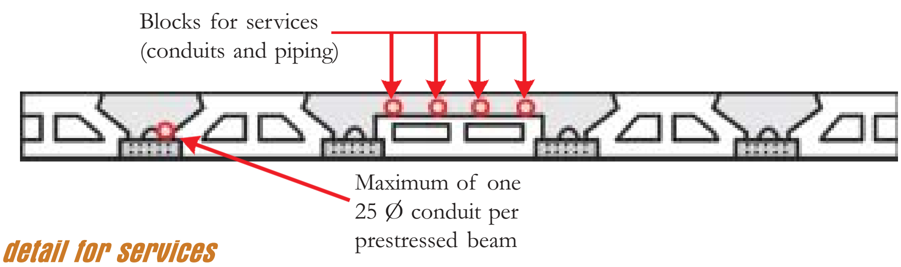
Downstand beam



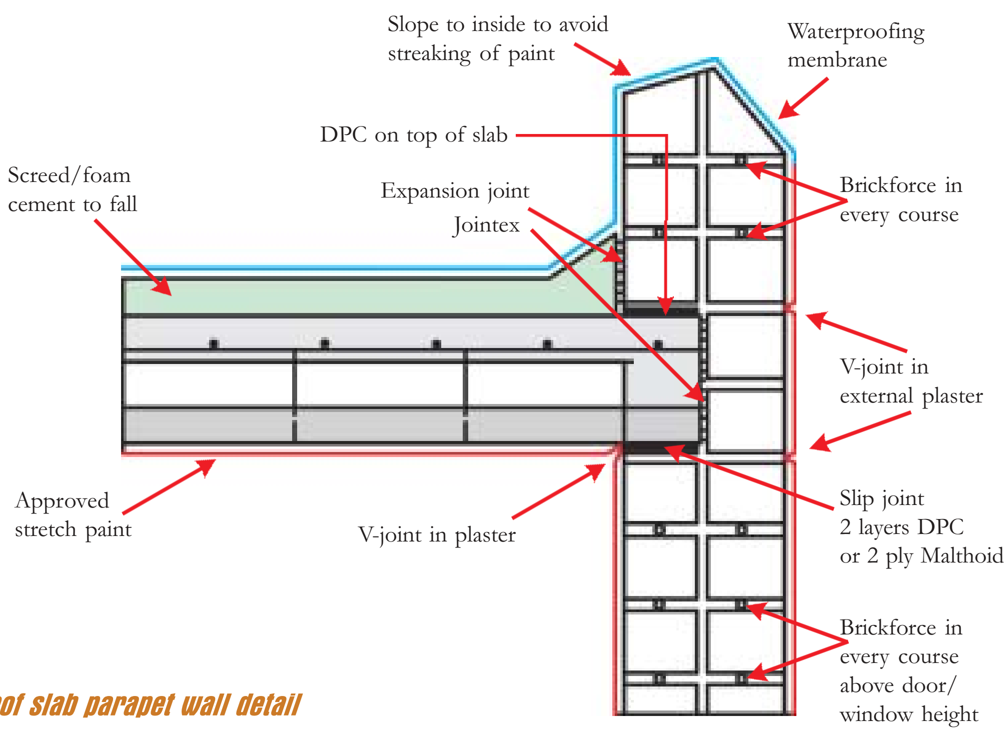
Cantilever balcony



Standard slab detail for load bearing walls



Slab detail for services



Roof slab parapet wall detail

11.REFERENCES:

1. Concrete Manufacturers Association, Precast concrete floor slabs: design manual, Randburg: The Association, 1996.

2. SABS 0100-1:1992, Code of practice for the structural use of concrete. Part I : Design, Pretoria: South African Bureau of Standards, 1992.

3. SABS 0400:1990, Code of practice for the application of the National Building Regulations, Pretoria: South African Bureau of Standards, 1990.

4. National Building Regulations and Standards Act, Pretoria: Government Printer, 1977. (Act No 103 of 1977).

5. SABS 0160: 1989, Code of practice for the general procedures and loadings to be adopted in the design of buildings, Pretoria: South African Bureau of Standards, 1989.

6. SABS 1504: 1990, Standard specification for prestressed concrete lintels, Pretoria: South African Bureau of Standards, 1990.

7. Multi-storey precast concrete framed structures. Kim S. Elliott - Blackwell Science, London.

8. Grinaker Precast: Flocon prestressed concrete floor system. Design Handbook - 1991

12. FURTHER READING:

1. Federation Internationale de la Precontrainte, Precast prestressed hollow core floors, London: Telford, 1988. (FIP recommendations).

2. Federation Internationale de la Precontrainte, Principles for hollow core slabs, London: Telford, 1982. (FIP technical report).

3. Federation Internationale de la Precontrainte, Quality assurance for hollow core slabs floors, London: Telford, 1992. (FIP guide to good practice).

4. National Precast Concrete Association of Australia, Hollow core floor: technical manual, North Sydney, The Association, 1992.

AVAILABILITY OF THE VARIOUS SYSTEMS

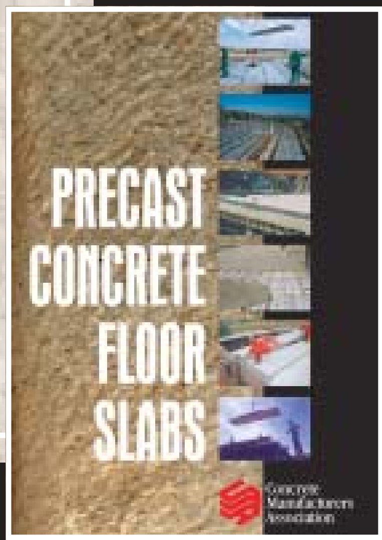
Member	Telephone Number	Beam and block	Hollow core		Panel Slabs	Stairs
			Reinforced	Prestressed		
Deranco	(041) 463-3338	★				★
Echo Floors	(011) 957-2033		★			★
Echo Prestress	(011) 393-4655			★		★
Fastfloor	(011) 923-5197	★		★		★
Grinaker Precast (KZN)	(031) 564-1304	★				
Neat Contech	(04664) 81 359	★				★
Superslabs	(011) 791-4554	★	★	★	★	
KBW	(011) 952-1610	★	★	★	★	

Concrete Manufacturers Association, P O Box 168 Halfway House 1685
Telephone: (011) 315-0300, Fax: (011) 315-4683, e-mail: cma@cis.co.za, website: www. cma.org.za

CONCRETE MANUFACTURERS ASSOCIATION – MEMBERSHIP LIST

Other Producer Members

Company Name	Telephone	Product
Bafokeng Brick & Tile	(014) 538-0842	MP
Bamburi Special Products Ltd	(09254) 2530504	P
* Brickcast Industries cc	(031) 507-7094	P
Cape Brick cc	(021) 511-2006	M
CEL	(021) 905-5998	P
*Columbia DCM (Pty) Ltd	(021) 946-3290	M
*Concor Technicrete (Pty) Ltd	(011) 495-2200	MPRT
*Corobrik (Pty) Ltd	(031) 560-3911	MPR
*Coverland Roof Tiles	(016) 421-4106	T
*Craig Concrete Products (Pty) Ltd	(011) 914-1730	T
DBL Concrete Products	(021) 905-1665	M
Eureka Brick & Block	(021) 887-4692	M
Fairmile Homes (Pty) Ltd	(021) 904-1620	M
False Bay Bricks	(021) 904-1620	P
Fanie Visser Concrete	(021) 904-1620	M
*Grinaker Precast (Pty) Ltd	(012) 652-0000	MPR
*Inca Masonry Products (Pty) Ltd	(043) 745-1215	MPRT
Klapmuts Concrete (Pty) Ltd	(021) 875-5151	R
*Lategan's Cement Works	(021) 873-1154	M
*Marley Roofing	(011) 316-2121	T
*Mimosa Brick (Pty) Ltd	(0163) 620507	P
*Morula Brick & Sand (Pty) Ltd	(012) 549-1727	M
Precast Concrete Industries	(09264) 61-280-4103	MP
*Stanger Brick & Tile (Pty) Ltd	(032) 4570237	MP
* Vanstone	(012) 5412056	PR
*Vibro Bricks (Pty) Ltd	(012) 374-2032	P
*Watson Tile & Concrete (Pty) Ltd	(011) 740-0910	MRT
Zimtile (Pvt) Limited	(09263) 4663511/5	T



* Companies which hold the SABS Mark
P = Paving M = Masonry R = Retaining Blocks T = Roof Tiles

Non-Producer Members

Ash Resources (Pty) Ltd	(011) 886-6200
Bayer (Pty) Ltd	(011) 921-5911
Besser Company	(091) 517-354-4508
Birkenmayer H (Pty) Ltd	(011) 970-3880
Brick King & Associates	(021) 948-6218
Cementex	(041)515-206
Chryso	(021) 933-5953
Friction Retaining Structures	(011) 622-2704
Inca (Cape)	(021) 904-1620
Kalode Construction (Pty) Ltd	(011) 781-3814
Natal Pavings (Pty) Ltd	(031) 209-3115
Pan Mixers SA Ltd	(011) 397-3754
Pave Show cc	(012) 346-6958
PPC Cement (Pty) Ltd	(021) 550-2100
Rampf Formen GmbH	(0949) 7 391-505-132
Randpave Industrial Contracts	(011) 805-1894
SA Paving (Pty) Ltd	(011) 483-1350
Siliseal Waterproofing Systems	(011) 464-1409
Slagment (Pty) Ltd	(011) 864-9900
Terraforce (Pty) Ltd	(021) 45-1907
Wates, Meiring & Barnard	(011) 315-0316
W R Grace (Pty) Ltd	(011) 923-4600

Emerging Manufacturers

Sabteca Concrete Products	(011) 424-7542 M

Cement Producer Members

Alpha Cement	(011) 780-1000
cement & concrete institute	(011) 315-0300
Lafarge South Africa	(011) 447-8360
NPC Natal Portland Cement	(031) 450-4411
PPC Cement	(011) 488-1700

Deranco (041) 463-3338

Echo Floors (011) 957-2033

Echo Prestress (011) 393-4655

Fastfloor (011) 923-5197

Grinaker Precast (KZN) (031) 564-1304

Neat Contech (04664) 81 359

Superslabs (011) 791-4554

KBW (011) 952-1610

Precast concrete floor slabs Published by the
Concrete Manufacturers Association
P O Box 168 Halfway House 1685
Telephone: (011) 315-0300
Fax: (011) 315-4683
e-mail: cma@cis.co.za
ISBN 0-9584106-8-2
First edition August 1996
Second edition July 1999